

A GUIDELINE FOR LOW-VOLUME SEALED ROADS IN THE SADC REGION.

by

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ABSTRACT

In spite of research conducted in the region of well in excess of US\$25 million to develop approaches, standards and specifications specifically relevant to the needs of road infrastructure in the region, relatively little of the results of this research has been put in practice.

In many countries the fundamental approach to rural road provision has remained unchanged in the past 20 to 30 years.

In the few instances where innovative and unconventional approaches developed through research have been successfully put into practice in the provision of secondary and feeder roads, the outcomes have invariably been highly beneficial and cost effective. There has, however, been relatively little dissemination of the results of this regional research. This project, which is commissioned by SATCC and funded by donors, is designed to produce a guideline that will increase awareness and facilitate implementation of locally developed technology in the provision of low-volume sealed roads.

Dissemination and promotion of appropriate technology is at the heart of the project. This paper describes the approach used to develop the guideline in which there is a much higher level of "local" and regional participation than has been usual in many previous documents of this type. The guideline is being produced through a series of workshops in which delegates from all the SADC countries are invited to attend and collaborate with researchers, consultants and contractors in the compilation of the document. This mix ensures that the needs of the region are reflected in the document and that the approaches adopted are both appropriate and based on sound regional knowledge and innovation. The working groups focus on particular aspects of the road provision process including planning and economic appraisal; geometric, pavement and drainage design; construction methodology and maintenance. The information presented at these workshops is then collated by lead authors who are responsible for drafting chapters of the document. These drafts will then subject to final review and agreement prior to launching the guideline.

1. INTRODUCTION

In recognition of the need for raising awareness of recent developments and current knowledge in the provision of rural roads, the British Department for International Development (DFID), the Norwegian Agency for Development Co-operation (NORAD) and the Swedish International Development Agency (SILDA) have agreed to fund a "guideline for low volume sealed roads in the SADC region". The guideline is being commissioned by SATCC and TRL have been appointed to manage the project in association with the Norwegian Public Roads Administration (NPRA), Road Departments and Agencies, other research organisations and consultancies.

The guidelines will provide a compendium of recent approaches to the planning and investment appraisal techniques, innovative technology in construction and maintenance and latest knowledge in labour-based and other construction techniques, which ensure the integrity of these roads through local participation and ownership.

2. BACKGROUND.

It is generally accepted that improvement of road infrastructure is one of the key elements in the development process. Road transport is the dominant mode of transport in the region comprising the Southern Africa Development Community (SADC), carrying over 80% of the region's goods and services. Typically, road spending absorbs about 5-10 per cent of the recurrent expenditure by governments in the region and 10-20% of its development budget. Much of this investment is in relatively low-volume secondary and feeder roads as well as in providing primary access.

Many aspects of road provision in Africa stemmed from technology and research in Europe and the USA 30-40 years ago. Although these methods have been modified to some extent in the intervening years, the basic philosophy of road provision has remained the same. Whilst this approach might be appropriate for much of the trunk road network in Africa, it is certainly not appropriate for many secondary and feeder roads

3. RESEARCH AND TECHNOLOGY TRANSFER

During the past 20 years, the DFID, NORAD and SIDA have funded research into various aspects of low volume roads with the aim of reducing costs and increasing the effectiveness of the provision of such roads for both rural and urban communities. Government departments and local agencies in the region have also carried out research and developed technology to meet their national needs. This investment is conservatively estimated at around US\$20-30 million.

This research has shown that a revised approach to economic appraisal, more appropriate geometric and pavement design standards, better use of locally available materials for the road pavement layers and surfacing, innovative construction methods and greater local and private sector participation in maintenance are just some of the areas where large savings in costs and increases in efficiency can be made.

There has, however, been relatively little dissemination of the results of this research in the region, which has led to a lack of awareness and implementation.

