ROAD MANAGEMENT SYSTEMS - THE DEVELOPMENT OF THE ROAD MENTOR SYSTEM IN TANZANIA.

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ABSTRACT

Tanzania is currently in the process of completing the re-organisation of responsibilities within the roads sector. Two new organisations have been created, namely a semi autonomous Roads Authority, named TANROADS, which will be responsible for managing the trunk and regional road network and a Road Funds Board (RFB) which disburses funds against the achievement of performance targets. The Ministry of Works (MOW) will retain responsibility for overall policy, setting standards (or service levels), strategic planning, monitoring and evaluation, securing funds and project identification for development projects and defining the resource envelope within which TANROADS will operate.

It is against this background that the Road Mentor System Development project is taking place. This project is co-funded by the Government of Tanzania and DFID and managed by TANROADS. The broad objectives of the project are;

1. to establish local capacity for applying the Road Mentor maintenance management system on a continuing basis for preparing maintenance programmes for paved and unpaved roads; and
2. to develop procedures for network and project level data collection, treatment selection and prioritisation and incorporate into updated software and operational guidance.

In performing their functions, road sector managers need to follow logical and clearly defined sequence of steps. Each successive step requires accurate and up to date supplies of information for correct decisions to be made. For this reason, the maintenance of a database of management information at the heart of any system is essential for informed, accurate decision making. To support strategic decisions on optimum road standards, budget levels and future works programmes within budget constraints, however, requires a multi-year planning tool that is able to predict future road performance.

This paper describes the approach being taken to the specification of a road management system that has Road Mentor at its core as the road information system from which data can be taken as input to HDM-4 which will be used as the multi-year analysis tool for strategic, programme and project analysis. The paper also covers other practical issues such as the classification of maintenance activities, the pre-optimisation of standards and the affordability of data collection and hence the sustainability of the road management system.

1. INTRODUCTION

In the reorganisation of the roads sector in Tanzania, TANROADS has taken responsibility for the central (HQ-based) and regional roles in road management which hitherto came under the MOW. Existing MOW resources in the regions have been transferred to TANROADS, and therefore TANROADS will retain an in-house capability to undertake maintenance operations, at least for the immediate future.

The precise relationships are defined in a Framework Document that sets out the responsibilities of the new Roads Authority and in the Performance Agreement that sets out the standards which the Roads Authority should deliver to road users. The main challenges include:

- Establishment of a full asset inventory
- Focus on performance agreements and service standards
- Rational means of allocating funds
- Dealing with uncertainties in road fund provision
- Making best use of available resources at a regional level

It is anticipated that in future, the Ministry of Regional Administration and Local Government (MRALG) who are responsible for the district road network will also be subject to reorganisation, and could also benefit from improvements to their management procedures and capability. It is against this background that the Road Mentor System Development project is taking place.

This Paper is intended to inform transport sector professionals of the approach being taken to develop a new road management system to meet current needs. It takes account of greater experience and advances in technology since 1997 when the current project was first designed. Amongst the most important developments has been the publication of HDM-4 (Kerali et al 1996), the latest version of the World Bank's road investment tool now published and managed by PIARC, which has a significantly expanded capability, and is now able to address strategic, programme and project level analyses.

Following this introduction, additional historical background on road management system development in Tanzania is given. This is followed by a summary of general lessons on the sustainability of management systems. The core of the paper then follows and includes consideration of a number of issues essential to effective road management, that include

- Priorities in the collection of information for use in road management
- The importance of clearly describing and classifying road maintenance and improvement activities.
- The definition and pre-optimisation of maintenance and improvement standards.

The paper concludes by summarising the key elements and complementary strengths of the current Road Mentor maintenance management system and HDM-4.

