

Malawi T² Newsletter

Technology Transfer for better Transportation



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University of Malawi
The Polytechnic
Technology Transfer Centre

A Newsletter of the Malawi Transportation Technology Transfer Centre



Final touches to Kwacha junction being turned into a roundabout in Blantyre. The National Roads Authority hopes motorists movements shall be eased and thus reduce accidents once this roundabout is completed. The roundabout is expected to be in use by August 2005.



The Mwanza Border Post accident wreckage. Malawi lost 15 lives as a result of this accident on 5th February 2005. The T2 Centre visited the scene of the accident and made several observations from which a report was prepared and sent to relevant stakeholders for action to prevent similar incidents in future across the country. The question is what action has been done to date because the National Road Safety Council road accidents statistics 1st quarter 2005 report that fatalities are projected to increase by more than 5% from 2004. Let us all take action to prevent fatalities from increasing beyond the 2004 figure of 689 fatalities.

Cover

- * Kwacha Junction round-about
- * Accident wreckage at Mwanza Border Post

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In Our Next Issue

- Highlights of the 2nd Africa Technology Transfer Conference
- What is International Focus Group on Rural Road Engineering (IFG)?

The T² Centre is pleased to publish the third issue of its newsletter. We welcome you to enjoy reading the articles but remember to give us feedback to serve you better.

Any opinions, findings, conclusions or recommendations presented in this Newsletter are those of the authors and do not necessarily reflect the views of the Mw T2 Centre, University of Malawi or its main stakeholder the Ministry of Transport and Public Works.



The Minister of Transport and Public Works, opened **LUPANGA RAILWAY BRIDGE**

Hon. Henry Mussa, MP
Minister of Transport and Public Works

The Minister of Transport and Public Works, Hon. Henry Mussa, MP opened the Lupanga Railway Bridge on Livirivi River on 15th April 2005 in Balaka. The Minister emphasized that the opening restores railway line connectivity to the Central Region thus reducing transport costs that had gone up since 2002 when the bridge was washed away.



View of Lupanga Railway Bridge



View of Lupanga Railway Bridge

Meet some of the Malawi Transportation Technology Transfer Centre Advisory Board Members:



Mr F Chinsinga, PS
Ministry of Transport and Public Works, Advisory Board Chairperson



Mr M Kachiwala,
Acting Chief Executive Officer, National Roads Authority, Advisory Board Vice-Chairperson



Mr Y Alide
Acting Principal,
Malawi Polytechnic.



Mr C Guta,
Director General, Malawi Industrial Research and Technology Development Centre



CAPACITY BUILDING IN CONSTRUCTION INDUSTRY

by Mr. Jonny J. Somba,

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1.0 Background

The National Construction Industry Council is mandated "to monitor and evaluate from time to time the capacity and progress of persons engaged in the construction industry" and also "to conduct training within Malawi and co-ordinate the training conducted by others of persons engaged in the construction industry." The two functions that are part of the 20 functions of the Council (see part IV of Clause 11 of NCIC Act) make the two building blocks to capacity building in the construction by the Council.

All the functions performed by the Council and powers invested in the Council were previously the mandate of Ministry of Works and Supplies. The Council absolved the functions and powers because the general public wanted an agency that would deal with both public and private sectors with more emphasis on private sector hence the creation of National Construction Industry Council (NCIC).

2.0 Monitoring and Evaluation of Capacity and Progress in the Construction Industry

For the construction industry to be successful, the clients, consultants, contractors, material suppliers and manufactures etc have to be monitored and evaluated. The four crucial stakeholders are inter-linked. Clients depend on consultants and contractors to execute the works. The works cannot be executed if required quality and quantity of materials are not available hence the need for material manufacturers and material suppliers.

All the four crucial stakeholders have been entrenched in the membership to the Council as stated in the NCIC Act Clause.

The Council has a role to play in ensuring that duties performed by each stakeholder is of required expectation and benefit to other stakeholders. Where performance of the particular stakeholders is not up to the expectations and has disadvantaged the other stakeholders, it is the mandate of NCIC to address such situations. The Council is likely to look at human resource, financial resource, equipment and materials in order to build capacity I making up the deficiencies. The capacity has been enhanced by NCIC through training and facilitation of provision of resources to the construction industry.

3.0 Addressing the Capacity Problems

Some solutions have been able to be resolved by the Council alone but other solutions required government and donor support.

3.1 NCIC Solutions

The Council has resolved capacity problems through the following means:

(i) Training
A number of training courses have been conducted to improve construction technology management to contractors. Consultations have been made to consultants and clients and in long courses of 4 months to 6 months consultants and clients have been able to send their members of staff for such training.

There have been courses that NCIC has been able to conduct using its own financial resources but donors have also been able to fund a number of courses.

(ii) Training Facilitation
The Council has noted capacity problem in trained personnel employed to clients, contractors and consultants yet training for such personnel has not been readily available. In this instance, the Council facilitated introduction of degree courses in Quantity Surveying, Land Surveying, Land Economy and Physical Planning at Malawi Polytechnic. Quantity Surveying and Land Surveying courses are operational whereas the other courses have their curricula done but yet to start in the next academic years. At least, the construction industry expects sufficient human resources when graduates start coming out of the Malawi Polytechnic.



Stakeholders at a workshop aimed at establishing a Training Unit at NCIC

CAPACITY BUILDING IN CONSTRUCTION INDUSTRY

3.2 Government Solution

The Council is thankful to Malawi Government for handling over training facilities at Works Training Centre, Lilongwe to the Council. The government also made it possible for road sector loans for infrastructure to be available to NCIC for capacity building.

3.3 Donors Solutions

Donors such as World Bank, Nordic Development Bank (NDB) and European Union have funded the construction industry in establishing the secretariat of NCIC, providing funds to undertake studies and provide training facilities.

Remarkable studies being undertaken through IDA funding are Construction Survey Function, Creation of Construction Fund, and Creation of Construction equipment pool (by NDP). The studies undertaken are useful to the Industry and give a bright future to the stakeholders to invest in the construction industry.

