

IMPROVING OPPORTUNITIES TO PROMOTE TRANSPORT RESEARCH

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ABSTRACT

The UK's Department for International Development (DFID) has historically funded much of TRL's research work in the transport sector of developing countries. This research is specifically targeted at the needs of developing countries and covers a wide spectrum of interest across the transport sector, including road safety, transport planning, rural access issues, highway engineering and geo-environmental considerations. In addition it addresses wider policy and strategic issues, as well as complementing DFID's focus on poverty alleviation. The results of this research is disseminated through a range of publications including manuals, application guides (e.g. the Overseas Road Note series), conference papers, scientific journals as well as within a host of documentation produced by others. The traditional technology transfer process used to get this information across to the user has relied heavily on 'paper' publication media and provision of training courses and materials.

The purpose of this paper is to raise wider discussion on a number of technology transfer issues in the sector. As well as examining the wider issues of mainstreaming research effectiveness and uptake, the paper highlights the need for consideration of a broad range of other issues which include:

- Ownership of research and the role of the user
- Increasing use and access to electronic media
- Feedback mechanisms and forums used, including the effectiveness of workshops, seminars and focus groups
- Need for effective networking through linkages established by key technology transfer groups (e.g. T², TRL, CSIR and others)
- Role of professional groups and the tertiary education system
- Role of international organisations such as the World Road Congress (PIARC), ILO/ASIST, Global Road Safety Partnership and others.
- Funding mechanisms and constraints

The paper concludes by exploring opportunities to improve the transfer of research knowledge in the short and medium term.

1. INTRODUCTION

More than \$15,000 million are spent each year on highway construction, maintenance and administration by governments in the developing countries of Africa, Asia and Latin America. Furthermore, the costs incurred by transport operators and other road users for vehicle operations are typically 10 times greater.

Despite the obvious importance of transport both socially and economically within developing economies, the funding ploughed into transport research is woefully inadequate. Apart from the commitment of a few dedicated donors (most notably the UK's Department for International Development - DFID), and some enlightened governments who support national research institutions and academia, the source of research funds is meagre and inconsistent. These circumstances behave that the suppliers of transport research not only focus on national priority issues, but also issues which reflect a universal need.

Researchers must ensure effective dissemination and application of their results as widely as possible. The researcher must also be in a position to demonstrate the potential benefits of the research to the funding agencies, politicians, decision makers and users, although post-research impact studies are in fact rarely carried out. Two examples illustrate the power of justifying research:

- Research and development costs for the Highway Design and Management model (HDM) are estimated at around \$40 million whilst benefits accruing through application of the model are conservatively estimated at 10 to 20 times this figure.
- Research by TRL in Africa on improved design of asphaltic materials and the appropriate use of unbound granular materials has led to savings on construction costs, typically of the order of \$40,000 to \$60,000 per km. The investment costs of the research can be fully recovered with the first 100 km of road built.

Increasingly the transport sector demands research on current problems and issues at the expense of fundamental and longer term research programmes (which for the most part would offer the maximum longer term benefits) that target projected problems and issues arising downstream. To attract funding for these long term programmes, the researcher needs to broaden the traditional skill base to include those of a political lobbyist.

Mechanisms for identifying and co-ordinating global transport research needs are not yet in place. National research institutions will obviously focus on national issues, whilst donor research funding is generally guided by the experience of their (the donors) advisors. Dissemination and application of findings is equally uncertain, and again mechanisms for co-ordinating and monitoring these activities are weak.

This paper is written in the context of a rapidly changing background to the development and dissemination of transport research. These changes include:

- The role of transport in meeting International Development Targets and the need for developing a cross-sectoral approach to research and uptake of the information generated.

- The increased focus by donors and national governments on the need for sustainable transport solutions to eliminate rural and urban poverty in developing countries.
- The rise in global networking through organisations such as the World Road Congress (PIARC) and development of international research partnerships.
- The move towards different organisational models for managing the transport sector in many developing countries including the establishment of autonomous or semi-autonomous executing agencies, Roads Boards, and funding mechanisms.
- The increased participation of private enterprise and non-governmental organisations within the sector and the increasing development of public private partnerships.
- The need for protection and better management of the natural and physical environment.
- The proliferation in the growth in electronic means of storing, managing and distributing information and the increased access to new information and communication technologies (ICT).

These changing circumstances present opportunities for re-thinking the way in which transport research is promoted and applied.

The purpose of this paper is to examine how this changing environment is impacting on the generation, dissemination and application of transport research. It draws largely on the experiences of the International Division of TRL and sets out TRL's vision for improving transport research dissemination in the future.