In civil engineering it is well recognised that the path from research, through development, to full implementation requires a minimum of five years and often very much longer. Furthermore the effort required at each succeeding stage in the process increases by a factor of between 2 and 10. Civil engineering is a conservative profession, for very good reasons, but the benefits of successful research can be very large indeed and this is, of course, why research is undertaken.

Donors have funded this research in the region for the development of road technology specifically for African conditions, particularly in the context of providing infrastructure to alleviate poverty through rural and urban development.

It is therefore surprising, that the same donors often fund foreign consultants and contractors to design and construct these roads, who have little knowledge of the region and show complete indifference to the implementation of locally developed technology. Also, in the few cases where these "appropriate technologies" are then put into practice, they are often carried out in a totally different environment from that in which they were developed. Then, if something goes wrong, it is the technology that is often blamed rather than the lack of understanding of those applying it and it is then all too easy to fall back on less appropriate standards and specifications regardless of the cost implications.

Furthermore, the “local” content in both the consulting and contracting component of road projects (especially sealed roads) is often very small or at a level in which there are virtually no opportunities for local practitioners to influence either the design or the construction methodology. In these circumstances, technology transfer in either direction is stifled and the long-term goal of sustainability through technology transfer, of which so much is spoken, is unlikely to be achieved.

Whenever the results of the research have been implemented, large cost savings have indeed occurred. Although further research is still needed in some aspects low-volume roads, the benefits from the application of existing knowledge are already very large indeed.

In the few instances where innovative and unconventional approaches developed through research have been successfully put into practice in the provision of secondary and feeder roads in the region, the outcomes have invariably been highly beneficial and cost effective. There has, however, been relatively little dissemination of the results of this research in the region, which has led to a lack of awareness. Even when the results are published there appear to be almost insurmountable obstacles in achieving the processes of technology transfer and subsequent implementation.

Unfortunately, in the past the problems associated with the implementation phase have not, perhaps, been fully understood; insufficient and inappropriate effort has been put into this phase of many projects and therefore the large potential benefits that are possible throughout the region have not been realised. The reasons for the implementation difficulties are now better understood and this project is designed to make full use of this.

4. SOCIAL AND ECONOMIC BENEFITS

Most of the rural and peri-urban communities in the SADC countries remain relatively poor although the GDP varies considerably in the countries comprising the SADC. Governments in the region are placing emphasis on maximising opportunities for employment and this includes the use of labour-based technology for the construction of rural roads. Whilst much of the technological developments reported in the guideline are aimed at secondary and feeder roads, some of these developments are also particularly suited to labour-based methods, including sealing operations.

It is conservatively estimated that savings of between £500 million £1000 million can be achieved in low-volume road construction in the region over the next 20 years by the implementation of existing knowledge.

(The guideline project is complementary to a separate project co-ordinated by SATCC to review the specifications and existing design standards for the SADC trunk road network with a view to the possible harmonisation of standards for these *main* roads at a future date).

5. SUMMARY OF PROJECT OBJECTIVES

The project objectives are to:

- a) Increase economic activity and alleviate poverty through the cost-effective provision of low-volume sealed roads in rural and peri-urban areas.
- b) Produce a document, which will enable road authorities, donors, consultants and contractors to plan, design, construct and maintain low-volume surfaced roads more cost-effectively.

c) Promote and implement new approaches, recent knowledge, innovative technologies and greater local involvement in the provision of these roads.

d) Produce a guideline with the full participation of regional experts from the public and private sectors in the region.

e) Produce the document through SATCC to ensure regional ownership and endorsement by the member states of SADC.

6. PROJECT METHODOLOGY

Local stakeholder participation in all aspects of the provision of infrastructure and transport services increases awareness of the benefits of appropriate technical solutions and reduces perceived risks.