3. BACKGROUND

The Ministry of Works first sought to develop a road management system in the early 1990's with assistance from the United Kingdom's Department for International Development (DFID), previously known as ODA. This was achieved by utilising and adapting the Road Mentor system originally developed by Jonathan Kemp Consultants (JKC), and now owned by the Transport Research Laboratory. The main development stages were as follows:

i) Testing of the basic Road Mentor package by the MoW through the establishment of a road inventory and condition database in the Iringa and Ruvuma regions;
ii) Review and amendment of the paved road data collection procedures and further development of the reporting and analysis capabilities of the system to select appropriate maintenance interventions;

iii) Implementation and completion of a Road inventory and condition survey of the entire paved and unpaved trunk and regional road network through DFID and USAID assistance in 1995/97 and the entry of the data into the Road Mentor database;
iv) Provision of Road Mentor software to MoW in each region and HQ;
v) Further review and validation of the unpaved road data collection procedures and treatment selection rules;
vi) Use of the database in the EU funded Paved Road Maintenance Plan in 1997 to develop a 10 year maintenance plan.

Despite this, however, use within the HQ sections and REO's has been limited due to the lack of user training and the absence of sufficient local expertise to maintain the system. The level of detail within the current system is also largely geared towards project level analysis and a network level capability is required for the system to gain wider acceptance.

The specific technical, software development, support and training requirements were initially established through a further review involving stakeholder participation. The review made the following recommendations:

a) To develop a comprehensive road management system building on the Road Mentor system.
b) To clearly define the scope (or aims), intended users, outputs, data and model requirements of each module;
c) To improve software support and rewrite the programme in a more common software language.

The above recommendations were fully endorsed in a Stakeholders workshop convened and the following additional emphasis was recommended to ensure early operational effectiveness:

1. A technical champion and 'home' within the former Department of Roads;
2. Urgent need for user training;
3. Provision of appropriate computer hardware in regional offices;
4. Implementation of formal change control procedures to ensure local participation and greater quality management;
5. Full piloting of the system and its component parts in the delivery of practical outputs, including the production of an interim unpaved road maintenance plan and the updating of the paved road condition database using a suitable network level procedure.

3. GENERAL LESSONS ON SUSTAINABILITY

The potential benefits of efficient road management systems are well known but few systems appear to be sustainable within developing environments. Current difficulties are partly a consequence of the substantial resources required to operate them effectively, particularly the basic data collection itself, and the over ambitious expectations of users. Key elements, such as the importance of cost effective standards, proven treatment selection and prioritisation methods and service delivery quality are often given insufficient attention.

Experience from Tanzania and elsewhere tells us also that the 'institutional' dimension has often been sadly neglected and, if the foundations and commitment required for sustainability do not exist, then the systems will fall into disuse and become ineffective. In Tanzania, this has been put into sharp focus as a result of the recent changes that assign responsibilities and clear end product objectives in a more transparent and accountable manner. In such circumstances it is to everyone's benefit to co-operate in meeting these objectives.

With respect to road management (TRL 1997), sustainability is more assured by -

- commitment to quality at all levels
- the existence of well defined policies and procedures
- clear definition of management functions and the cycle of activities
- specifying the system based on it's intended use, including the use of appropriate and affordable data collection strategies
- priorities for staged implementation

Perhaps not surprisingly, where effective implementation coupled with sound procedures and a responsive and caring attitude towards roads exists, little deterioration has occurred in some primary road networks over many years. However, in at least one circumstance where an over-sophisticated system existed side by side with poor implementation quality the lives of major rehabilitation treatments were reduced to between 30% and 50% of that expected. Getting the balance right forms the basis of our approach. This is illustrated in Table 1 where the 'profile' of three different countries is matched against observed deterioration.

It is generally believed that priorities in developing countries, where resources are constrained, should focus on identifying and prioritising works through use of a suitable programming system, and through effective management and control of maintenance and construction operations to ensure value for money. If taken in isolation, high budget levels and recorded volumes of works are no guarantee of quality or costs effectiveness.

