

Foreword

by the Rt.Hon. Clare Short, Secretary of State for International Development



One year on from the White Paper on International Development I think it is appropriate to look again at the issues that this Newsletter brings to public attention. In particular I should like to renew the emphasis that the White Paper placed on the importance of Knowledge and Research in eliminating poverty and protecting the environment.

Poor people need improved access to the fruits of technology if they are to lead fulfilling and healthy lives. The Engineering Sectors are critically important in this respect, because many of the key elements of society's development are dependent on engineering technology. Water supply and sanitation, transport infrastructure and operations, housing and other structures, energy supply and the extraction and processing of basic raw materials are all fundamental to life and, indeed, to progress beyond subsistence levels.

But the kind of technology that benefits poor people most tends not to be the most "advanced". Instead it needs to be appropriately focused. So I am delighted that there has been increasing attention paid over the last twelve months to the question of poverty focus in our Knowledge and Research programme.

This Newsletter spreads the word about what that programme is achieving by reaching out to organisations and individuals who are committed to using and adapting technical knowledge for the benefit of people in developing countries.

If we are to continue to succeed in our battle against poverty it will be increasingly important for the people in poor countries to tell us what they need from our extensive research capacity in Britain, and it will be equally important for us to help them to develop their own capacity through collaborative efforts with our skilled researchers. Together we can win our fight and make poverty and deprivation a thing of the past.

Diary of Forthcoming Events

December 1998

2nd Seminar on National Transport Models

December 1998, Stockholm, Sweden.
Contact: PTRC Education & Research Services.
Tel: +44 (0)181 741 1516
Fax: +44 (0)181 741 5993
Email: ptrc@cityscape.co.uk

Investing in Transport: 19th ARRB Conference

6 December 1998, Sydney, Australia.
Contact: ARRB Transport Research.
Tel: +61 398 811 578
Fax: +61 398 878 104
Email: marghu@arrb.org.au

Corrosion & Rehabilitation of Reinforced Concrete Structures

8 December 1998, Orlando, Florida, USA.
Contact: Federal Highways Administration
Tel: +1 202 366 6770

January 1999

77th Annual Meeting, Transportation Research Board

11-15 January 1999, Washington DC, USA
Contact: Angelia Summons
Tel: +1 202 334 2934
Fax: +1 202 334 2003

2nd Regional Training Workshop on Management of Labour-based Contract Roadworks

18-29 January 1999, Harare, Zimbabwe.
Contact: Robert Petts
Tel/Fax: +44 (0)1372 458955
Email: rob@intech-consult.demon.co.uk

May 1999

Vehicle Technology Conference

17 May 1999, Houston, Texas, USA.
Contact: Texas Transportation Institute
Tel: +1 409 845 1536
Fax: +1 409 845 6001

7th International Conference on Low Volume Roads

23-27 May 1999, Louisiana State University, Baton Rouge, Louisiana.
Contact: G.P.Jayaprakash, Transportation Research Board, 2101 Constitution Avenue, NW Washington DC, 20418, USA
Tel: +1 202 334 2952 Fax: +1 202 334 2003
Email: gjayapra@nas.edu

June 1999

Management of Appropriate Technology in the Road Sector

21 to 25 June 1999, TRL, Crowthorne, UK
Course organised by TRL and Intech Associates
Contact: Linda Parsley, TRL
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Fax +44 (0) 1344 770356 Email: international_enquiries@trl.co.uk

TRL Roads and Transport in Developing Countries and Emerging Nations

28 June to 9 July 1999 TRL, Crowthorne, UK
Course organised by TRL
Contact: Linda Parsley, TRL
Tel: +44 (0) 1344 770551
Fax +44 (0) 1344 770356
Email: international_enquiries@trl.co.uk

Road Management for Senior Engineers

14 to 25 June 1999, Worthing, UK.
Course organised by Crown Agents
Contact: David Mulvagh, Crown Agents Management Centre
Tel: +44 (0) 1903 234444
Fax: +44 (0) 1903 212622

October 1999

21st World Road Congress, PIARC

October 3 to 9, Kuala Lumpur, Malaysia
Contact : MPCR/PIARC
La Grande Arche, Paris Nord Niveau 8, 92053 La Defense Cedex, France
Fax +33 1 49 000202
Email piarc@pratique.fr

TRL EMAIL ADDRESS CHANGE

In October TRL's enquiries address changed to:

Email: international_enquiries@trl.co.uk

All individuals can now be reached in the following way:

<initial><surname>@trl.co.uk

INTERNET

The DFID World Wide Web Home Page can be found at:

<http://www.oneworld.org/dfid>

The text of the latest DFID Transport newsletter can be found on the TRL Overseas WWW Home Page:

<http://www.trl.co.uk/oseas.htm>

Do you like it?

