The publications listed in this section represent the main current output from the International Division of TRL Limited (formerly the Transport Research Laboratory). The publications are grouped according to type, and subdivided by subject. At the beginning of the document are notes on availability and price. The reports may be obtained from the address below.

Mrs S Stoneman  
TRL Limited  
Crowthorne, Berkshire  
RG45 6AU  
United Kingdom

Tel: +44.1344.77.0187  
Fax: +44.1344.77.0356  
Email: international_enquiries@trl.co.uk
TRL International

List of Publications
1. AVAILABILITY

This list contains selected publications produced by the Transport Research Laboratory’s International specialists relating to research carried out in developing countries in tropical and subtropical regions. The publications are available on application to the International Division, TRL, with the exception of State of the Art Reviews.

As from April 1995, the TRL International publications have been priced to commercial organisations. The prices are set at a level which allows for recovery of costs only and include postage and packing. See section 2.

Availability of copies to developing countries

It is still possible (through DFID support) to provide small numbers of these publications without charge to nationals from developing countries. However, large numbers of publications to organisations in these countries may require a charge to be made.

Discounts may be available to educational and training organisations for bulk orders. Application should be made to the International Division giving full details.

Address for TRL International Publications

International Division
Transport Research Laboratory,
Old Wokingham Road,
Crowthorne,
Berkshire, RG45 6AU.
U.K.
Fax: +44 (0)1344 770356
E.mail: international_enquiries@trl.co.uk

State of the Art Reviews

State of the Art Reviews are only available from The London Bookshop, 123 Kingsway, London, WC2B 6PQ Tel: + 44 (0)207 430 1676, Fax: + 44 (0)207 831 1326 to whom applications should be made.

Other TRL Reports

All other publications from TRL, relating to work in the United Kingdom, are priced and issued by Library Services of TRL, to whom application should be made. Fax: + 44 (0)1344 770193, E.mail: info@trl.co.uk
2. COST AND PAYMENT

The TRL International publications are priced to commercial organisations.

Price List for TRL International Publications

1) Overseas Road Notes (ORN's) £10
   (ORN 7 Vol 1 & 2) £20
   (ORN 15 and ORN 16) £15
   (ORN 9) £20
2) Reports (Black & White) (series: TRL, PR, RR, LR, SR, etc.) £10
3) Reports other (inc.: TRL 265) £15
4) International Road Maintenance Handbooks (4 volumes) £40
5) Manual - Towards Safer Roads £20
6) Other manuals and guides £10

These prices include postage and packing.

Payment

Payment by cheque or credit card should be sent with an order or covering note to the address below clearly stating the address to which the reports should be sent.

Cheque: Payment can be made by a sterling cheque, drawn on a UK bank, payable to the "TRL Ltd", endorsed A/C PAYEE.

Credit card: The following credit cards can be accepted:
VISA, MASTERCARD, EUROCARD, AMEX. Please state number and expiry date.

Address

International Division,
Transport Research Laboratory,
Old Wokingham Road,
Crowthorne,
Berkshire, RG45 6AU.
U.K.
Fax: +44 (0)1344 770356
E.Mail: international_enquiries@trl.co.uk
3. OVERSEAS ROAD NOTES
Overseas Road Notes are prepared principally for use as manuals or guidelines by road and transport authorities in countries receiving technical assistance from the British government.

ORN 1 MAINTENANCE MANAGEMENT FOR DISTRICT ENGINEERS

This Note is a practical guide to the management of maintenance operations. It outlines a rational approach that will help maintenance engineers organise and control the activities for which they are responsible, so as to improve efficiency and make more productive use of maintenance resources.

ORN 2 MAINTENANCE TECHNIQUES FOR DISTRICT ENGINEERS

This Note describes the principal techniques used to maintain roads within a District in a developing country. Particular attention is paid to the planning and design aspects of the work, as it is in this area that the Engineer will make the largest contribution.

The Note discusses the merits of using labour or equipment-based operations and examines the scope for using local contractors for maintenance work. The importance of safety during maintenance work is then discussed and each of the various maintenance techniques is described in turn.

ORN 3 A GUIDE TO SURFACE DRESSING IN TROPICAL AND SUB-TROPICAL COUNTRIES (First published 1982, revised 1985).

This Note provides a general guide to the design and execution of surface dressing in tropical countries upon which the Engineer can base more specific recommendations to suit particular local conditions. Brief descriptions are also given of some other types of surface treatment.