Table 1 Relation between country profile and road performance

Frequency of periodic maintenance versus rate of increase in roughness			
Country	Profile	Resurfacing frequency	Annual roughness increase
A	Poor construction quality High tech management system Inappropriate treatments Poor axle load control Bad mix specifications	< 5 years	> 20 %
B	Average construction quality Simple management system Typical maintenance response Some overloading Typical specifications and designs	8 years	2 %
C	High construction quality Simple management system Very effective maintenance response Good axle load control Good specifications and designs	12 years	Negligible

4. FUNCTIONS AND AIMS IN ROAD MANAGEMENT

TANROADS requires a system that can be used by different users for alternative purposes. The needs of the users will vary depending on their respective role within the organisation, and the outputs they require to carry out the activities for which they are responsible. Within TANROADS, at least three levels of management have been identified with indicative primary responsibilities as follows:

Headquarters:	For network planning, budgetting and zonal programming.
Zone:	For road link programming
Region:	Project level implementation and operational management

In reality, it is expected that the lower level organisation would make some contribution to the tasks in the level immediately above, for example in preparing draft programmes and supplying information.

With the re-organisation of the roads sector a distinct set of Client, Manager and Service Provider relationships have been established which extend previous relationships. In addition, a new semi-autonomous Roads Fund Board, representing the interests of road users and the general public, ensures that funds are properly managed and made available and service standards to users met.

The management arrangement that has been established requires a mature, partnership-type approach that encourages a win-win situation for all parties. For example, it would be pointless for the MOW and RFB to impose a performance agreement on TANROADS that it was not confident that it could achieve with the allocated funds. Conversely, the MOW and the RFB cannot expect to adhere to rigid standards and fixed works programmes if the anticipated levels of funding and their timing is significantly different from plan. Reaching agreement in either of these circumstances requires a common understanding and shared objectives, supported by an agreed set of management procedures, reliable data and appropriate models.

Table 2 lists the management functions, their aims, the spatial coverage, the applicable time horizon and the management staff/organisations concerned, all of which will need to be considered in designing the new system.

To ensure consistency in approach and in order to help achieve compliance with the objectives of each activity, management procedures are required which -

i) specify in greater detail the purpose and objectives of each activity;
ii) identify the organisation and specific unit responsible;
iii) clearly define all terms in the procedure;
iv) describe the individual tasks, processes, outputs, criteria, calculations, data and models used in performing each activity;
v) define the level of information detail required for each activity and each management function; and
vi) provide guidance on the expected outcomes, in performance terms, of applying particular work standards and strategies.

Procedures should be used to underpin management activities and are the starting point for specifying computer-based systems. In moving from planning to operations changes also take place that, if recognised in system design can considerably improve the cost effectiveness of a management system. For instance, at a network level it is sufficient to employ the concept of representative sections, whereas at a project or sub-network level decisions are benefit from local knowledge and experience, and a greater level of detail is required.

Table 2 Management functions

Management function	Typical aims	Spatial Coverage	Time horizon	Organisations and staff concerned
Strategic Planning	1.1 Defining standards 1.2 Formulation of strategic objectives 1.3 Determining resources to support defined standards and objectives	Network-wide	Long term (strategic)	TANROADS HQ, MOW policy advisors and Roads Fund Board
Programming	2.1 Determining the work programme that can be obtained within the budget period and resource constraints	Network-wide to Region-wide	Medium term (tactical)	Zonal Managers and TANROADS HQ
Preparation	3.1 Design of works 3.2 Preparation and issue of contracts and works instructions	Sub-network, Road-link, Section or project	Budget year annually	Regional Managers, Engineers, technical and contract staff and Zonal Managers
Operations	4.1 Undertaking tasks as part of works activities	Sub-network, Road-link, Section or project	Immediate/ very short term	Works supervisors and Regional Managers
Monitoring and Evaluation	5.1 Measuring achievements against performance, end product and financial targets	Network-wide to project level.	Budget year to immediate/very short term	Roads Fund Board and representatives of all other management functions

4. APPROACH TO THE SPECIFICATION OF THE ROAD MANAGEMENT SYSTEM

The approach for developing the specification for the improved system involves:

i) Specifying the **SCOPE** of the system and its component modules, or sub systems;
ii) Identifying the prospective **USERS** of the system and their role in managing its various parts and the access they will require across the whole system;

iii) Confirming the **OUTPUTS** that its users will require; and
iv) Selecting the categories of **DATA** and **MODELS** required to produce the outputs.