4.0 Challenges

It is expected that clients, contractors, consultants etc will accept their performance shortfalls and allow the council work with them to address the shortfalls. Not many stakeholders in particular contractors see the need to build capacity within themselves in order to produce quality work. There are about 1000 contractors but one can see only 10 participants to a full course.

It is also hoped that government will inject more funds into infrastructure development so that contractors and consultants can develop their skills so material suppliers be able to supply adequate materials to the industry.

5.0 Opportunities

There is goodwill for the Industry to prosper to higher limits. Government is willing to assist so too the donors. There are also stakeholders who are willing to learn and it is hoped such stakeholders in form of contractors, consultants, material suppliers etc can prosper and be able to work on international projects. Let us work together in order to build capacity in the construction industry. ●

Continued from last issue!

Improving the Transportation Skills Base!

Transport and trade are inextricably linked...!

By Louis L. Wright Uko, SHIPBROKER (SIST) +265 9 957 798, loudoggzin4000@yahoo.com

Introduction

As the subject continues to be discussed, a close look will be to discuss particular areas on problems related to new trends and so supporting the subject; this been so as a result of a consultation and from the feedback given by readers on the subject.

Customs Vs. New Age in the Transportation Industry: What's the Difference?

Problems that exist in the Transportation/Freight markets is also a result of say the New Age and its e-Economies, that much must be done to increase the development pace in transportation/freight technologies (hardware and software solutions) and capacity building so that we trade globally in goods and services more competently. Technologies today make it possible to innovations in industries and trades of all kinds. The mega transportation industry alone is composed of so many industries and markets that with the available technologies it is very simple to trade the services globally.

Traditional Means of trading -Old Age

The analysis of existing facilities for trading in the transportation/freight industries

in Malawi is part of an overall research in transportation/freight technologies (i.e. in particular Software Solutions). The research addresses that enough opportunities and profit-abilities of both transportation/freight firms, consumers of the services and the suppliers of the solutions do exist in the region: this studied within the framework of the economy's mission in identifying specific transportation/freight trading facilities necessary for improvements to support existing and future international trade in goods. The existing facilities do not help much in the 'reduction of transportation costs management' as a result of sticking too much to traditional means of trading. Facilities for trading in the new age are not supplied sufficiently and consumed by the trade in the region. For instance few freight companies in Malawi have a presence on the Internet -a freight company even so little must have a presence on the Internet, at least one Web page!

This article outlines in brief other findings that address the need to change and bring in an effective configuration of the trading facilities in the practices.

The Findings

In the said research, we also discovered the following:

- Transportation/Freight technologies

(in this regard, Software Solutions) can be used in the reduction of transportation/freight services production, supply and delivery costs;

- The solutions aids maximum profitability to be achieved;
- In Malawi and in other parts of the region (but not in South Africa) designers, developers and suppliers of related solutions are not located;
- The users, service providers and authorities of the transportation / freight industries all are looking forward to see the introduction and development of these technologies.

In the New Age

In the New Age the following happens in transportation/freight firms:

- Rims of papers are reduced;
- Costs incurred in sending and receiving of messages are kept low;
- Obsolete-labor (e.g. all non-ICT personnel or say those leaving behind the age) are removed from job;
- New and unlimited clientele list introduced.

.... To be continued in Next Issue

Some useful links:

URL: <http://www.ics.uk.org>

URL: <http://www.routesmart.com/>

ROADS WORKS COMPONENT UNDER THE GOVERNMENT OF MALAWI/EUROPEAN UNION

By *Mr. Harris Kumwenda*, Ministry of Local Government and Rural Development

Introduction

Most rural roads in Malawi are in a very poor state. As a result, accessibility to social services such as schools, hospitals and markets is difficult.

Malawi is a relatively small country with a high population, 105 persons per sq km, naturally, and a rural proportion of 80% (NSO 2000) there is a great need for access in the rural areas.

In order to support the Government efforts in improving rural access and alleviating poverty the GoM/EU Public Works Programme (PWP) is promoting labour intensive rehabilitation of district roads. The programme is part of the European Union's overall assistance to the Government of Malawi's Poverty Alleviation Programme. The programme has been in operation since April 2001.

The roads component was implemented in Lilongwe, Mchinji, Kasungu, Ntchisi and Dowa from 2001 to 2004. In 2004 and part of 2005 it was in Nkhatakota, Salima, Dedza and Ntcheu districts. The maintenance activities will continue in the five original districts.

Component Objectives

The roads component has the objective of improving district feeder roads and bridges and maintaining previously rehabilitated roads.

Expenditure

The 8th European Development Fund (EDF) and European Annual Food Security Programme with a budget of 23 million Euros fund the programme over 4 years. Of the budget 44% is allocated to the roads component.

Component Outputs

- 2, 089km of rural roads have been rehabilitated.
- Concrete decks have replaced 678m timber deck bridges.
- 895 km of rehabilitated roads are being maintained.

- 25, 934 persons have participated in road and bridge works.
- 879 persons are employed in road maintenance.

Implementation

The GoM/EU PWP roads components is implemented with Technical Assistance provided by Africon Limited and locally appointed engineers from private consultants and the National Roads Authority. This will ensure that the training skills learnt during the programme will remain for future activities of the personnel.

Implementation Activities

Road Rehabilitation

Rehabilitation of rural feeder roads includes: -

- Pavement creation: cleaning and grubbing, profile reshaping pothole and scouring repair and minor alignment.
- Drainage Structures: Side drains, mitre drains, culverts, drifts, Irish bridges and erosion control measures.

Rehabilitation work is done on existing designated roads that are part of national road network. The programme does not construct new roads. The average cost of rural road rehabilitation is approximately US\$3, 500 per kilometer, employing 14 to 16 people for a period of 3 months. On average one person employed earns US\$50 per contract.

Bridge Works

This involves replacing existing timber deck bridges with concrete deck to ensure long-term rural accessibility. This includes the construction of temporary deviations, removal of existing timber decks, repair to existing abutments and piers, construction of concrete caps to abutment and piers, construction of new cast in situ concrete decks. Also erosion protection works, watercourse clearing works and raising bridge approaches. Bridges are only replaced on the roads that the programme covers under the rehabilitation mentioned above.