ORN 4 FIELD SURVEY TECHNIQUES AND ANALYSIS FOR URBAN BUS OPERATORS (Published 1987)

This guide explains how the quality of management information in the bus industry can be improved by means of field surveys. It further explains how the efficiency of public transport operations in towns and cities in Third World Countries can be improved by the use of information collected from these surveys. The guide is aimed primarily at the middle management of public transport operators and at those who have been delegated the responsibility of collecting relevant data.
ORN 5  A GUIDE TO ROAD PROJECT APPRAISAL  (Published 1988)

This Note gives guidance on carrying out feasibility studies for road projects in developing countries. It is intended for administrators, economists, transport planners and engineers in road and transport ministries in developing countries who are responsible for preparing or appraising project submissions. It will also be of interest to personnel in aid agencies and consultancies who are responsible for road projects.

The Note deals with rural (non urban) road projects for new construction, upgrading, rehabilitation, stage construction and maintenance. A background description of the engineering and transport issues involved is provided, and guidance is given as to which aspects of feasibility studies should be undertaken by a transport planner and which require the advice of a road engineer. The phases involved in executing a road project are outlined and attention is drawn to the need to collect good data and to identify which data and decisions are the most important.

ORN 6  A GUIDE TO GEOMETRIC DESIGN  (Published 1988)

This Note gives guidance on geometric design and the setting of geometric design standards for single carriageway rural (inter-urban) roads in developing countries. It is aimed at government officials who are responsible for formulating policy on geometric design and at engineers who are responsible for preparing road designs. It will also be of interest to personnel in aid agencies and consultancies who are responsible for the preparation and design of road projects.

ORN 7  VOL 1 A GUIDE TO BRIDGE INSPECTION AND DATA SYSTEMS FOR DISTRICT ENGINEERS  (Published 1988)

The purpose of this Note is to provide a district engineer with guidance on the establishment and operation of an effective bridge and culvert data system. The two main components of the system are the bridge data and recording methods together with bridge inspection, which is covered by the companion volume of this Note.

ORN 7  VOL 2 BRIDGE INSPECTOR'S HANDBOOK  (Published 1988)

In many developing countries there is a shortage of trained bridge engineers. Where this is so, other personnel must be used for routine bridge inspections, or the bridges are neglected and deteriorate. Using this handbook, a person with experience, but little formal technical training, such as a road maintenance supervisor, should be able to carry out routine bridge inspections on the majority of bridges.

ORN 8  A USERS MANUAL FOR A PROGRAM TO ANALYSE DYNAMIC CONE PENETROMETER DATA  (Published 1990)  (see Software)

This Note is a User manual for the TRL DCP program which is designed to help with the interpretation and presentation of DCP test results (see section 6). The Note does not describe the use of the DCP equipment. Please note that the DCP program is a DOS program and will only run in Windows 95 if the DOS driver ANSI.SYS is installed on the computer and referred to in the start up configuration file called CONFIG.SYS.
ORN 9  A GUIDE TO SMALL BRIDGE DESIGN FOR HIGHWAY ENGINEERS (Published 1992, revised 2000)

Small bridges and culverts are an essential part of every road network being far more common than large structures and simpler to design and build. This manual presents guidelines for the whole design process from the planning stage, through site investigations, materials analysis, hydraulic design and structural design to the final presentation in the form of drawings and specifications. "Small" here is taken to mean single or multi-span bridges with individual spans no more than 12m long, i.e. one span to bridge a two-lane highway with shoulders or two spans to bridge a dual carriageway.

ORN 10  COSTING ROAD ACCIDENTS IN DEVELOPING COUNTRIES (Published 1995)

The objective of this Note is to advise economists, planners and engineers in developing countries on a method that can be used to cost road accidents. Information is also provided on how to collect the data required and this is illustrated by means of a case-study. The Note also uses results from appraisals carried out in different countries to illustrate the effects of including accident savings in highway cost-benefit analyses.

ORN 11  URBAN ROAD TRAFFIC SURVEYS (Published 1993)

This Note covers the design and implementation of urban road traffic surveys. It provides traffic engineers in developing countries with a comprehensive guide to simple, reliable survey techniques. The manual covers surveys of transport supply, transport demand and the performance of the network. The emphasis is on usability, with fourteen sets of instructions and forms ready to be photocopied and given directly to survey staff.

ORN 12  DESIGN GUIDELINES FOR BUSWAY TRANSIT (Published 1993)

Busway transit, the physical segregation of bus and other traffic, offers the possibility of introducing a mass transit system at relatively low cost.

The purpose of these design guidelines is to assemble current ideas on busway transit and to offer transport planners and designers a source of practical information on their use and implementation. This Note is primarily directed at practitioners rather than policy makers, and focuses on busway transit rather than general bus priority measures. It contains examples of current practice, derived from published information and from observation of operational schemes around the world. The Note complements TRL Research Report 329 on busway transit performance (Gardner et al, 1991).