The scope and components (or sub systems) include:

- A **Network Information System** at the core, used to assemble, organise and store data about the network, including Road inventory, Pavement details, Structures, Traffic, Finance, including budgets, on-going and planned Activities, and Resources.
- A number of **Decision Support Systems** to assist in the tasks that form the management cycle. These may include Planning, Programming, Preparation (or design), Operations and Monitoring and Evaluation systems.

Modern management systems are usually designed on a modular basis with the data held centrally, which each module accesses. Modules may be added or removed on an individual basis and the contents of the core database revised to meet the change in needs. The decision support modules assist activities that are performed at the periphery of the management cycle, as shown in Figure 1. More detailed examples of each activity are contained in Table 3.

The main distinction between the two types of systems is, decision support systems produce **OUTPUTS** which inform management decisions whereas information systems simply list or present input data in tabular, graphical or map format.

DATA can also be held at different levels of detail, eg. for the same road section, and selected by the user to meet their specific requirements. In some cases, eg. for network planning purposes, summary (or aggregate) data may be used which is representative of the characteristics of the entire range of road sections on the network, or perhaps the types of vehicles. Alternatively, specific data related to each section under consideration may be used, as is the case when a project is designed. What is most important is that the data is appropriate and sufficiently accurate for the task that is being performed. Also, management decisions, road performance standards and transport costs are sensitive to particular parameters and therefore any data collection strategy should reflect this. This approach forms the basis to HDM-4 and other modern systems.

Decision support systems also need **MODELS and RULES** to be specified which are applied to determine required treatments, project current conditions, estimate vehicle operating costs, etc. Simple models, or look up tables based on historical trends, may also be applicable in some circumstances, such as in determining off carriageway maintenance requirements. All issues will be addressed in the design of the system.