This newsletter is available free of charge, aimed at those who are interested in Transport related issues in the developing world. To be included on the mailing list for future editions, please send your name and address to the editor or use the application form now available on the TRL World Wide Web Home Page.

To optimise the dissemination process, it is important that this newsletter is reaching the right people. Please inform the editor of changes in address details or if you no longer want to remain on the mailing list.

TRL begins research programme in the Philippines

A three year, £1.5 million programme of research in the Philippines has just begun, comprising five projects concerning road materials, bituminous surfacings and the rehabilitation of concrete road pavements. The programme is jointly funded by the Philippine Government's Department of Public Works and Highways (through a loan from the Asian Development Bank) and the UK through the Department for International Development. The projects will be carried out with the Bureau of Research and Standards (BRS) in Manila. TRL has had a close working relationship with the BRS for a number of years and has spent some considerable time developing and implementing new technology in the area of concrete road construction.

The five projects comprise:

- the economic use of local materials for road construction;
- the use of stabilised materials for heavily trafficked roads;
- the rehabilitation of concrete road pavements with concrete overlays;
- the rehabilitation of concrete road pavements with bituminous surfacings
- the use of bitumen modifiers to improve the durability of surfacings.

The Philippines is one of the few countries in the tropics with an extensive network of concrete roads as well as the more traditional flexible construction. There is a continuing need to reduce the cost of constructing, rehabilitating and maintaining roads of all types by improving design and construction practice, introducing new methods, making better use of cheaper, more abundant materials such as volcanic ash and revising specifications and standards. TRL's project team will be stationed full time in Manila and will be supplemented by a number of short term visiting specialists, all of whom will work alongside staff of the BRS to help develop their professional skills.

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DFID Projects Reference R6841: 'Promoting the use of volcanic ash, a natural pozzolan'; R6027:

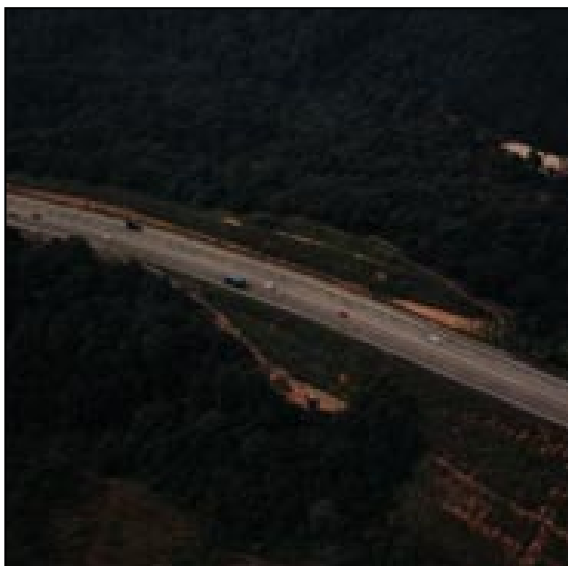
'The design of stabilised sub-bases for heavily trafficked roads'; R6473: 'Longer life road surfacings using bitumen modifiers'.

Applying DFID earthwork research

Earthwork and slope failure following heavy rainfall causes many roads to be blocked and traffic disrupted for long periods.

For any road at risk the triggering mechanisms should ideally be identified in good time. The problem has always been that locating and identifying the indicators of potential failure is difficult because of the steep and densely vegetated nature of some road slopes.

In the November 1995 issue we reported the development of an airborne earthwork condition assessment technique (ECAT) which overcame access difficulties to earthwork slopes in precipitous terrain. By using the ECAT technique, detailed photographic records of each site, collected at ground level and in the air, took only a few days to obtain for hundreds of kilometres of road.



An ECAT aerial photo of a highway embankment



Scour of Lahar (volcanic ash) from around bridge piles, Pampanga region, Philippines

Analysis of these photographic records by experienced earthwork engineers allows a rapid and cost effective condition analysis to be made, producing, hazard and risk maps, earthwork inventories and engineering appraisals. The data are used with an image and text database to assist in prioritising repairs and calculating provisional repair costs.