ORN 13  THE USE OF TRAFFIC SIGNALS IN DEVELOPING CITIES (Published 1996)

Traffic signals are used throughout the world for the control of traffic at junctions. Their use in developing cities is likely to increase, despite some doubts as to their effectiveness and safety if used incorrectly. The purpose of this Note is to assist local authority engineers in developing cities on the need for traffic signals and then how to use them optimally. It aims to help in the choice between the technologies available and to clarify the benefits of low-cost methods, where applied correctly.
ORN 14 HYDROLOGICAL DESIGN MANUAL FOR SLOPE STABILITY IN THE TROPICS (Published 1997)

Most slope failures in tropical soils are triggered by local rainfall leading to changes in the soil-water conditions. The objective of this manual is to provide advice on how to determine if these conditions are critical and if so how to measure them. The predictions of stability are based on a combined slope hydrology/stability model developed at Bristol University under ODA sponsored research. The results have been tested under field conditions and integrated with existing practice.

The main part of the manual consists of a series of 'Instructions', which are procedures to expand existing site investigations. These introduce new slope stability design charts, the use of the dimensionless resistance envelope and the measurement of permeability and suction together with factors affecting the use of piezometers. The manual concludes with a section on data collection.

ORN 15 GUIDELINES FOR THE DESIGN AND OPERATION OF ROAD MANAGEMENT SYSTEMS, (Published 1998)

This Overseas Road Note provides detailed guidance on the design and operation of computer-based road management systems. The note draws on material from a number of sources and combines experience of active involvement in many institutions with on-going research carried out by TRL on this subject. The fundamental message of the Note is that institutional 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 process involved in 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.

ORN 16 PRINCIPLES OF LOW COST ROAD ENGINEERING IN MOUNTAINOUS REGIONS, (Published 1997)

This Note discusses the principles behind design decisions and procedures demanded by the rigours of a mountainous environment. The geographical areas addressed are geologically young fold mountain regions in humid tropical and sub-tropical climatic zones. However, most of the principles in the Note would be applicable in any steep, topographically complex, unstable terrain. The main subjects covered are terrain hazards, route planning and site investigations, drainage design, and slope stabilisation and protection. The Note emphasises the risks associated with inappropriate design and poor construction practice, and describes procedures and techniques that are safe and economical. The Note is aimed principally at design engineers, but it will also be of value to all those involved in site investigations and contracting.
ORN 17  ROAD SAFETY EDUCATION IN DEVELOPING COUNTRIES - GUIDELINES FOR GOOD PRACTICE IN PRIMARY SCHOOLS, (Published 1997)

Based on research carried out in selected developing countries and on considerable experience of the British Road Safety Education scene, the guidelines have been prepared to illustrate the importance of Road Safety Education, and show how a developing country might put in place a system ensuring that primary school children receive adequate Road Safety Education. The guidelines are aimed at policy makers in education, transport, health, curriculum development departments, police etc.

ORN 18  A GUIDE TO THE PAVEMENT EVALUATION AND MAINTENANCE OF BITUMEN-SURFACED ROADS IN TROPICAL AND SUB-TROPICAL COUNTRIES (Published 1999)

This Road Note gives guidance on road pavement evaluation procedures suitable for bituminous-surfaced roads in tropical and sub-tropical climates and reviews alternative methods of maintenance and repair. It is intended primarily for highway engineers who are responsible for maintaining roads in these environments but the techniques and principles on which it is based are equally applicable elsewhere.

ORN 31  A GUIDE TO THE STRUCTURAL DESIGN OF BITUMEN - SUBFACED ROADS IN TROPICAL AND SUB-TROPICAL COUNTRIES (Fourth Edition published 1993)

This Note gives recommendations for the structural design of bituminous surfaced roads in tropical and sub-tropical climates. It is aimed at highway engineers responsible for the design and construction of new road pavements and is appropriate for roads which are required to carry up to 30 million cumulative equivalent standard axles in one direction.
4. OTHER MANUALS AND APPLICATION GUIDES

RN 40  A GUIDE TO THE MEASUREMENT OF AXLE LOADS IN DEVELOPING COUNTRIES USING A PORTABLE WEIGHBRIDGE.

This Note describes a simple and convenient procedure for carrying out axle load surveys in developing countries using portable weighing platforms. The procedure is based on experience gained by TRL staff who have undertaken a considerable number of axle load surveys in several developing countries.