Figure 1 The Management Cycle

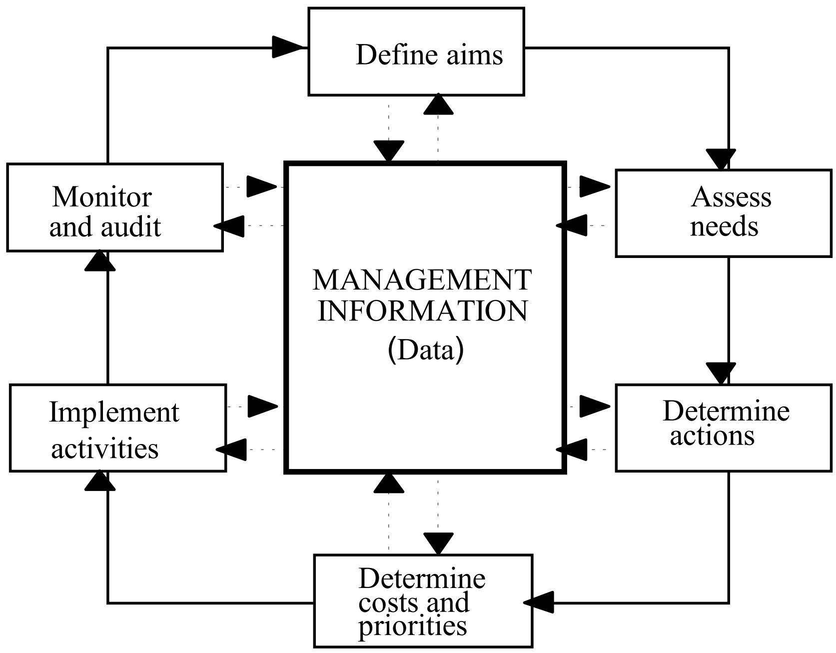

Table 3 Examples of Management Cycles and Component Tasks

Steps in the management cycle	Planning	Programming
Define aims	a) Confirm appropriate standards. b) Determine budget required to support given standards c) Update Norms, assumptions, network information and procedures	a) Network Screening b) Determine work programme that can be carried out with next year's budget c) Distribute budget between Regions
Assess needs	Assessed using whole life costing techniques (eg. HDM-4) and maintenance 'norms' based on aggregate network condition data for periodic and some reactive works, and using historical data for cyclic and special works	Assessed by comparing condition measurements with standards for periodic and some reactive works, and historical data for cyclic and special works
Determine actions	Treatments determined by applying fixed standards	Works options that are available to restore conditions to standards are determined
Determine costs and priorities	Application of cost rates to determine budget requirements, with no prioritisation	Cost rates are applied and options prioritised to produce a programme within the budget
Implement activities	a) Confirm and publish standards b) Publish forecast budget needs c) Update 'Norms' d) Update Network Information	Submit works programme
Monitor and audit	• Review forecasts prior to start of next planning cycle • Review planning procedures	• Review programme produced prior to start of next programming cycle • Review programming procedures
Length of cycle	Every 3 - 5 years	Annually, as part of a 'Rolling 5-Year Plan'

5. FUNDAMENTAL ISSUES

5.1 Introduction

A number of fundamental issues of significance need to be considered which govern the sustainability of the system itself and, as importantly, its cost effectiveness. Approaching system design without a thorough technical and economic understanding of some of these issues will lead to a poor solution.

The issues of data requirements, definition of maintenance activities and pre-optimisation of standards are among the most important and are addressed here.

5.2 Road data requirements for network level and local level management activities.

A major criticism of management tools, and a key reason for the lack of success of many systems, is their demand for comprehensive and detailed information which road managers can often ill afford. It is a criticism levelled against earlier versions of HDM and the current Road Mentor programme.

Data requirements should be tailored to the application. In practice, coarse data is required for network level decisions, whereas detailed data is required for project or local level decisions. Example data collection strategies for paved roads are illustrated in Table 4, where the relevant strategy for planning and programming purposes would require IQL III or IV data, with project level and research studies requiring IQL II or I data respectively.

Table 4 Illustrative IQLs for Pavement Data

Item	IQL I	IQL II	IQL III	IQL IV
Roughness	Profile Waveband analysis IRI	IRI Precise	IRI approx	IRI estimate
Cracking	Type, Extent Severity, Intensity and Location	Type, Extent and Severity	Type and Extent	Extent
Disintegration	Extent and Severity of potholes etc	Extent only	Any	-
Rutting	Mean and SD Transverse profile Crossfall Corrugations	Mean and SD	-	-

HDM-4 has also been developed to accommodate different data requirements at a strategic, programme and project level, although it can operate on detailed data at all levels if it is available. The current proposals for developing Road Mentor include the provision of a low cost, network level procedure for data collection and its use in subsequent analysis by HDM-4 or using in-built routines.

Building on the recommendations of the Paved Road Maintenance Plan study, a network level strategy equivalent to IQL III is currently being piloted. Estimated costs are of the order of US $17 per km, which is considerably less than the cost of full Road Mentor type surveys. The survey may also provide input to a coarse level calibration of HDM-4 and to a re-analysis of future needs. The availability of calibrated relationships is vital to the cost-effective programming of resources, and to the development of optimum standards.

The data collection strategy has two main tenets, firstly it focuses on data that management decisions are sensitive to and, secondly, it emphasises the importance of reserving scarce resources for project level studies to ensure designs are properly formulated to address performance problems and causes of failure.

5.3 The description and classification of road maintenance and improvement activities.

Clear and unambiguous descriptions and classification of road maintenance and improvement activities are required to:

- calculate the cost of maintenance and improvement activities, resource needs and productivity levels;
- estimate costs within each budget category;
- predict future deterioration trends and the improvements resulting from maintenance.