Road Maintenance

Once completed and the defects liability period is over the rehabilitation contractor is released and the roads need to be maintained. Members of a road maintenance club are selected from the communities previously involved in the rehabilitation works. The Length - Man system is used where each club member is allocated a kilometer of road to maintain with supervision from the Programmes' maintenance supervisor. Clubs are provided with all the necessary tools needed to carry out maintenance work. Each club has elected leaders and a bank account for receipts of monthly payments based on performance.

Key activities under road maintenance include:

- ❖ Pothole filling
- ❖ Clearing of bushes
- ❖ Drainage maintenance and silt clearing

The cost of road maintenance is approximately US\$250 per km per year with 85% of the cost going directly to club members.

Implementation Process

Prioritization

Community members through the District Assembly identify the roads and bridges. The GoM/EU PWP works on the availed priorities by conducting site surveys and taking an inventory of works to be done. The survey results are used for design works and to compile tender documents.

Tender Procurement

The tenders are advertised in the local press to small and medium scale contractors who are registered with the National Construction Industry Council (NCIC). Bridge works require established and experienced contractors. All interested bidders attend a Compulsory Management Unit meeting during which issues regarding instructions to the tender bidders, conditions of contract, particular technical specifications, standard drawings and particular specification for employment of local workforce are discussed.

Tender Evaluation and Contract Award

Submitted tenders are publicly opened and are evaluated using the European Development Fund (EDF) guidelines looking at administrative, techni-

cal and financial factors. The successful bidder is awarded the contract through official letters and the local press. The road or bridge to be rehabilitated is thereafter handed over to the successful bidders (contractors).

Community Mobilization

Once the contracts are awarded, the contractors are sensitized and they mobilize resources through the local leaders such as the Traditional Authorities, group village heads or ward councillors. Sensitization emphasizes land issues, methods to use, extent of road to be rehabilitated, who to employ and the need for the activity. It is a requirement that at least 40% of the workers employed are women.

Contract Management and Site Supervision

The first 100 metres of road for rehabilitation is used as a training ground for contractors, thereafter the contractors continue work on their own. After demonstrating, the programme engineers and supervisors conduct routine site supervision of the contractors. During supervision, the engineers and supervisors check that activities are done according to specifications and that the contractors are adhering to their budget.

Payment for the workforce (labourers) is done fortnightly and is based on tasks completed. Payment for the contractor is based on compliance to specifications and standards with payment certificates compiled for approval and processing. The payroll, which is attached to payment certificate, is verified with the workforce on the ground to ensure that the contractor has paid them.

EXPECTED BENEFITS

Upon successful completion of the programme, the following benefits are expected:

- Better and quicker accessibility to rural health centres, schools and markets;
- Job creation for the community members;
- Contractors exposed to higher construction standards through detailed specifications and drawings;
- Road construction experience gained by community members for similar programme in future; and
- Less vehicle maintenance and travel costs due to better road conditions.



Road Pavement Technologies and Applicability in DEVELOPING COUNTRIES

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In recent decades significant technological advances have been developed and introduced worldwide in the field of road pavement industry. The main objectives of this paper are to present an overview of the latest issues and developments in the design and road engineers and practitioners in the field of highway engineering [Figs. 1, 2]. Popular innovations in pavement evaluation, maintenance, rehabilitation [Fig. 3, Eqn. of Fig. 4, & Photos 5, 6] and design of overlays [Fig. 7] are presented. Asphalt pavement recycling and use of non-traditional road construction materials are included [Photo 8]. The advent and implications of using foamed asphalt in cold-mix recycling in road maintenance in Africa are emphasized. Of particular interest consideration is the status and experience in developing countries compared to those practices. The study also provides treatment of potential applicability of these technologies in Africa. Regional initiatives are undertaken by country groupings such as the fourteen countries of the Southern Africa Development Community (SADC). The SADC has recently developed and launched a design guide for low-volume sealed roads of the trunk road network as defined by the SADC Southern Africa Transport and Communications Commission (SATCC). Although traffic analysis and projection are similar to the mechanistic and the Transport Research Laboratory (TRL) procedures, the design approach basically follows TRL Road Note 31. On the other hand, the road subgrade is characterized by the conventional parameters of California Bearing Ratio and the Dynamic Cone Penetrometer. The development of the design catalogue has been based on current practice considered appropriate for the region such as the South African Technical Recommendations for Highways TRH42. The documents developed by SATCC contain five volumes which include road and bridge design, specifications and rehabilitation. Economic considerations for relying on such regional specifications and standards are discussed. Cost items include expensive equipment and facilities for laboratory and accelerated full-scale testing which are difficult to justify for the road network with low-to-medium traffic level in most countries of the region.

Key Words: Pavement Design; Maintenance and Rehabilitation; Emerging Technologies

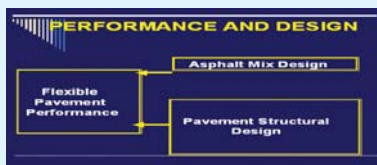


Fig. 1: Pavement Performance Components



Fig. 2: Pavement Failure / Design Criteria

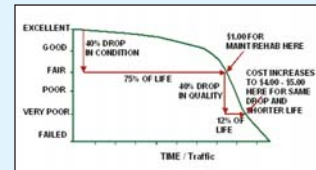


Fig. 3: Road Condition and Timing of Rehabilitation (Adapted From FHWA)

Eqn. Fig. 4: Maintenance & Rehabilitation Priority Index

Maint/Rehab Priority Index (PI):

$$PI = (TF * FC * RF * MF) / PCI$$
 TF = Traffic factor
 FC = Functional Classification
 RF = Route Factor
 MF = Maint. Factor
 PCI = Pavt. Condition Index



Photo 5: Pavement Premature Failure



Photo 6: Pavement Evaluation Equipment (From FHWA)

$$SNOL = SN_r - (FRL \times SN_{net})$$

Fig. 7: Overlay Design Method

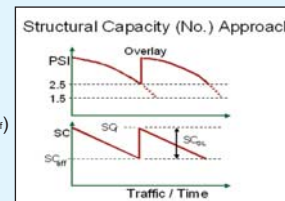


Photo 8: Recyclable Material



INSITU COLD MIX MILLING of THE BLANTYRE-CHIKWAWA ROAD

BY GROUP 5 INTERNATIONAL

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Introduction

At the end of the service-lifetime of a road, when the damaged pavement can not anymore fulfill its purpose of a comfortable carrier of traffic, the road pavement must be renewed. In this country the most common renewal technique of the road pavement is the treatment of potholes, which many people have criticised as being ineffective.