A GUIDE FOR DRIVERS OF HEAVY GOODS VEHICLES (Published 1990)

This manual or Highway Code is intended primarily for drivers of heavy goods vehicles in African countries. It explains the basic rules of road safety and gives advice on how to drive safely in a wide range of common traffic situations. It also includes information to the driver on how to check that he or she is fit to drive and that the vehicle is safe. Information on road signs, markings, traffic rules and regulations and special requirements for international driving is also included. Alternative versions are available for countries which drive on the left and for those which drive on the right.

TOWARDS SAFER ROADS IN DEVELOPING COUNTRIES (Published 1991)

This manual outlines the different stages involved in planning and designing road networks and introduces safety conscious design principles so that professionals and decision-makers in developing countries can be given some practical guidance on how to make their road networks safer. Guidance on "Accident Prevention" given by highlighting the key, safety-related factors which need to be incorporated when planning, designing and operating road networks. Advice is also given on "Accident Reduction" by showing how hazardous locations can be analysed and what types of countermeasures can be used to reduce accidents at such locations.

A MANUAL OF ROAD LIGHTING IN DEVELOPING COUNTRIES
(Published 1991). Produced in association with the Institution of Lighting Engineers UK.

This manual is intended to help the local engineer understand the basics of good roadway lighting and achieve some of its benefits. Rather than give definitive 'best buys' for the enormous range of conditions and situations which the engineer has to face it sets out the various options, and their strengths and weaknesses, so that he can make the most of his scarce budget and equipment.
INTERNATIONAL ROAD MAINTENANCE HANDBOOK

Volume I  Maintenance of roadside areas and drainage
Volume II  Maintenance of unpaved roads
Volume III  Maintenance of paved roads
Volume IV  Maintenance of structures and traffic control devices

These handbooks present in a simple and understandable form, maintenance practices and operations developed through many years of experience with highway problems in developing countries. They are intended for use by maintenance foremen or supervisors to assist with all aspects of their work.
5. TRL STATE OF THE ART REVIEWS

The following TRL State of the Art Reviews are published by HMSO and enquiries for purchase should be directed to the HMSO Publication Centre, 20 Box 276, London SW8 5DT, UK. Tel: +44 (0)207 873 9090, Fax: +44 (0)207 873 8200. They are not available from TRL.


The influence of terrain in shaping the design of roads and other engineering structures is especially important in developing countries, where a minimum cost specification is usually adopted. Site investigation is carried out to identify terrain factors that are relevant to the project, from which a design is produced that strikes a balance between the terrain, the required level of performance and cost. Terrain evaluation helps the engineer to optimise this balance, by showing how the geology, water conditions and soils in a landscape relate to one another, and how they affect design.

The Terrain Evaluation Manual presents TRL’s experience of route location and materials surveys for roads overseas, and has been written for highway engineers or senior technicians who have responsibility for locating and planning the design of roads in tropical and subtropical countries.


This book provides a comprehensive source of information for engineering students and highway engineers practising in hot, tropical countries. The first part deals with tropical soils and roadbuilding materials, describing their formation, characteristics and methods of testing. The second part describes the methods used to design and build roads, and includes chapters on all of the different types of pavements, including both concrete and unpaved roads. Much of the information contained in the book derives from research carried out by TRL’s Overseas specialists on behalf of ODA.


This book reviews the subject of soil stabilisation which is the process whereby soils and related materials are made stronger and more durable by mixing with a stabilising agent. Although other stabilising agents can be used, cement and lime are by far the most important and the book therefore concentrates on their use. The book begins with an outline of the principles of stabilisation followed by a review of the methods of testing and the specifications in use in different parts of the world. The physical and chemical factors affecting the strength of stabilised soils are dealt with in depth, and practical aspects of the technology are described, including the design process, construction techniques, quality control procedures, and problem areas. The environmental and economic benefits of the techniques are reviewed and summarised in the final chapter.
The number of urban dwellers in the Third World is rapidly approaching 2000 million. Most rely heavily on some form of public transport for their everyday activities. This review recognises the vital role that public transport plays in Third World cities. It aims to provide background information for aid agencies seeking to provide assistance; researchers as a starting point for more in-depth research; businessmen exploring markets; Third World authorities interested in the approaches adopted by other developing cities, and consultants in need of a concise briefing on public transport in Third World cities. The review is based on comprehensive studies of bus services, light rail transit and metros in developing cities undertaken by TRL and the author, embracing some 65 cities.
6. SOFTWARE