However, definitions vary significantly from place to place and users are often unaware of the consequences. These can grow to significant proportions if tools such as Road Mentor and HDM-4 are not configured properly. For example, it is well known that optimum maintenance strategies for unpaved roads require consideration of the traffic volume and the frequency of grading to achieve the desired result. However, considerable differences exist in the specification of grading activities, and whether they only involve light trimming of the surface or significant reworking, watering and compaction of the surface layer. As shown in Table 5 below, the optimum frequency using the former technique may be between 1.5 and 3 times greater to achieve the same standard (SFRDP, 2000).

Table 5 Optimum grading frequencies (number per year) for unpaved roads using different techniques

Daily traffic	Light grading	Heavy grading
25	0.5	0
50	1.5	1
100	3.5	2
200	7	3

In a further example, the specification and adherence to minimum maintenance inputs, eg. in performing routine and urgent works on all roads and in funding committed projects, is a necessary consideration in the development of practical maintenance plans. Maintenance standards can be developed which reflect 'user-oriented' objectives, for example providing accessibility at very low traffic volumes to minimising total transport costs at higher traffic levels (Toole, 1999). Differences in the costs of the various strategies range from perhaps a few hundred dollars per year on the lowest class of road to thousands of dollars per year for higher trafficked roads. Such standards, however, need to be clearly defined and applied consistently in support of objectives. They also provide a means of re-allocating priorities and budgets when funds are tight.

5.4 The definition and pre-optimisation of maintenance and improvement standards.

Most road investment tools and maintenance management systems operate by applying user defined intervention or design standards in response to projected road and traffic conditions, or only analyse a prescribed set of options. Thus any optimisation or treatment selection that takes place assumes that the standards are set at appropriate levels. However, this is almost certainly not the case, and investigation of optimum maintenance and improvement standards is a necessary first step in setting up a new system Analyses should be performed to determine:

- optimum grading frequencies of unpaved roads for each grading technique (see above).
- typical break-even traffic levels for upgrading from earth to gravel, gravel to paved, etc.
- optimum pavement and cross sectional designs for paved roads.
- optimum intervention strategies for maintaining paved roads.

Table 6 shows an example Optimum Treatment Matrix for maintaining paved roads that demonstrates the need to vary intervention standards by traffic level, and is derived by identifying the strategy which provides the best economic return for each cell of the matrix based on a total transport costs analysis. The resulting matrix of solutions should then form the basis of maintenance standards for use in the field and in developing works programmes.

In a further example, earlier work on Road Mentor in Tanzania led to recommendations on appropriate intervention standards for maintaining paved roads with AC surfaces based on the extent and severity of surface distress. After some refinement through field inspections by a panel of engineers, savings by up to 50% of previous estimates were calculated. The question of whether these are justified on a whole life costing basis needs to be asked.

Table 6 Example optimum treatment matrix for paved roads

Roughness Range (IRI m/km)	Crocodile Cracking (%)		Traffic Range – AADT			
	Narrow	Wide	< 150	150 - 500	501 –1000	> 1000
< 4	< 10 > 10 > 10	< 5 < 5 > 5	RM RM Seal	RM RM Seal	RM RM Seal	RM RM Seal
4 - 5	< 10 > 10 > 10	< 5 < 5 > 5	RM RM Seal	RM RM Seal	OLAY OLAY OLAY	OLAY OLAY OLAY
5 - 6	Any	Any	SC and Seal	OLAY	OLAY	OLAY
6 - 8	Any	Any	SC and Seal	OLAY	RECON	RECON
> 8	Any	Any	RECON	RECON	RECON	RECON

Notes.
RM - Routine maintenance only, Seal - Single surface dressing (or similar), SC - Thin Overlay (< 50 mm) and Seal
OLAY - asphalt overlay of 50 - 100 mm, RECON - Replacement of base and asphalt surfacing.