When enough monetary resources are available, that road pavement renewal is done either by removing the materials from the old road and constructing a new one, or by other rehabilitation and reconstruction techniques including recycling.

The first solution is expensive although widely used with severe environmental drawbacks, as it involves the creation of huge amounts of demolition wastes and the consumption of equal amounts of new materials (gravel, sand, bitumen or cement).

The other solution (pavement rehabilitation including recycling of the road materials in place) is a much more sustainable solution of road construction.

This article dwells on the experience of insitu pavement recycling on the Blantyre-Chikwawa road performed by Group 5 International in 2001 and discusses the lessons that Malawi learnt or missed.

In 2001 Group 5 International, a South African construction company were involved in the rehabilitation of many roads in the City of Blantyre including Blantyre-Chikwawa road among the many projects. The contractor also built Hotel Victoria, Shoprite complex and the new look Ryalls Hotel in the City of Blantyre.

Blantyre-Chikwawa Road Rehabilitation Works

On the Blantyre-Chikwawa road, the works involved rehabilitation of the existing pavement by patching the pothole and resealing the road in addition to reinstat-

ing the damaged drainage facilities. The total road length was 47km from Catholic Institute to Kamuzu Bridge on the Shire River in Chikwawa. The first 4 kilometres from Catholic Institute and the last 7 km of the road were so bad that the contract demanded removal of the existing material and replacing with new one. The contractor proposed to recycle the existing material by a technique called "insitu cold mix milling" taking advantage of the equipment which was doing similar work in the City of Blantyre claiming that it was faster and cheaper than conventional method earlier proposed in the document. The client and consultant were uncertain at the idea but later consented to the contractor's proposal.

The author has a first hand experience with this method by the contractor since he was among the consultant's team who supervised the rehabilitation of the road.

On the Blantyre-Chikwawa road, traffic counts performed in January 2000 gave a cumulative number of equivalent standard axle of 0.33 million ESA.

The first four kilometers of the road had two distinct pavement structures; waterbound macadam and crushed stone base. This section was set for recycling.

The Wirtgen machine was used to do the operations. Before the process, the existing road potholes were filled with sand and gravel, then the surface was sprayed with a cement blanket at 1.5% mix by weight. The hot 80/100-pen bitumen was drawn from a tanker in front of the Wirtgen and into the Recycler's computer controlled bitumen pumps, where it was metered into special expansion chambers on each nozzle. A small-predetermined quantity of water from a water bowser in front of the bitumen distributor, combined with a jet of compressed air, was injected into each nozzle chamber to foam up the bitumen to over 15 times its original volume, which was then ejected directly into the mix. Individual nozzles could be

switched off to match the width of road being treated. All the ingredients were thoroughly mixed together to reconstitute and strengthen the old roadbase.

The contractor's team followed on directly behind the Recycler taking and testing samples of the strengthened mixture before and after compaction. The consultant also closely monitored the testing. The tests that were carried out were Marshall Stability and Flow; Indirect Tensile Stiffness and Indirect Tensile Strength (ITS).

The rejuvenated mat was compacted, reprofiled, and levelled with the motor grader prior to the roller finally compacting the recycled road base to the specified mean density. After final rolling the strengthened and stabilized recycled road base was left to cure for 36 hours prior to covering with the double chip seal surface finish, even though traffic could use it immediately after rolling.

The process could also be performed even during periods of light rains; a case to remember is the Glyn Jones Road, which was treated during periods of heavy rains. The road did not become muddy and remained strong and stable even through traffic could use it immediately after treatment.

Conclusion

The in-situ recycling technique has major cost and environmental benefits as it was about 20% cheaper and generally 50% faster than conventional repair methods of taking out and transporting the spoil to tip and importing new quarry material. The process proved also to be far more environmentally friendly, and far less disruptive to traffic and local residents. The recycling technique could also cut the number of lorry movements needed to take spoil off site to tip and import with new materials.

Even though Group 5 is not in town, this technology should have been documented and papers written by engineers from Blantyre City Assembly, National Roads Authority or the Ministry of Transport and Public Works for future review so that this technology could be applied to our roads that are in bad shape.

If we are to do the conventional treatment to Masauko Chipembere Road, Mahatma Ghandi Road or Moi Road in the City of Blantyre for example, how much trouble would that bring to traffic and the public. Pavement recycling could be the answer ■

ROAD TRAFFIC DIRECTORATE

REFORMS AND PROGRAMMES IN THE DIRECTORATE OF ROAD TRAFFIC

By **Symon Maliko**, Senior Road Traffic Officer, RTD

The Directorate of Road Traffic is a regulatory arm of the Ministry of Transport and Public Works, responsible for all matters relating to road transportation, as well as issues pertaining to the implementation of policies and directions sanctioned under various Regional and International Conventions such as SADC. As a technical wing of the Ministry, the Directorate also plays a crucial role in the provision of advisory services to other government institutions and stakeholders in road transport industry.

The mandate of the Directorate is prescribed in the Road Traffic Act (1997) which provides a legal framework for the Road Transport Industry. Under this Act, the Directorate of Road Traffic is charged with the responsibility to administer regulatory provisions governing Motor Vehicle Administration, Driver Licensing Administration, Operator Authorization and Permit Control and other issues related to traffic management and control. The Directorate's authority is further derived from the provisions of the National Transport Policy Document (November 2000).