**MAAP - MICROCOMPUTER ACCIDENT ANALYSIS PACKAGE**

MAAP\textsubscript{five} MAAP for Windows*

The Microcomputer Accident Analysis Package (MAAP) was developed by the TRL’s Overseas specialists to assist engineers, planners and police in the storage and analysis of road accident data at the 'Local Authority' level i.e. a city, county or province. The package is intended for use with a police accident booklet or form thus enabling data to be entered directly into the microcomputer without the need to transfer data to a coding sheet. It provides the investigator with a range of tools for identifying and analysing problems, and isolating common features in the accidents. These facilities include accident, casualty and vehicle cross tabulations with graphical presentation, and stick diagram analyses. The data handling in MAAP for Windows is based on the popular Access* database "engine". A new version of MAAP has recently been developed for use with an SQL Server, instead of an Access database, intended for customers requiring several users to have simultaneous access to the database. This should be available from mid-1999. For further details on MAAP including cost, please contact:
The TRL Software Bureau, Transport Research Laboratory, Old Wokingham Road, Crowthorne, Berkshire, RG45 6AU, UK. Tel: + 44 (0)1344 770018, + 44 (0)1344 770758, + 44 (0)1344 770176, Fax: + 44 (0)1344 770864. E.mail : softwarebureau@trl.co.uk

* SQL Server, Access and Windows are the registered trademarks of the Microsoft Corporation.

**RTIM3 - ROAD TRANSPORT INVESTMENT MODEL** (published 1993)

RTIM\textsubscript{3} is a computer model for the economic appraisal of road schemes in developing countries. The program is the latest version of Road Transport Investment Model, RTIM, which was developed by TRL and is widely used to carry out cost benefit analyses on road construction, upgrading and maintenance projects in developing countries. The RTIM\textsubscript{3} program runs on a microcomputer and operates as a series of linked compiled spreadsheets. These deal in turn with traffic flow, road deterioration, vehicle operating costs and economic analysis. The program is supported by an interactive 'Help' facility and a User manual. The program operates in MSDOS and does not require any spreadsheet software to be present.

**Buying the Program**
The program can be obtained from the Transport Research Laboratory under the terms of a Licence Agreement. The Licence Fee (£150) covers the supply of one copy of the program on microcomputer diskette together with the User's Manual. For further information contact the International Development Unit.
TRL DCP is a program designed to help with the interpretation and presentation of DCP test results. The program has been written to operate under MSDOS and PCDOS compatible microcomputer operating systems. It is totally interactive with 'Help' facilities, and is highly user-friendly with rigorous error checking at data input. The program and User manual (ORN8) are available on application to the International Development Unit.

Please note that the DCP program is a DOS program and will only run in Windows 95 if the DOS driver ANSI.SYS is installed on the computer and referred to in the start up configuration file called CONFIG.SYS.
7. REPORTS BY SUBJECT

7.1 Design and Performance

<p>| RR 381 | Parry, J D, N C Hewitt and T E Jones | Concrete pavement trials in Zimbabwe. (1993) |
| RR 301 | Cundill, MA | The MERLIN low cost road roughness measuring machine. (1991) |
| RR 114 | Kosasih, D, R Robinson and J Snell | A review of some recent geometric road standards and their application to developing countries. (1987) |
| LR 970 | Parry, J D | The Kenyan low cost modular timber bridge. (1981) |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR 763</td>
<td>Jones, T E</td>
<td>Axle-loads on paved roads in Kenya.</td>
</tr>
<tr>
<td>LR 721</td>
<td>Robinson, R</td>
<td>ALSA. A program for the analysis of axle-load survey data.</td>
</tr>
<tr>
<td>LR 715</td>
<td>Ford, W G</td>
<td>The adaption of the RRL Hydrograph Method of storm sewer design for tropical conditions.</td>
</tr>
<tr>
<td>LR 706</td>
<td>Fiddes, D</td>
<td>The TRRL East African flood model.</td>
</tr>
<tr>
<td>LR 673</td>
<td>Hodges, J W, J Rolt and T E Jones</td>
<td>The Kenya road transport cost study: research on road deterioration.</td>
</tr>
<tr>
<td>LR 667</td>
<td>Ellis, C I</td>
<td>Risk and the pavement design decision in developing countries.</td>
</tr>
<tr>
<td>LR 623</td>
<td>Fiddes, D, J A Forsgate and A O Grigg</td>
<td>The prediction of storm rainfall in East Africa.</td>
</tr>
<tr>
<td>LR 318</td>
<td>Fiddes, D and J A Forsgate</td>
<td>Representative rural catchments in Kenya and Uganda.</td>
</tr>
<tr>
<td>SR 537</td>
<td>Ellis, C I</td>
<td>Pavement engineering in developing countries. (Also available in Spanish)</td>
</tr>
<tr>
<td>SR 412</td>
<td>Potocki, F P</td>
<td>Road temperatures and climatological observations in the Emirate of Abu Dhabi.</td>
</tr>
</tbody>
</table>