The principal aim of the project is to maximise the implementation of previous research and development and therefore dissemination and promotion is the heart of the project. It is now accepted that substantial local involvement in projects is essential for sustainability and methods of increasing the participation of indigenous professionals from the public and private sectors are included in both the project itself and in the published guidelines. It is therefore a key aspect of the project design that most of the tasks will be carried out by teams of professionals from throughout the region, drawing on local experiences as well as the outputs of the international research effort. Therefore, there will be a much higher level of "local" participation in the compilation of the guideline than has been usual in many previous documents of this type. This will ensure that local knowledge is incorporated in the document and that the guideline will be a local product reflecting the needs of the region. This is particularly important in the compilation of application manuals and guideline documents. Thus, in order to have the maximum impact; it is essential that the local engineering community play a *full* part in developing the manual.

Task groups will be established which will include government specialists, consultants and researchers who are considered experts in their fields. Each task group will review the information available and present the information available to the workshop. Other technical papers will also be presented. The guideline chapters will be subjected to peer review. The final draft document will be presented at a seminar and the final document prepared for publication through SATCC-TU.

The guideline will include state-of-the-art information on the following aspects of low-volume sealed road provision

- Planning and economic appraisal
- Geometric design
- Pavement design and surfacing
- Construction methods (including labour-based methods) and drainage
- Maintenance
- Environment
- Road safety

In each of these areas there have been developments in recent years, which impact on the provision of low-volume surfaced roads in the region. Many of these developments are unpublished but the professionals involved in the provision of low-volume sealed roads also seem to ignore or, for some reason, are unable to apply even those that are published.

7. PROJECT MANAGEMENT

The project is managed by the Transport Research Laboratory (TRL) based in Harare,

Zimbabwe under a contract with SATCC-TU. The Norwegian Provincial Roads Administration (NPRA) is the named co-manager providing specific inputs on the technical management and co-ordination of the project under a sub-contract agreement with TRL.

8. PROGRAM

The project started in May 2000 and it is due for completion by April 2002.

The outline methodology includes a series of workshops to be held throughout the SADC region, in which the contents of the appropriate chapter of the guideline are discussed. Each of the SADC member states is invited to send a delegate, who can contribute to the technical content of the chapter and represent the views of the country that is represented.

Other key stakeholders in the project are representatives from the private sector, who are expected to play a major role both in the compilation of the guideline and in the implementation of the guideline recommendations. Consultants have been provisionally identified who are considered competent to make a significant contribution to the technical contents of the chapters of the report. These include local and regional consultants based within the SADC member states as well as international consultants and researchers who are considered to be experts in their fields and who are familiar with the problems associated with road provision in the region.

It is recognised that much innovative work is often carried out in in-house country programmes in order to solve particular problems. Often, the results of this work are not published and other countries in the region are then unaware of options and solutions, which may be also appropriate for them too. It is important that such projects are identified and the results and recommendations included in the document, as they may be particularly relevant in the context of this regional guideline.

The importance of SATCC-TU in providing technical and strategic advice in the project is also recognised. As the organisation responsible for the harmonisation of standards for the trunk road network and for developing recommendations for the implementation of appropriate standards on other roads, its role is pivotal to the production of the guideline, dissemination of the document and implementation.

9. COLLATION OF INFORMATION

It is the intention that this document will contain as much information as possible on the results of research, practices, methodologies, techniques, which have been developed in the region and for the region. The aim is to raise awareness of these developments so that practitioners and funding agencies in the road sector have a greater level of choice in deciding what is most appropriate in their respective field of expertise in road provision. Part of the role of all the participants in this project is to provide information for the relevant chapter to the lead author and this is a key continuous activity in the project.

10. WORKSHOP PERSONNEL

As stated previously, the main thrust of the methodology proposed for the delivery of the guideline is through the workshops. It is in the workshops that the contents of the relevant chapters will evolve through discussion and reasoned argument.