The advent of multiparty politics in Malawi in the early 90's marked the beginning of a new era of market liberalization. The country experienced influx of second hand vehicles

imported from foreign markets such as South Africa and Dubai, hence a rapid expansion in motorization during the period.

Coupled with problems relating to institutional capacity and technological advancement, the Directorate could not cope with the ever growing vehicle population in Malawi. To address this problem, the Directorate embarked on Computerization Project in 2000. Under the project most of the Directorate's functions and processes are automated. It was envisaged that this would improve efficiency and substantially prevent proliferation of fake licensing documents through which the Government has been losing huge sums of revenue in the past.

After automation of road traffic functions and process, the Directorate with the assistance from the Department of Human Resource Management and Development conducted functional and institutional reviews. Following that exercise, the Directorate has new organizational structure.

The Computerization Project has so far been successful in that production of fake vehicles and Driver licenses has been minimized and the annual revenue collections have over the last few years sharply increased.

In an effort to pursue concept of decentralization, the Directorate is currently extending its services at district level. In light of this, it has already opened vehicle inspection centres throughout the country. The Plant and Vehicle Hire Organisation centers are in some designated (P.V.H.O) offices and vehicle inspectors have been deployed to these stations to discharge vehicle inspection services. The Directorate also intends to open fully-fledged offices in other districts such as Zomba and Mangochi in the South, Kasungu in the Centre and Karonga in the Northern Region.

The Directorate's expectation is that by bringing road traffic services closer to motorists it will not only broaden the revenue collection base but also enhance compliance rate thereby promoting road safety in the country.

CHALLENGES

Despite the Directorate's efforts in improving operations of the road transport industry through these reforms and programmes, it continues to be besieged by various problems ranging from inadequate financial capacity for undertaking such programmes to lack of well-trained personnel.

Handcarts:

The Most Appropriate Transportation Technology for Transfer to Malawi

Arnold P. Wendroff, Ph.D., Malawi Handcart Project www.malawihandcartproject.org

Transportation technology transfer policymakers in Malawi are focusing their efforts on extending the benefits of wheeled transport to subsistence farm families, the backbone of Malawi's agriculture-based economy. Most of these often female-headed households have no wheeled transport of their own, and minimal access to public transport. Virtually all of their domestic water supply, firewood, and farm inputs and outputs are moved by head-loading, which is both economically inefficient and physically debilitating. With per capita incomes under 200 dollars per year, their wheeled transport options are few.

Four designs of handcarts:



There are four 'relatively' affordable intermediate means of transport (IMT) available to Malawi's subsistence farming communities, and to its rapidly growing urban poor. Bicycles, the commonest IMTs in Malawi, while ergonomically efficient, have few domestic or agricultural applications as they lack the box-body needed to conveniently carry heavy, bulky loads such as water, firewood, and harvested crops. Moreover, bicycles have traditionally been 'off-limits' to women. Wheelbarrows cost about as much as bicycles and have a large volumetric capacity. Unlike bicycles, however, wheelbarrows are ergonomically inefficient, requiring the operator to lift half the combined weight of the vehicle and its contents and to balance it laterally. Furthermore, most have wheels with crude high-friction bearings and solid or semi-pneumatic high-hysteresis tyres. Ox- and donkey-carts are an order of magnitude more expensive than either bicycles or wheelbarrows, and draught animals add to their expense. Ox-carts are unwieldy, their carrying capacity is far in excess of the majority of subsistence farmstead requirements, their speed is no more than that of the wheelbarrow, and, as with bicycles, there is a cultural bias against their use by women.

Despite these drawbacks, the development community has focused its efforts on oxcart dissemination, but, not surprisingly, oxcart uptake has been minimal. Farmsteads of less than one hectare cannot sustain the families living on them, let alone a family's draught animals, and tsetse fly infestation poses a further constraint. These several factors have operated to limit

oxcart ownership to one cart per 400 Malawians, and they will continue to impose severe limits on such ownership.

Given the substantial limitations of bicycles, wheelbarrows, and ox-carts, what affordable wheeled transport technology is available to assist poor Malawians? I propose the lightweight handcart as the transport technology of choice, and suggest that we direct our efforts to transferring handcart technology to Malawi, in particular, and to sub-Saharan Africa in general.

A handcart is fundamentally different from a wheelbarrow, having two wheels, one on either side of the cart. Because the high-volumetric-capacity box body and its load are balanced over the axis of the wheels, the operator neither lifts nor laterally balances the combined weight, as in a wheelbarrow, but simply propels it. The cart's two wheels are of relatively large diameter, rolling over depressions smaller diameter wheelbarrow wheels sink into. Handcarts wheels have low-hysteresis pneumatic tyres and anti-friction ball bearing hubs. Handcarts are lightweight and convenient to use. Handcarts are so ergonomically efficient that during official trials at Chitedze Research Station in 1998, Malawian women and even primary school children of average physique easily transported 100-kilogram loads at a rate of 4 kilometers per hour.

Why are handcarts essentially unknown in Malawi? One reason is the development community's

Eurocentric mindset. African development has been dominated by European concepts and by European-trained experts having minimal familiarity with and expertise in handcart applications. Their focus has tended to be on capital-intensive transport modalities which, unfortunately and for obvious reasons, have largely failed to meet the needs of Africa's subsistence farmers. Although handcarts are a major transport modality in both rural and urban Asia, relatively few Asian development experts have worked in Africa. (Nevertheless, it is odd that neither the Taiwanese agriculture development experts working in Malawi since the 1960's, nor their Chinese counterparts in neighboring Tanzania and Zambia, have acted to introduce into Africa the handcart technology so widely and effectively in use in their own countries. Ironically, both Taiwan and China export handcarts and their wheel sets to Europe and North America!)