7.2 Maintenance

<table>
<thead>
<tr>
<th>Code</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR 145</td>
<td>Robinson, R</td>
<td>A view of road maintenance economics, policy and management in developing countries. (1988)</td>
</tr>
<tr>
<td>RR 91</td>
<td>Jones, T E and R Robinson</td>
<td>A study of the cost-effectiveness of grading unpaved roads in developing countries. (1986)</td>
</tr>
<tr>
<td>Reference</td>
<td>Author(s)</td>
<td>Title and Details</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------</td>
<td>-------------------</td>
</tr>
</tbody>
</table>

### 7.3 Materials

<table>
<thead>
<tr>
<th>Reference</th>
<th>Author(s)</th>
<th>Title and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR 91</td>
<td>Woodbridge, M E, R Freer-Hewish, M Obika and B Neil</td>
<td>Avoiding salt damage to bituminous surfacings: results from a road trial in Botswana. (1994)</td>
</tr>
<tr>
<td>CR351</td>
<td>Mockett, LD, M B Barton, M B Woodbridge and D Newill</td>
<td>Collapsing sand from the Kalahari region of Botswana. (1992)</td>
</tr>
<tr>
<td>RR 86</td>
<td>Khodaii, A I, 0 T Farouki and J Rolt</td>
<td>A laboratory study of the mechanical properties of sand/sulphur/bitumen mixes. (1986)</td>
</tr>
<tr>
<td>LR 1122</td>
<td>Lawrance, C and T Toole</td>
<td>The location, selection and use of calcrete for bituminous road construction in Botswana. (1984)</td>
</tr>
<tr>
<td>SR 729</td>
<td>Dowling, J W F, R Franco and R B C Russell</td>
<td>Natural asphalts: their occurrence, properties and use and in road construction in Colombia. (1982)</td>
</tr>
<tr>
<td>SR 610</td>
<td>Heath, W and R Robinson</td>
<td>Review of published research into the formation of corrugations on paved roads. (1980)</td>
</tr>
</tbody>
</table>

**Pre-1980**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Author(s)</th>
<th>Title and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR 717</td>
<td>Hitch, L S and R B C Russell</td>
<td>Sand-bitumen for road bases: an examination of five methods of measuring stability</td>
</tr>
<tr>
<td>LR 600</td>
<td>O'Reilly, M P</td>
<td>The compaction of soils and stabilised bases on roads in East Africa.</td>
</tr>
</tbody>
</table>
LR 523  Ellis, C I Arabian salt-bearing soil (Sabkha) as an engineering material
LR 379  Bofinger, H E and G A Sullivan An investigation of cracking in soil-cement bases for roads
LR 365  Bofinger, H E The measurement of the tensile properties of soil-cement.
SR 421  Beaven, P J and L W Tubey The polishing of roadstone in Peninsular Malaysia.
SR 398  Bofinger, H E, H O Hassan and R I T Williams The shrinkage of fine-grained soil-cement.
SR 284  Hitch, L S and R B C Russell Bituminous bases and surfacings for low-cost roads in the tropics.
SR 79   Russell, R B C Chemical and physical properties of Sabicha-type materials.

7.4  Geotechnics

SR 632  Heath, W Inexpensive aerial photography for highway engineering and traffic studies. (1980)

Pre-1980

LR 816  Heath, W; L L Parsley J W F Dowling Terrestrial photogrammetric surveys of unstable terrain in and Colombia.
LR 703  Stewart, M and A Celis C The use of geophysics in landslide studies.
LR 424  Stewart, M The use of seismic refraction in a route feasibility study in St. Lucia.
SR 448  Anon Terrain evaluation for highway engineering and transport planning.
<table>
<thead>
<tr>
<th>Code</th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR 433</td>
<td>Beaumont, T E</td>
<td>Remote sensing for transport planning and highway engineering in developing countries.</td>
</tr>
<tr>
<td>SR 378</td>
<td>Lawrance, C J</td>
<td>Terrain evaluation in West Malaysia Part 2. Land systems of South West Malaysia.</td>
</tr>
</tbody>
</table>