ECAT has now been piloted in several countries in Asia and South America. Recommendations made to highway authorities have led to the implementation of more proactive maintenance and rehabilitation strategies.

The cover photograph shows a section of the Bogota to Villavicencio road in Colombia which is being realigned. The ECAT technique was used on this road.

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DFID Project reference R6893:

"Benefits of structured highway and earthwork maintenance"



Typical height of ECAT taking aerial photos



Urban transport performance indicators

While the problems of travel, congestion and pollution in cities of the developing world are quite apparent to transport operators and users alike, there is often little measurement of the nature and impact of these problems. The need for such a quantitative assessment is important for the following reasons:-

- to clearly establish the performance of the transport system, and in particular where, how and why it is failing.
- to help identify possible remedial actions and priorities for implementation.
- to provide a base-line against which to monitor the impact of remedial actions in particular, and trends in general.
- to provide basic data for longer term strategic planning.

To furnish this information on a comprehensive basis requires costly major survey work which cannot be undertaken on a regular and frequent basis. However, a small set of performance indicators, which use information from sample surveys, can be used to track transport development (overall growth in traffic, changes in traffic speeds, etc.). These indicators provide a basis for



up-dating historic transport information and for identifying the need for more detailed studies on specific issues. Benchmark values for these indicators can also be established which are then used to compare the transport performance of a peer group of similar cities, and provide targets for improvement.

In a study recently completed for the Department for International Development TRL proposed a set of transport performance indicators and benchmark values for developing cities. The study also examined how these indicators would help in undertaking an audit of city transport, indicating where performance was weak and should be improved.

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 DFID Project Reference R6017: 'Traffic Database and Audit'
 Theme Objective U2



Sub-Saharan Africa Transport Policy: the 1998-2002 Development Plan

The Sub-Saharan Africa Transport Policy Program (SSATP) is a multilateral partnership coordinated by the World Bank to facilitate policy reforms. Members include 17 African countries and other authorities involved in the transport sector.

The SSATP is directed at key issues, such as:

- institutional reforms
- the setting up of national partnerships
- a programme on Non Motorised Transport (NMT)
- data collection on road safety

The annual (Steering Committee) Meeting took place in September in Cape Town, South Africa, where the 1998-2002 Strategic Development Plan was approved. This proposed a working agenda on the following projects:

- undertaking institutional reforms in Burkina Faso, Senegal, Cote d'Ivoire, Cameroon, Zimbabwe;

- improving road safety for pedestrians in Ouagadougou (Burkina Faso) and Harare (Zimbabwe);
- carrying out research on microenterprises in Dakar (Senegal), Abidjan (Cote d'Ivoire), Bamako (Mali), Nairobi (Kenya) and Harare;
- undertaking air quality initiatives in Dakar, Ouagadougou, Douala (Cameroon), Abidjan, Nairobi and Dar es Salaam (Tanzania);
- completing the NMT Program in Kenya and Tanzania;
- analysing urban transport indirect costs in Abidjan, Dakar and Ouagadougou;
- training local staff in urban transport research techniques;
- research on links between poverty and urban transport.

The implementation of the Development Plan will be carried out in cooperation with research institutions. Specific attention will be given to the use of local expertise and participation from local representatives of the urban transport industry. Links with regional organisations such as SITRASS (Solidarité Internationale sur les Transports en Afrique Sub-Saharienne) and the MDP (Municipal Development Program) will be strengthened. Dissemination of best practices and exchange of information between the African Urban Transport sector will also be enhanced during implementation of the Plan.

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Typical street scene in West Africa

Road safety improvements in Nepal

A Traffic Engineering and Safety Unit is being developed within the Department of Roads in the Himalayan Kingdom of Nepal. It is being managed by Roughton International and TRL on behalf of the Department for International Development. Some projects are described below.

Many of Nepal's mountain roads have small masonry "confidence blocks" to mark road edges. Unfortunately, these can shear when hit by drivers, leading to fatal consequences. The installation of proper safety barriers on the most hazardous sections is being investigated by the Safety Unit to reduce the severity of such accidents. Conventional steel beam barriers cannot be used since they are expensive and have to be imported. Good results have been achieved using a gabion safety barrier wall, consisting of large wire baskets filled with stones and wired together. The walls are inexpensive, easy to build, and can be quickly repaired. They are not usually anchored to the road, but are still strong enough to stop runaway vehicles, including fully loaded trucks. Following their successful use they are now used as edge barriers and to protect bridge parapets.