In addition to the reasons cited above, lightweight handcarts are rarely found in Malawi or elsewhere in sub-Saharan Africa in large part because conventional handcart wheels and axles are simply not available. Recognizing this constraint, in 2000 I developed the AfriCart handcart design that could be built by local carpenters with hand tools and using the ordinary 28-inch bicycle wheels available throughout Malawi. The wheels are carried in a wooden frame or chassis, sharing a common axis but not a common axle. A similar design is used in the hand-powered steel 'polio tricycles' found throughout Malawi. The chassis supports a wooden box-body having short handles affixed at its rear and a sliding gate at the front. (The handle arrangement is based on the assumption that the cart is to be pushed European style rather than pulled in the Asian fashion. For pulling, longer handles can be attached at what then becomes the cart's front end.) A retractable wooden stand affixed to the chassis supports the cart and its contents when stationary. All components, fasteners, and materials are readily available in rural markets. When available, stronger 12 gauge (as opposed to the common 14 gauge) spokes are employed, allowing the AfriCart to safely transport over 150 kilograms, a far higher load than headloading or wheelbarrows allow and with far less effort.

However, the AfriCart design is far from being an optimal handcart, as bicycle wheels, even with 12 gauge spokes, are still relatively delicate, and the requisite chassis adds weight and expense. The AfriCart design is simply a way to adapt Africa's only available, affordable, and ergonomically efficient wheels to a handcart design when more rugged handcart wheels mounted on a common thick steel axle are not to be had. Recent negotiations have convinced "SinoLink-Malawi," a distributor of Chinese agricultural machinery with offices in Blantyre and Lusaka, to import purpose-built handcart wheel and axle sets into Malawi. The company's Beijing headquarters recently offered "to send some Chinese experts to help local workers to assemble handcarts from Chinese imported components, as well as help them to build local small workshops and larger factories

to build handcarts for local and more distant markets." This generous offer has been forwarded to Malawi's Ministry of Industry, Science and Technology in the hope that that agency will assist in disseminating this technology throughout Malawi, creating a handcart industry with attendant employment opportunities.

In the interim, the AfriCart and its welded steel counterparts are being manufactured in small workshops from Blantyre to Mzuzu (see listing below). The Malawi Rural Travel and Transport Programme (MRTTP) tested sixteen early model AfriCarts, and in 2003 reported that "the introduction of the Malawi Handcart has also relieved the burden of head and shoulder loading and it has been taken as an alternative to the bicycle for heavy carriage for both business and domestic use." The Ministry of Agriculture is about to certify AfriCarts as an approved agricultural technology. AfriCarts were awarded third prize and first prize respectively in the farm mechanization category at the 2003 and 2004 National Agriculture Fairs held in Lilongwe and Blantyre.

Handcarts are a mature technology, in use in countries around the world. Now is the time for this technology to be transferred to Malawi's rural and urban poor. Malawi's economic situation is rapidly worsening, and widespread handcart availability can play a crucial role in turning the economy around and fostering the rural and urban development needed to enhance the economic, domestic, and personal lives of Malawians. What other wheeled transport technology with significant uptake potential is available to subsistence farmers? A serious discussion of this technology is warranted. We need to convene a conference of stakeholders drawn from relevant ministries, NGOs, and commercial interests, including agriculture, water supply, gender, health, HIV/AIDS, forestry, industry, education, vocational training, and transport, to discuss how Malawi can acquire handcart technology. Participants would discuss how handcarts can help in achieving their organizations' goals, and suggest how their ministries, NGOs, and businesses can assist in promoting handcart use.

Further sources of information, and/or to order an AfriCart (* handcart builder / ** component stockist)

- Blantyre*** - Ellaton Mkwate, Malawi Handcart Project 01 667-880 guildbook-binder@yahoo.com
- Limbe*** - George Malunga, BSc, SinoLink Malawi 01 644-128 sinolinkmalawi@vip.sina.com
- Chitedze*** - Chika Mughogho, Malawi Handcart Project 09 280-547 wanyalaos@yahoo.com
- Chitedze*** - Wells Kumwenda, MSc, Chitedze Research Station 01 707-224 farmesamalawi@sdpn.org.mw
- Lilongwe** - Jephthah Chagunda, MSc. MRTTP 01 754-766 mrttp@malawi.net
- Lilongwe** - Grace Malindi, PhD, Agriculture Extension Services 01 756-522
- Lilongwe**** - Afzal Chunara, Choonara Highway Emporium 01 726-405 che786@globemw.net
- Lilongwe*** - George Godinho, Durobloc Limited 01 752-006
- Bunda** - Elisha Vitsitsi, MSc, Bunda College of Agriculture 01 277-223 gvitsitsi@yahoo.com
- Mchinji*** - Mussa Balakazi, Rizik Metal Works 09 303-509
- Mponela*** - Charles Kazembe, MBA MEDI 01 286-244 medi@liccom.net
- Champhira*** - Peter Mugunta P.O. Box 105
- Mzuzu*** - Hastings Mkandawire, Malawi Handcart Project 09 351-319, hastingismkandawire@yahoo.com
- U.S.A.-Arnold Wendroff, PhD**, Malawi Handcart Project 1 718 499-8336 mercurywendroff@mindspring.com

WHOM TO BLAME

By Constable Hassan Dezio Traffic Public Relations Officer

It has become a common feature nowadays that before conferences and big meetings start, a moment of silence is observed in memory of those who have succumbed to road accidents. Indeed the moment can be a heart breaking one when one remembers colleagues and friends who have lost their lives through road accidents.

grammes and road safety programmes are also some of the activities that the traffic police introduced so as to civic educate the statistically revealed vulnerable groups of people. These initiatives have tremendously decreased the shocking figures of road accidents in a back somersault manner.

As we all are aware that accidents do not just occur but they are caused and that there are a lot of factors or rather parties that contribute to the occurrence of road accidents. Traffic Officers are there to enforce that traffic law on the Roads of Malawi, which is their responsibility. It is shocking to learn that whenever an accident occurs people and even organizations start pointing fingers at traffic department. We must always remember and it should settle in our minds that every Malawian citizen has in one way or the other a responsibility to prevent road accidents. Therefore, it is the Traffic Police Department's suggestion that, if we really are to save could be victims, we should rather get busy performing our responsibilities than searching for whom to point fingers at.