6. THE STRENGTHS OF THE ROAD MENTOR AND HDM-4 SYSTEMS

Table 7 lists possible components of an improved system, concentrating on 3 out of 5 proposed modules, the scope of each component and examples of outputs and data and model requirements, and the strengths of the current Road Mentor system and HDM-4 in fulfilling these.

It is evident from Table 7 that each system has particular strengths, which are, for the most part, complementary. The following points are worth noting:

a) Road Mentor's fundamental strength is as a road information system, to which other capabilities have been added to process current road condition data and produce a variety of reports of use in identifying sections of road requiring maintenance in the near future and computing the associated costs of works. Historical knowledge, eg. typical costs of off carriageway works, can also be stored in the system and used as input to models such as HDM-4 which does not model such costs.

b) HDM-4's strength is as a multi year planning tool which enables strategic decisions to be taken on optimum road standards and budget levels and future works programmes within user defined budget constraints. In so doing it employs models which predict road conditions in future years.

Table 7 Possible components and scope of an improved system and current strengths of Road Mentor and HDM-4

Module	Scope	Aspect	Example Elements Features	Road Mentor	HDM-4
Network Information	Storage of all data about the road network so that it can be interrogated by users seeking information on any particular aspect of the network	Outputs	• Road listings giving the attributes of each section	✓	
			• Lists of sections which meet user defined criteria	✓	
			• Graphical outputs of the roads gazetteer		
		Data	• Pavement structure and history	✓	
			• Bridges inventory		
			• Traffic classification and data	✓	
			• Unit costs	✓	
Strategic Planning, Policies and Standards	Determination of standards which minimise total transport costs and/or satisfy road service standards, with or without budget constraints Estimate budget levels to fulfil standards	Outputs	• Optimum maintenance and design standards for different road types and classes		✓
			• Service standards for different road types and classes		✓
		Data	• Representative data for all roads, including design, condition, traffic, cost data, etc.	✓	
		Models	• Prioritisation rules for multi year analysis		✓
			• Prioritisation rules for budget year analysis	✓	✓
			• Condition projection and vehicle operating cost models		✓
			• Methods for estimating cyclic quantities	✓	
			• Treatment selection rules for paved and unpaved roads	✓	
Network Planning and Programming	Determination of a multi year programme under budget constraint for all periodic works on paved and unpaved roads. Determination of a multi year programme for all routine works. Screening of the network to identify priority links for periodic and routine works in the next year.	Outputs	• Multi year programme analysis under budget constraints		✓
			• Planned Maintenance Programme (PMP) by priority/section order, including interactive review	✓	✓
		Data	• Specific for all road sections (Paved and Unpaved)	✓	
		Models	• Prioritisation rules for multi year analysis		✓
			• Prioritisation rules for budget year analysis	✓	✓
			• Condition projection and vehicle operating cost models		✓
			• Methods for estimating cyclic quantities	✓	
			• Treatment selection rules for paved and unpaved roads	✓	

c) The simple pavement intervention level approach within Road Mentor is very transparent and incorporates experience derived in Tanzania. A similar approach does not exist within HDM-4, but could be incorporated by defining a pre-set selection of maintenance intervention standards. On the other hand, HDM-4 has the capability of being able to investigate optimum carriageway maintenance standards on an economic basis.

d) Whilst HDM-4 is capable of investigating the economic feasibility of design options at a project level, it does not aid project planning, nor can it be used in operations management. On the other hand, Road Mentor is more capable in the area of processing and presenting data for planning purposes, and could be extended for use in operations management.

e) A particular strength of HDM-4 is the ability to represent the network as lengths of road occupying different cells in a multi dimensional matrix, the matrix being defined on the basis of broad categories of road strength, condition, traffic, etc., thus reducing the effort consumed in data collection and analysis. Road Mentor could assist in this process by using its database to define the length of road occupying the various cells.

f) Finally, both systems can incorporate a degree of interactive review, in which committed or user-selected projects and minimum standards, eg. routine maintenance on all roads, can be specified and the remaining works identified and prioritised.

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