For each chapter, the lead author will be responsible for the collation of information both in advance of the workshop and during the workshop itself and the person appointed will be assisted in this task by local and regional consultants and researchers. Following the workshop, the lead author will be responsible for collating the information available in published and unpublished documentation as well as any additional information revealed during the workshop and for drafting the relevant chapter of the guideline. This will then be subjected to editing and peer review before presentation at the review workshop and final publication and presentation at the launch seminar. Thus the role of key author is particularly important and requires a person who is not only sufficiently conversant with the technical subject of the chapter but who is also somebody who has empathy with the purpose of the guideline and its perceived contribution to rural road provision.

Other resource personnel have also been identified to support the lead author and present papers, which reflect start-of-the-art knowledge in the roads sector in the region. These personnel are researchers and consultants with local experience.

11. COUNTRY DELEGATES

An important component of the project is local consultation. This is the reason that the document is being compiled through a series of workshops. Country delegates are invited to present papers at the workshop in acknowledgement that many local innovative ideas and practices do not surface through conference papers and scientific papers through lack of resources and opportunity. These papers presented by the delegates are intended both to provide information for the lead author and to share knowledge with the workshop participants.

12. CURRENT PROJECT STATUS

The first three workshop in the series have been completed and the following topics covered:

- Project overview
- Road maintenance
- Pavement design
- Surfacing
- Construction methods (including labour-based methods)
- Drainage

The workshops are designed to be as interactive as possible and to provide maximum opportunity for the participants to contribute to the proceedings. This objective is achieved as follows:

- Short, introductory, scene-setting presentations on key topics by resource persons as a lead-in to plenary/breakaway sessions
- Presentations from country delegates highlighting experiences in their own countries with particular emphasis on the use of innovative methods
- Facilitated plenary and break-away sessions involving the participants in discussion and feedback of key issues pertaining to the topics under discussion.

A significant outcome from the workshops is the amount of information on innovative practices described by the country delegates in their presentations and the workshop discussions. Much of the information is unpublished. It is the role of the lead authors to collate this information with the assistance of the other workshop participants.

13. WORKSHOP REPORTS

Reports are currently available for the first two workshops and the main issues discussed and outcomes are as follows.

Workshop No 1. (Overview and Road maintenance)

The workshop aimed to provide participants with a comprehensive appreciation of the overall concept and background to the guideline, and to seek their input to the implementation of the project, the scope and focus of the guideline and the issues to be addressed in the chapter on 'Maintenance'.

23 participants drawn from 15 countries attended the first 5-day workshop held in Harare, Zimbabwe between the 13th and 17th November 2000.

The workshop format involved introductions and summing up, presentations led by the Project Team, 8 workshop tasks and feedback sessions and 14 participant presentations. Participatory activities occupied in excess of 60% of the workshop programme.

A set of 8 Outcomes and Actions covering the following issues were agreed:

- Increasing the Adoption of Appropriate Cost Effective Standards
- Importance of Effective In-Country Organisation
- Importance of In country Standards Development
- Regional and International Co-ordination
- Project Strategy
- Format and Structure of the Guidelines
- Proposed Companion Document
- Draft Table of Contents of Maintenance Chapter

In addition, the workshop generated the following valuable information and insights:

- a) 39 case studies relating to relevant and often innovative experience (the 'Gems') were offered by the Group;
- b) Analysis of barriers to the implementation of appropriate, cost effective standards identified 'Fear of Change' and perceived 'Risk' as major factors in the lack of widespread adoption of new techniques;
- c) 'Lack of Ownership and User Acceptance' and 'Lack of Capacity and Funds' to effectively participate in technology development programmes were also ranked highly as obstacles to change;
- d) Solutions mirrored the problems and emphasised the need to develop broad stakeholder ownership through participation and effective dissemination.

Workshop No 2 (Construction Methods and Drainage)

The second 5 day workshop on *Pavement Design and Surfacing* was held in Dar es Salaam, Tanzania, from 22 – 26 January, 2001 and was attended by participants from national roads agencies in 10 SADC countries.