Malawi is one of the countries which indicate high statistical figures of road accidents of which are threatening to reverse the enormous economic, social and political achievements realized by the country. Accidents cost the government a whopping K3.3 billion yearly and an average of 200 persons killed per 10,000 vehicles out of a vehicle population of approximately 300,000.

The Malawi Police as a whole and the traffic branch in particular chose not to give a blind eye to this sad development. This saw the extensive and conducive implementation of new traffic enforcement techniques of which was approached by an increase in traffic personnel. The increase in traffic personnel helped to minimize the improper ration of traffic officer to motor vehicle.

In addition to this, in view of the foregoing and to prove it's pro-activeness in curbing down road accidents, the traffic police department intensified traffic checks and point duties so as to scrutinize the roadworthiness, documentation and free flowing of motor vehicles on our roads. TV/Radio pro-

For instance, Motor Vehicle Owners have a responsibility to ensure that their motor vehicle is road worth at all times, it is fully documented and that they employ drivers who are sane and have proper documents i.e. drivers license. Talking about vehicle owners, it has been learnt that most minibuss owners give target amounts to their drivers to say "make sure you bring K10, 000 each day or else you are fired." This automatically forces the driver to be over speeding and driving recklessly, thereby jumping into avoidable accidents of which the causer is the Motor Vehicle Owner.

The Drivers on the other hand, have a major responsibility of driving with full compliance to the highway code and the road traffic signs and to exercise maximum competence and professionalism bearing in mind that they are carrying innocent lives. They should also drive with due care and consideration to other road users. Out of all the causes of road accidents 75% of these accidents is caused by human error, mostly of the drivers. This shows that drivers ought to be very responsible on our roads.

It should also be borne in our minds that it is every passenger's responsibility and right to caution a driver whenever such drivers start over speeding or driving recklessly, or if necessary drop from such a vehicle and ask for a fee of the remaining distance, then report such driver to police. To the contrary, you find that most passengers prompt drivers to over speed, pretending to be rushing for an important meeting or that they are against time. If one is rushing or is against time he hires a taxi period.

Traffic Branch like any other branch has stakeholders with whom it shares the responsibility of preventing road accidents, the czar of all being the Road Traffic Directorate. The Directorate plays a very big role as far as accident prevention is concerned by ensuring that every motor vehicle operating on the public road is fully documented. But still there are some areas that the management need to look into, for instance there are some vehicles in dangerous condition which are possessing fake certificates of fitness. They are finding it easy to forge this document just because the writing material used on this document easily faints when exposed to the sun and this makes it very difficult for traffic police officers to inspect. Who, where and how they obtained such fake certificates remains our food for thought and subject for investigation. Most accidents are happening due to brake failures and defectiveness of construction equipment and use mechanisms of which the blame goes to innocent enforcers.

The second stakeholder in term of accident prevention being the National Roads Authority which is also doing a creditable job indeed, by constructing

roads and road features so as to ensure smooth flowing of traffic. Talking about construction, there is a vital need of cycle tracks to save the lives of our pedal cyclists who are being hit like stray dogs by monopoly minded drivers. There is also need for barriers on areas where people trade on public road. The maintenance of roads which is done in our cities should also extend to remote areas where we are losing a lot of lives due to multiple potholes that forces drivers to drive on pedestrian walks.

Much as we appreciate the commendable job being performed by the National Road Safety Council of Malawi in giving civic education to the Malawian masses, we should also point out that it is now high time that they target much the minibus drivers, pedestrians and pedal cyclists of which statistics have shown that they are the most vulnerable victims of road accidents due to negligence and lack of knowledge of traffic law respectively.

On the same note, the Minibus Owners Association ought to discipline their drivers against exceeding carrying capacity/speed limits. In this way they are going to save more lives and prove their existence rather than chipping in only when there is tight traffic enforcement.

The Malawi Police Service through its community based policing programme is ready to work hand in hand with the general public and its various stakeholders in both crime and road accident prevention. Let's unite in making Malawi a crime and accident free nation ■

What's up at T2 Centre Library?

The following are new additions to the library collections: SADC Guidelines on Low Volume Sealed Roads, Manual on the Construction of Footbridges, Integrated Rural Accessibility Planning (IRAP) Modular Training Package, Manual on Uniform Traffic Control Devices- Millennium Edition, Research Reports on Safety, Transportation Data, Non-motorized transport, Structural Design Issues, Transit Intermodal Transfer Facilities etc. In all over 100 new titles have been added to the list.

Technological practices are always changing and it is only those countries and individuals who keep abreast of the times that are enjoying life - do not be left out of the exciting times!

Mw T2 CENTRE TRAINING UPDATE

This newsletter has carried a number of articles on various issues that impact on our lives be it safety, economy, technology choices etc. There is however a common denominator, namely, training of implementation officers. The Centre has advertised and conducted a number of courses that have received not very satisfactory participation from contractors and consultants. This is worrisome because the general public has questioned the quality of services on our transportation system be it on radio or newspapers. The Centre has listed more courses that are aimed at enriching the skills and technological know in the transporta-

tion personnel. It is expectation that those concerned will engage only those that attend training courses be it from T Centre, National Construction Industry Council or other training providers - the bottom line is TRAINING.



Business, Activities,

Challenges and Constraints

By **Portia Kajanga**, Public Relations Officer

The National Roads Authority (NRA) was established through an Act of Parliament No. 13 of 16th May 1997. It is responsible for the maintenance, rehabilitation and development of designated public roads using funds from the Road Fund.

NRA's vision is that by the year 2020 the Malawi public road network is developed and maintained up to a standard where all motorized and non-motorized traffic can reach every society of the country in adequate, safe, reliable, efficient, economic and environmentally friendly manner at all times of the year.

Its main business areas include:

Planning: which oversees planning of road programmes, reviewing feasibility studies and detailed engineering design of road projects, axle load control, environmental management of road projects as well as management of Information Systems.

Procurement: which is responsible for procuring of the institution's works, goods and services. All this is done in accordance with the Public Procurement Guidelines, NRA being a public institution.

Central Roads: which oversees implementation of road programmes involving the main, secondary and tertiary road network.

Urban and District roads: which oversees implementation of road programmes involving the urban and district road network.