### 7.5 Road Safety

<table>
<thead>
<tr>
<th>Code</th>
<th>Author(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRL 442</td>
<td>Sayer, I A, Quimby, Murray and Guy</td>
<td>Improving road safety education (RSE) in developing countries: India (2000)</td>
</tr>
<tr>
<td>TRL 247</td>
<td>Ghee, C, D Silcock, Astrop and Jacobs</td>
<td>Socio-economic aspects of road accidents in developing countries. (1997)</td>
</tr>
<tr>
<td>TRL 227</td>
<td>Sayer, I A and Downing</td>
<td>Pedestrian accidents and road safety education in selected developing countries. (1996)</td>
</tr>
<tr>
<td>TRL 211</td>
<td>Hills, B L, Thompson, Johnson and Posanau</td>
<td>A roadside and hospital survey of drinking and driving in Port Moresby, Papua New Guinea. (1996)</td>
</tr>
<tr>
<td>PR 68</td>
<td>Sayer, I A and Baguley</td>
<td>Preliminary studies of pedestrian crossing improvements in Karachi, Pakistan. (1994)</td>
</tr>
<tr>
<td>SR 839</td>
<td>Jacobs, G D and Sayer</td>
<td>Road accidents in developing countries - urban problems and remedial measures. (1984)</td>
</tr>
<tr>
<td>SR 807</td>
<td>Jacobs, G D and Sayer</td>
<td>Road accidents in developing countries. (1983)</td>
</tr>
</tbody>
</table>

Jacobs, G D: A study of accident rates on rural roads in developing countries.

Jacobs, G D and P R Fouracre: Further research on road accident rates in developing countries.

7.6 Transport Planning


Ellis, S: Key issues in rural transport in developing countries. (1997)


Cundill, M A: Effect of prices on petrol and diesel sales in Kenya. (1986)

Cundill, M A: Car ownership and use in Kenya. (1986)

Cundill, M A: Road-rail competition for freight traffic in Kenya. (1986)


SR 777  Thomas, S  The value of time savings in West Malaysia: car, bus and taxi occupants. (1983)

LR 1031  Hide, H  Vehicle operating costs in the Caribbean: results of a survey of vehicle operators. (1982)


LR 1057  Parsley, L L and R Robinson  The TRRL road investment model for developing countries (RTIM2). (1982)

LR 1056  Morosiuk, G and S W Abaynayaka  Vehicle operating costs in the Caribbean: an experimental study of vehicle performance.


LR 1002  Rolt, J  Optimum axle loads of commercial vehicles in developing countries. (1981)


Pre-1980

LR 672  Hide, H, S W Abaynayaka, I Sayer and R J Wyatt  The Kenya road transport cost study: research on vehicle operating costs.

LR 427  Howe, J  A review of rural traffic-counting methods in developing countries.

SR 527  Hide, H and D Keith  Effect of simple road improvement measures on vehicle operating costs in the Eastern Caribbean.

SR 271  Abaynayaka, S W, G Morosiuk and H Hide  The effect of vehicle and road characteristics on commercial vehicle speeds in Ethiopia.

SR 32  Jacobs, G D and D Blackmore  Traffic census design in Malawi.
### Urban Transport

<table>
<thead>
<tr>
<th>Code</th>
<th>Authors</th>
<th>Title</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRL 263</td>
<td>Palmer, C, A Astrop and D A C Maunder</td>
<td>Constraints, attitudes and travel behaviour of low income households in two developing cities.</td>
<td>1997</td>
</tr>
<tr>
<td>TRL 123</td>
<td>Maunder, D A C and T C Mbara</td>
<td>The initial effects of introducing commuter omnibus services in Harare, Zimbabwe.</td>
<td>1995</td>
</tr>
<tr>
<td>PR 69</td>
<td>Gardner, G, J Rutter and F Kuhn</td>
<td>The performance and potential of light rail transit in developing cities.</td>
<td>1994</td>
</tr>
<tr>
<td>RR 278</td>
<td>Fouracre, P R, R J Alport and J M Thomson</td>
<td>The performance and impact of rail mass transit in developing countries.</td>
<td>1990</td>
</tr>
<tr>
<td>RR 121</td>
<td>Fouracre, P R and D A C Maunder</td>
<td>Travel demand characteristics in three medium sized Indian cities.</td>
<td>1987</td>
</tr>
<tr>
<td>RR 294</td>
<td>Maunder, D A C</td>
<td>The impact of bus regulatory policy in five African cities.</td>
<td>1986</td>
</tr>
<tr>
<td>RR 82</td>
<td>Fouracre, P R and D A C Maunder</td>
<td>A comparison of public transport in three medium sized cities of India.</td>
<td>1986</td>
</tr>
<tr>
<td>RR1</td>
<td>Maunder, D A C</td>
<td>Trip rates and travel patterns in Delhi, India.</td>
<td>1984</td>
</tr>
<tr>
<td>SR 723</td>
<td>Marler, N W</td>
<td>The performance of high-flow bus lanes in Bangkok.</td>
<td>1982</td>
</tr>
<tr>
<td>SR 733</td>
<td>Cundill, M A and H M Byrne</td>
<td>A study of goods vehicle restraint in Bangkok.</td>
<td>1982</td>
</tr>
<tr>
<td>SR 710</td>
<td>Fouracre, P R, D A C Maunder, M G Pathak and C H Rao</td>
<td>Studies of bus operations in Delhi, India.</td>
<td>1981</td>
</tr>
<tr>
<td>Code</td>
<td>Authors</td>
<td>Title</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>-------</td>
<td></td>
</tr>
</tbody>
</table>