The main objective of the workshop was to involve a cross-section of practitioners from the region in the critical review and discussion of a range of factors that affect the pavement

design and surfacing of low volume sealed roads. The final output of the workshop was aimed at producing the outline of a Table of Contents for the chapter on Pavement Design and Surfacing in the Guideline.

The workshop format included 10 scene-setting presentations from the resource team, presentations from all 10 country participants, 6 Working Group and related feedback sessions and a site visit to an on-going road construction project. Participatory activities consumed more than 60% of the workshop programme and included the participants consideration of the following 5 main issues:

- Identification of key factors influencing the design of low volume roads
- Impact of low volume road considerations on pavement design
- Surfacing issues:
 - options available
 - advantages/disadvantages of seal types
 - factors affecting choice
- Proposed Table of Contents
- Workshop feedback:
 - Main observations and lessons learned
 - Mechanisms for implementation of workshop outputs

Some of the important related outcomes of the issues considered by the workshop participants included:

- Pavement design is a structured, multi-dimensional process that consists of a number of input variables, analytical methods and decision processes. They perform as part of an overall system and must therefore be designed as part of that system. The interaction of all components must therefore be considered carefully if appropriate designs are to be achieved
- In the compilation of the chapter on Pavement Design and Surfacing, a conceptualized, systems approach should be adopted. The guide should not be prescriptive in terms of a recipe approach to pavement design. Rather, it should guide practitioners in terms of the choices available to them in undertaking a design process and the implications and impact of these choices on the end product.
- The chapter should not be written in the traditional text book style often associated with pavement design guides and manuals. Rather, it should be written in such a manner as to be easily understood by a wide range of stakeholders – donors, senior Government decision-makers, planners, environmentalists, etc. As such, emphasis should be placed on the use of flow charts, graphical illustrations and tables to support the text.

The workshop highlighted the dearth of information available on pavement design and surfacing that relates specifically to relatively low-trafficked roads that comprise more than 75% of the road network in the SADC region. This emphasized the value of producing a Guideline with the full participation of regional experts, which will engender ownership and facilitate implementation.

14. FUTURE PROGRAMME

The following topics are planned for the remaining workshops:

- Planning and Economic Appraisal
- Environment
- Geometric design
- Road safety

These topics will be covered in two further “technical” workshops with a final review workshop followed by the launch seminar and publication of the guideline.

16. RECOMMENDATIONS AND CONCLUSIONS (to date)

Some of the main recommendations and conclusions at this half way stage of the project are:

- There is strong support amongst the workshop delegates for the aims of the project and only one of the 14 SADC member states has not participated in any of the three workshops held to date.
- Some of the country delegates attending the workshops readily offer to make more than one presentation at the workshops, which is indicative of the amount of information relevant to the project that is available in the region.
- Much of the information presented (referred to as “gems” by one of the lead authors) is new and is indicative of the innovative practices that are often undertaken in the region but remain unpublished.
- Other delegates from Roads Boards and Road Agencies have also participated in the workshops.
- The lead authors have received a large volume of information and have been guided by the workshop participants on the framework and content of the guideline chapters discussed to date.
- Recommendations were made by the delegates on the structure, format and layout of the guideline, including that it should be in colour.
- A strong recommendation was made that guidelines/manuals should be easily readable and understood by the wide range of stakeholders and in a form that can easily be updated.
- A companion document has been recommended, which would include more detailed information of examples of successful innovation in the region.

It is too early in the project to state with confidence if this approach to the production of a regional guideline will result in increased awareness of locally developed technology, increased scope for technology transfer and subsequent implementation. The high level of stakeholder participation in the project and subsequent dissemination through SATCC should ensure a higher level of implementation than has sometimes occurred with other guidelines. It is also anticipated that the approach adopted will result in the guideline making a significant contribution to the higher goal of poverty reduction through the cost-effective provision of rural

road infrastructure.