Effectiveness of gabion safety barrier on Prithvi highway. (Photo by Colin Foote, N D Lea International)

Another innovation has been the provision of pedestrian refuges at zebra crossings on a busy wide road in Kathmandu. A single trial refuge of conventional design was initially unsuccessful as it was continually hit by traffic at night, therefore the

Safety Unit designed a new refuge with a low profile and no upright sign. These new-style refuges have been fitted at all zebra crossings along the road. They are well-marked with paint and reflective studs and drivers respect them. The refuges are a great help to pedestrians and appear to have reduced the incidence of speeding and unsafe overtaking.

Most main roads in Nepal are used by large numbers of pedestrians and slow-moving vehicles (including cycles, cycle-rickshaws, and ox-carts) as well as trucks and buses that travel at high speeds. In order to segregate the traffic and minimise accidents, an innovative approach has been to promote the construction of diversions when roads are being rehabilitated. This method can speed up the rehabilitation work and, on completion, the diversion can be converted into a permanent side road for pedestrians and non-motorised vehicles at modest cost.

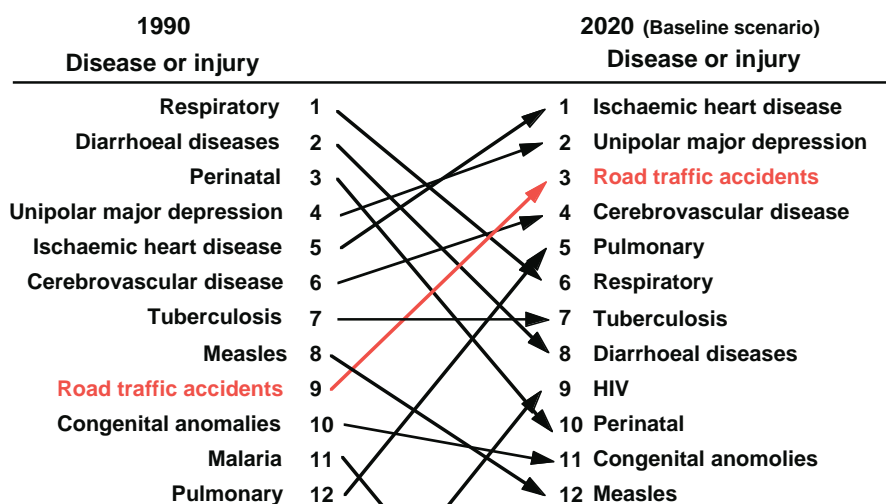
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ROUGHTON INTERNATIONAL

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The disaster of traffic accidents



Change in the rank order of disease burden for leading causes, world 1990-2020

The Transport Research Laboratory (TRL) were asked by the International Federation of Red Cross and Red Crescent Societies to contribute to their 1998 World Disasters Report with information on road accident rates and costs. Research carried out for the Department for

International Development (DFID) provided much of the information.

The Report poses the question "Must millions more die from traffic accidents?". It devotes a whole chapter in the section on key issues to traffic accidents: costs, death rates, planning priorities, risks

and potential engineering solutions. It concludes that the need for action is clear as traffic accidents are forecast to do more harm through death and disability than many of the health threats presently given greater priority for assistance.

Currently road accidents are around the 9th biggest cause of premature death in the world, estimated to be responsible for around 500,000 deaths and around 15 million injuries. Together with the social impact in terms of pain, grief and suffering, there is an economic impact: an estimated cost to developing societies of US\$53 billion, about the level of all international aid. By 2020 road accidents could well move from 9th place to 3rd place in the league table of major causes of death and disability in the world, way ahead of war, HIV and other infectious diseases.

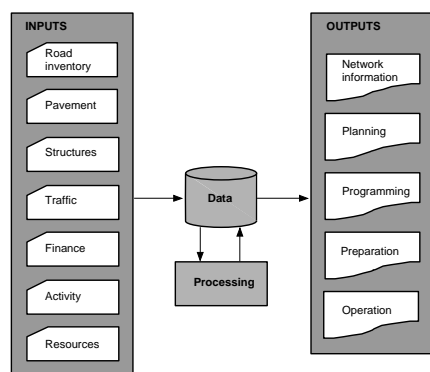
While accidents in the developed world have reduced, despite increasing vehicle usage, traffic accidents in the developing world are increasing. Cost-effective action is necessary to counter-act this trend but it is not always possible to transfer the safety strategies used in developed countries. In many developing countries resources are not available to invest in road safety programmes and help is needed to provide funds for investment in road accident prevention. The DFID funded research at TRL has been aimed at investigating this and developing suitable solutions.