**Pre-1980**

<table>
<thead>
<tr>
<th>Code</th>
<th>Authors</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>LR 772</td>
<td>Fouracre, P R</td>
<td>Intermediate public transport in developing countries.</td>
</tr>
</tbody>
</table>
The following is a selection of papers published in various conferences, journals etc. Copies of most of these are held by the TRL.

8.1  **Design and Performance**

PA 3575/00  DALY, A F and W WITARNAWAN (2000).  
**A method for increasing the capacity of short and medium span bridges.**  
10th REAAA Conference 4 - 9 September 2000, Tokyo, Japan.

PA 3579/00  ROLT, J and C PARKMAN (2000).  
**Characterisation of Pavement Strength in HDM-III and Changes Adopted for HDM-4.**  
10th REAAA Conference 4 - 9 September 2000, Tokyo, Japan.

PA 3578/00  MOROSIUK, G, T TOOLE, S MAHMUD and T DACHLAN (2000).  
**Modelling the deterioration of bituminous pavements in Indonesia a HDM-4 framework.**  
10th REAAA Conference 4 - 9 September 2000, Tokyo, Japan.

**Preliminary results of the accelerated ageing of modified and unmodified bituminous binders using the pressure ageing vessel.**  
10th REAAA Conference 4 - 9 September 2000, Tokyo, Japan.

**Roughness progressions and appropriate maintenance strategies for inter-urban roads in Indonesia.**  
XXI st World Road Congress, PIARC, Kuala Lumpur, Malaysia, 3 - 9 October 1999.

**Performance of asphalt concrete overlays in Malaysia.**  
XXI st World Road Congress, PIARC, Kuala Lumpur, Malaysia, 3 - 9 October 1999.

**A structural design guide for low volume secondary and feeder roads in Zimbabwe.**  

**Bituminous surfacing for heavily trafficked roads in tropical climates.**  

**New mix composition to increase the storage life of Indonesian bitumen emulsion.**  

PA 3307/97  DALY, A F and W WITARNAWAN (1997).  
**Strengthening of bridges using external post-tensioning.**  


PA1303/93  PARRY, J D (1993). Directing research to ensure that cost-effective solutions to highway problems are found and implemented. *Second Annual Meeting of the Pan American Institute of Highways, Santiago, September 1993*.


8.2 Maintenance


TRL International Publications 28 September 2000
8.3 Materials


8.4 Geotechnics


8.5 Road Safety

PA3574/00 PEARCE, T and D A C MAUNDER (2000). The causes of bus accidents in five emerging nations. 10th REAAA Conference 4-9 September 2000, Tokyo, Japan.


PA3622/00 GRANNE, Y H , B L HILLS, E P WALTEROS and S H PEREZ (2000). Road safety un urban Santa Fe de Bogota D.C CODATU IX Conference, Mexico City, 11 - 14 April 2000.


PA3049/95  JACOBS, G D (1995). Road safety in the developing world. 5th Annual Public Health Forum, London School of Hygiene and Tropical Medicine, 4-7 April 1995.


PA1163/86    JACOBS, G D and C A CUTTING (1986). Further research on accident rates in developing countries.  Accident Analysis and Prevention, 18 (2), 119-127


Transport Planning

PA3601/00 HINE, J L, H P SINAGA and D D RUDJITO (2000) Transport costs for highway planning in Indonesia: results from new research into speed and fuel consumption in congestion, values of passenger time and vehicle maintenance costs. 10th REAAA Conference, 4 - 9 September 2000, Tokyo, Japan.


PA3144/96 ELLIS, S and J L HINE (1995). The transition from non-motorised to motorised modes of transport. 7th World Conference on Transportation Research, Sydney, Australia, July 1995.


8.7 Urban Transport

PA3573/00  GARDNER, G and D QUINN (2000). Barriers to cost-effective transport. *CODATU IX Conference, Mexico City, 11 - 14 April 2000.*


PA1162/86 MAUNDER, D A C (1986). Public transport needs of the urban poor in Delhi, India. CODATU. Third Conference on Urban Transport in Developing Countries, Cairo, 20-23 January 1986.