NRA's main activities are:

Routine Maintenance: this involves pothole patching, grading, repairing the shoulders of the road, drainage-cleaning and grass cutting.

Periodic Maintenance: which comprises resealing of paved roads, gravelling unpaved roads, putting up road signs and road markings.

Rehabilitation: this includes the reconstruction of failed sections of any road

Road Construction: this includes upgrading of earth roads to bitumen standard, as well as construction of new roads including new bridges.

Sources of Funding

The NRA manages roads as on behalf of government through funding from the fuel levy and other road user charges. The levy is collected on every

litre of petrol and diesel imported into the country. Currently, this levy is at K8.70 per litre for petrol and 6.70 per litre for diesel.

For the backlog maintenance, rehabilitation, and construction works, donor agencies and money-lending institutions and government counterpart funding fund these.

Some of these donors and money-lending institutions include: European Union, World Bank, African Development Bank, Jica of Japan, Kfw, Kuwait Fund, OPEC, BADEA, and the Nordic Development Fund, among others.

The Malawi Public Road Network

The National Roads Authority is responsible for the maintenance of the public road network, which is classified into five categories, namely main roads, secondary roads, tertiary roads, urban roads and district roads.

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	8	3,492	3,500
Urban	770	578	1,348
Total	4,038	11,413	15,451

Classification of the Malawi Public Road Network by Road Class and Pavement Type as of June 2004

In functional terms, the Main, Secondary and Tertiary roads effectively make up the country's primary road network, with district and other undesignated roads acting as a feeder system to the primary network.

Major projects currently in progress.

- The 88Km Masasa-Golomoti-Monkey-bay road
- The 4 Bridges project comprising Kalwe Bridge on the Mzuzu - Nkhata-bay road, the Lisasadzi bridge on the Lilongwe - Kasungu road and the

Liwaladzi and Kasangadzi bridges on the M 5 between Nkhota-kota and Dwangwa

- The 46Km Limbe - Chisitu road
- The 2.2 Km length of roads in Makata Industrial Area in Blantyre.
- The 4.5 Km Kenyatta Drive in Blantyre
- The 3.6 Km Chilambula road in Lilongwe
- The concrete decked Likuni Bridge
- The 33 Km Mponela - Ntchisi road
- The 16 Km Kamphata - Nkhoma road
- The 1.3 Km Area 18 round about - Area 49(Gulliver) road

Challenges and Constraints

A good road infrastructure network plays a crucial role in government's effort to alleviate poverty and sustain economic growth. A good network also reduces transport costs, lowers vehicle operations costs and travel time and increases accessibility to markets. It is the intention of MoTPW through NRA to ensure that government achieves its objective of having a reliable road network. A number of challenges and constraints are however being met in the course of fulfilling this objective, some of which are as follows:

Insufficient funding

There is always an ever-increasing demand for maintenance works against income levels that are insufficient to meet the demand. The income from the fuel levy is not enough to meet the demand.

According to World Bank studies, for a country to maintain its road network to a sustainable level, the fuel levy must be at least US\$0.10 (MK11.00 per litre at exchange rate US\$1.00=MK110.00). This is a major issue that the general public fails to appreciate. But it must be understood that the economic costs of postponing road maintenance are largely borne by the road users through higher vehicle operating costs and increased travel times. Research has shown that when a road is allowed to deteriorate from good to poor condition, each denied-dollar- needed for road maintenance increases vehicle operating costs by as much as US\$3.

Construction Capacity Shortfalls

Lack of capacity in the construction industry in terms of financial and human resources is another challenge that NRA faces. The majority of contractors and consultants in the industry either do not have the financial muscle for increased capacity building in terms of plant and equipment let alone the necessary qualified technical personnel in terms of engineers and inspectors which is a prerequisite for ensuring achievement of the desired quality of works. This leads to delays in completion of works, often leading to time overruns which not only is an inconvenience to the general public but also to NRA in terms of contract administration. In an effort to improve the situation, NRA is working with government, the National Construction Industrial Council (NCIC) and major donors like the EU and the World Bank to improve the capacity of local contractors and consultants through training programmes, domestic preference and appropriate packaging of contracts.

Lack of respect for road reserve by the General public
Another problem that NRA faces is the lack of respect by the general public of the road reserve. According to the Public Roads Act (Cap. 69:02), where any existing road is designated as a public road the land within the boundaries of the road reserve is supposed to be free from encroachment. The road reserve width is:

- For a main road, 60 metres;
- For a secondary road, 36 metres;
- For a district road, 36 metres;
- For branch and estate roads, 18 metres.

The centerline of the road reserve is the centerline of the carriageway of the road so that for a main road, no one should build a structure 30 metres from the centerline of the road. In many instances, along the roads in Malawi, members of the general public are constructing houses and other buildings right onto the edge of the road and sometimes even grow rice in the drains of a road.

This encroachment is not only unlawful and a safety hazard, but also leads to rapid deterioration of roads resulting from the blocked side-drains which prevents free flow of water. Secondly it becomes very complicated when the government decides to upgrade a road through extension. According to the law the encroachers on a road reserve are not entitled to compensation when a road is upgraded unless there is a change in the road class.

The challenge for NRA in this area lies in sensitizing the general public on the importance of observing the road reserve and refusing to compensate the encroachers during road upgrading by using the existing legal framework against any form of pressure.

Vandalism and Theft to Road Furniture and Drainage Structures

There has been rampant vandalism and theft of various road furniture and drainage structures like road signs, pavement markings, guardrails, metal pipe culverts etc all over the country by the general public. Road furniture has a very important traffic safety function and need to be kept in good shape and order at all times to be effective. On the other hand, removal of drainage steel pipes leads to road cut offs and closures that affect the travelling public adversely. NRA is trying its level best to sensitive the general public to desist from such malpractices.

Conclusion

Since its inception, NRA has always strived to improve its service to the road users by directly dealing with the challenges and constraints that come its way. Although it is clear that there will always be new challenges with time, it is convinced that with continued support of the general public, government and the donor community it will overcome challenges.

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