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TRL Overseas Road Note 15: Guidelines for the design and operation of road management systems

A new publication in the well known Overseas Road Note series, Overseas Road Note 15, was published in August 1998 and provides detailed guidance on the design and operation of computer-based road management systems. It has been issued in parallel with a reference textbook published by Macmillan Press Ltd covering the wider area of road maintenance management: Road maintenance management: concepts and systems by Robinson, Danielson and Snaith: see Book Review. The original draft of the Road Note was prepared by Dr Robinson in association with May Associates, with further contributions from staff at TRL and material from the World Bank. It therefore combines



the experience from many institutions and on-going research carried out by TRL in this subject.

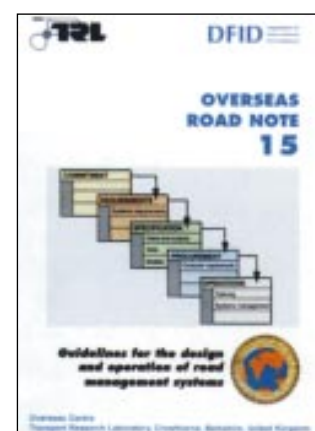
The Note's fundamental message is that institutional and management issues in a road administration must be addressed first before a technical improvement, such as introduction of a road management system, can be a success. The structure of the Note reflects this, with its division into three distinct parts:

Part A is meant for senior policy and decision-makers. It outlines the principles of best practice in road management and the role that computer-based systems might play in supporting management procedures.

Part B is intended for use by professional staff who have the task of recommending the type of system design to be adopted. It addresses the processes involved in system design and identifies a generic approach to system specification.

Part C, which is intended for staff involved in system implementation, deals with the training activities needed to ensure the successful introduction of a computer-based system and its continuing operation, and also addresses issues related to the day-to-day management of systems.

Supporting appendices which provide reference



material and background information are also included.

The Overseas Road Note series is prepared principally for road and transport authorities in countries receiving technical assistance from the British Government. It is also available to others interested in road transport in developing countries.

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DFID Project Reference R6024: Road Network Management
Theme Objective T2

Balancing the Load

Balancing the Load is a two year research programme aiming at exploring how gender and gender relations affect transport deprivation, and what remedies can be proposed.

Women living in rural areas of developing countries are often the group with the least mobility. They have the greatest difficulty in obtaining access to goods and services, yet their needs are frequently ignored by transport planners and policy makers.

Balancing the Load is being undertaken by the International Forum for Rural Transport and Development (IFRTD) funded by the Engineering Knowledge and Research programme of the Department for International Development (DFID).

Case studies will be implemented in sixteen countries in Africa and Asia and will cover a wide range of transport issues including:

- the impact of national policies on rural women's transport burden
- the importance of transport for women's entrepreneurial activities
- the transport needs of rural women in Asia (less extensively documented than the burden of women's transport in Africa)

- the impact of road rehabilitation on: women and roadside communities in general women's health status community food security



Woman street seller in India

- the use and maintenance of village paths, tracks and footbridges
- infrastructure projects initiated by women themselves (challenging the current thinking on women's participation in infrastructure projects which is argued not to meet women's priorities in terms of infrastructure provision).
- women's access to intermediate means of transport (e.g. access to animal power, scotch carts, bicycles and the use of hand carts to ease the burden of fuelwood transport)
- the benefit from appropriate rural transport services - for women without ownership or access to means of transport.
- the relationship between women's transport needs and the availability of water in arid regions

Complementing the analytical studies will be two studies from India and Ghana that will allow rural women to articulate their own assessments of transport provision.

Balancing the Load plans to conduct a seminar in each region so that the researchers can share the findings of the studies and develop ways in which the issues can be addressed in policies and programmes.

For further information contact Priyanthi Fernando, IFRDT

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DFID Project Reference R 6854

Theme Objective T3

ICE: Reduced subscription and fees scheme

Good news for civil engineers! The Institution of Civil Engineers (ICE) has introduced a scheme especially designed to assist engineers from emerging countries who are already ICE members and who may find the levels of subscription a deterrent to continuing membership. Up to 90% reduction can be obtained, depending on the country's GDP per capita as published by the World Bank. The ICE is internationally recognised as a centre of learning, a qualifying body and a public voice of the profession and welcomes enquiries from those not yet members.

For further details please contact the ICE, Department MR, POBox 4479, London, SW1P 3XB.
Tel +44 (0) 171 665 2135; Fax +44 (0) 171 233 3114 (Members), and
Tel +44 (0) 171 665; Fax +44 (0) 171 0515 (Non members)

International roads course



In July TRL held its annual training course "Roads and Transport in Developing Countries and Emerging Nations". All topics of road design, construction, maintenance, transport planning, systems and safety were covered in an intensive two week course aimed at disseminating the results of research funded by the Department for International Development (DFID) and carried out by TRL's international specialists. Participants included middle or senior management staff from Government ministries, Universities, Consultants and donors from

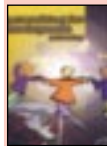
14 countries. Of the 28 delegates who attended, 12 were supported by DFID. In addition to the technical issues discussed, opportunity was given for delegates to interact with one another, or individual lecturers, and follow up issues in TRL's comprehensive library. There was even time to appreciate the local culture!

The course is an annual event at TRL and the details for next year can be found on page 2.

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Book Reviews



Networking for development
by Paul Starkey
Published by IFRTD (International Forum for Rural Transport and Development), 1997

While the concept of sharing information for mutual benefit is obviously desirable, the logistics of establishing and maintaining a network are more problematic. Paul Starkey's book provides a thorough introduction into networking and is based on the author's extensive experience with developing networks in Africa, Asia and Latin America.

The book is divided into two parts with Part One summarising both the potential benefits and problems of networking. It also reviews the different organisational structures of networks and includes guidelines on networking, addressing such issues as how clear objectives, concrete activities and committed core groups help a network to be more successful. As resources are a regular problem, the option of self financing is also discussed. The potential for facilitating information exchange electronically is acknowledged.

Although practical examples are included throughout the book, Part Two contains two detailed case studies of regional African animal traction networks and their associated national networks as well as a summary of the lessons learned which could benefit future networking initiatives. The book also has a list of recommended reading and a list of network contacts.

Many of the examples refer to rural issues yet the material and lessons presented apply to all situations. While the book, like networking itself, is intended to share experience and thereby avoid repetition of errors, there are no rigid guidelines or formats to follow and the focus is on activity rather than structure.

Reviewed by Amy Aeron-Thomas, Independent Consultant



Road Maintenance Management: Concepts and Systems by Richard Robinson, Uno Danielson and Martin Snaith. Published by MacMillan.

During the last decade or so we have learnt a great deal about the problems of managing road networks, both in industrialised countries and in the less wealthy parts of the world where resource constraints put a heavy burden on road authorities. This book provides a valuable and up-to-date description of the subject based on the experiences of the authors and their collaborators in many countries worldwide. It is intended as a text book aimed at not only those with responsibility for managing roads but also those developing or implementing management systems themselves. The subject matter is considered within a framework based on the four functions of planning, programming, preparation and operations. These terms are carefully defined in the book but essentially reflect a hierarchy which begins with issues which are dealt with at the national level but going right down to day-to-day operational matters. Within each of the functions there are differences in the degree of detail required, the timescales involved, the staff who will manage or carry out the work, and the scale of the works. Although the book is full of detail and deals comprehensively in its 290 pages with all that it sets out to tackle, it does not deal with bridges and structures, footpaths, street lighting, traffic control and signals, or road safety. The book has been published in parallel with TRL's Overseas Road Note 15 'Guidelines for the design and operation of road management systems', which is concerned primarily with computer-based road management systems.

Reviewed by John Rolt, TRL



Roads and the Environment: a handbook. World Bank Technical Paper No. 378. Published by the World Bank, 1997

The publication of this handbook is welcomed and it lives up to expectations. Its precursor was an informal working document (report TWU 13), which this handbook replaced after feedback and comments from end users.

This publication is well laid out and draughtsmanship and presentation of illustrations have a high standard of detail and sophistication. Judicious use is made of tables, schematic diagrams and flowcharts to present data and information. This document is an essential prerequisite for environmental guidance when considering road projects.

Part I provides an overview of the environmental assessment process in the context of road planning and construction and also describes the detailed methodological steps of the process for specific projects. Part II provides a more detailed discussion of each of the major factors involved in the environmental assessment of road projects, including impact mitigation and economic valuation. Each chapter covers one component of the environment and provide a description of possible impacts, the nature and scale of the impacts and practical information regarding mitigation options. Impacts on human health and road safety have been given a separate chapter.

TWU 13 contained a Part III, Analysis Tools (use of maps, remote sensing, computers), which has been dropped, sadly, as a result of peer review.

The editors are to be congratulated for producing this invaluable document which is highly recommended to all practitioners and should take pride of place on all reference shelves.

Reviewed by Dudley E. Harte, TRL

Recent publications

BOOKS

THE WORLD BANK, (1997). Roads & the Environment: a handbook.

Edited by Koji Tsunokawa & Christopher Hoban. Published by the World Bank, Washington, ISSN 0253-7494, free of charge on application to World Bank.

ROBINSON R, U DANIELSON & M SNAITH (1998). Road maintenance management: concepts & systems. Published by Macmillan Press Ltd, ISBN 0-333-72155-1.

STARKEY P (1998). Networking for Development. Published by The International Forum for Rural Transport and Development, ISBN 1 85339 430 0.

REPORTS

Overseas Road Note 15
TRL (1998). Guidelines for the design and operation of road management systems. (£15) (TRL)

TRL353
AIREY A and M A CUNDILL. A study of household travel in the Meru district of Kenya. TRL Report 353. (£10) (TRL)

PAPERS

PEARCE, T (1998). Vehicle roadworthiness inspections - a guide to their establishment and maintenance. Indian Journal of Transport Management, Vol 22, No 3, March 1998 (PA3333/98) (TRL)

SMITH, H R and C R JONES (1998) Bituminous surfacings for heavily trafficked roads in tropical climates. Proceedings of Institution of Civil Engineers. Transport, 1998, 129, Feb. pp28 - 33. (PA3334/98) (TRL)

MAUNDER, D A C and P R FOURACRE (1998). Shifting the main mode of urban transport from road to rail in a developing nation. Seminar on Development of Transport Infrastructure in a Sustainable Environment, Kuala Lumpur, 20 October, 1998. (PA3366/98)

GARDNER, G and R EVANS (RE Associates) (1998) Towards good urban design. World Conference on Transport Research, Antwerp, July 1998. (PA3379/98)

GARDNER, G (1998). Mass transit decision making. CIT conference, Colombo, Sri Lanka, March 1998. (PA3380/98) (TRL)

GARDNER, G and R EVANS (RE Associates). (1998) Urban design in developing countries. CODATU VIII Conference, Cape Town, September 1998. (PA3381/98) (TRL)

PEARCE, T, D A C MAUNDER and T C MBARA (University of Zimbabwe). (1998) Road safety for buses. CODATU VIII Conference, Cape Town, September 1998. (PA3382/98) (TRL)

KWAKYE, E A and P R FOURACRE (1998). The urban transport policy reform in Ghana. CODATU VIII Conference, Cape Town, September 1998. (PA3383/98) (TRL)

FOURACRE, P R and E A KWAKYE (1998). Urban transport performance indicators. CODATU VIII Conference, Cape Town, September 1998. (PA3384/98) (TRL)

PEARCE, T (1998). A guide to the establishment and maintenance of vehicle roadworthiness inspections in developing countries. World Conference on Transport Research, Antwerp, July 1998 (PA3385/98) (TRL)

GOURLEY, C S, P A K GREENING and U BRUDEFORNS (1998). A structural design guide for low volume secondary and feeder roads in Zimbabwe. Secondary Feeder Roads Development Project (SFRDP) Workshop, Harare, Zimbabwe. June 1998. (PA 3395/98) (TRL)

HEWITT, N C, T MUTOWEMBA and T TOOLE (1998). The Zimbabwe road deterioration study. Secondary Feeder Roads Development Project (SFRDP) Workshop, Harare, Zimbabwe. June 1998. (PA 3396/98) (TRL)

FOURACRE, P R and E A KWAKYE (1998). Urban transport performance indicators. CODATU VIII Conference, Cape Town, September 1998. (PA 3384/98) (TRL)

*For copies of the above publications, please contact the relevant organisation - indicated in brackets
* Limited numbers of TRL publications are free of charge to nationals from developing countries.*

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