2. THE RESEARCH PROGRAMME OF TRL INTERNATIONAL

For many years the International Division of TRL has been the main supplier of transport research for DFID. Part of TRL's responsibility is promotion and dissemination of the findings from these research programmes. It follows that the types of information available for dissemination largely follow the scope and strategies which DFID adopt in developing the transport component of their Knowledge and Research (KaR) programme, and in the research projects which they elect to support. At present the principle objectives of the DFID transport KaR programme can be summarised as follows; to:

- Improve transport safety and reduce the impact of accidents particularly for poor people in rural and urban areas.
- Reduce the costs of construction, rehabilitating and maintaining road infrastructure to help reduce vehicle operation costs.
- Improve the mobility of rural and urban poor for meeting their livelihood needs.
- Increase the efficiency of national and regional transport systems whilst safeguarding the interest of poor and vulnerable users.

The information base generated from the research programme is diverse and covers a wide range of specialist areas within the transport field. These include:

- road engineering issues (e.g. appropriate use of materials; development of pavement design standards for paved and unpaved roads; maintenance

organisation and programming tools) which address how to design, construct, maintain and rehabilitate roads).

- road planning, operation and management (e.g. development and application of road transport investment models).
- road user and pedestrian safety.
- road traffic management.

This portfolio of research has gradually extended the information base into investigation of the:

- economics, financing and planning of road provision;
- organisational and institutional models for providing transport;
- fundamentals of travel behaviour;
- road user needs including services using the roads;
- environmental demands of transport provision and geotechnics.

In the past TRL, as part of the government sector, had the brief of identifying the research programme for DFID. This was on the basis of its corporate experience of working on transport problems of the developing world. DFID are moving away from this supply led approach and are proactively encouraging stakeholders in developing countries to become partners in research process, including the:

- identification of transport research needs;
- lobbying of funding agencies for support and resource provision;
- management and implementation of the in country research programme;
- development of national implementation pathways;
- formulating the dissemination process including format of outputs, training and awareness raising programmes;
- continued monitoring and improvement of research impact and uptake after completion of the initial research cycle;
- improved linking with other research collaborators and co-ordination across national boundaries.

TRL's current research portfolio for DFID reflect these changes and we continue to welcome approaches from potential research partners in developing countries in the continued expansion of the transport research programme to meet DFID's development and poverty alleviation objectives.

3. DISSEMINATION OF TRL RESEARCH

The range and nature of transport research yields different types of information which can be broadly classified as:

- *Research reports* containing the basic research findings or output from a research project. These reports usually set out the way in which the empirical data has been gathered and analysed and how the results conform to the original project objectives and hypotheses.
- The translation of the research project(s) findings into *guidelines, manuals, procedures and advice*.

- The development of *training and education materials*. These seek to support the application of guidelines and procedures and importantly to inform the policy makers.

In the case of engineering science this may yield information on the basis of which strong prescriptive advice may be given, and which, once demonstrated, may survive largely unchanged over time. In the case of social science observation, which provides a set of comparative experiences on, for example, the impact of constructing a road, the information may be less robust. The observations may not be easily transferable, and may be unstable over time, but can be very helpful in the development of transport policy and planning because they alert the policy advisor to possible policy impact.

The range of information types can be an important consideration in the publication of the material. There will be different target audiences, different ways of presentation and the need for up-dating material which is subject to rapid change or re-interpretation. Two very distinct target audiences, representing the direct users of information, are immediately apparent: the practising road engineers who design, build and maintain the road network; the policy and planning advisors who need to justify particular transport development programmes. At another level there is the community of intermediate users, i.e. those who may largely promote the use of the findings amongst the recipient countries. These include donors (multi and bi-laterals), NGOs, and (increasingly important) the private financiers involved in development.

To summarise these points, Table 1 illustrates a matrix of information types and target audiences, indicating where the main interest may lie.

Table 1: Information requirements of transport community in developing countries

Target audience	Research findings	Guidance and tools	Policy and planning lessons	Training materials	General and source information
Road transport students	√	√	√	√	√
Research and academic institutions	√	√	√	√	√
Road technicians		√		√	√
Road engineers	√	√		√	√
Road administrators			√	√	√
Transport planners	√		√	√	√
Transport service providers	√		√		√
Transport policy advisers	√		√		√
Donors/NGOs - technical	√	√	√	√	√
Donors/NGOs - administrative			√		√
Cross-sectoral interests	√		√		√
Civil society/community groups		√	√	√	√
Education services		√		√	√
Private financiers			√		√

TRL's main publication format reflects (in varying degree) different levels of detail, different audiences or end user and different purposes. These are:

- Research Reports (variously known as Laboratory Reports, Supplementary Reports, TRL Reports) and these describe the detailed research findings from a particular project.

- Working Papers and Unpublished Reports. These usually provide supporting materials for Research Reports and are usually distributed on an ad hoc basis.
- Overseas Road Notes (ORNs) which are guides on the practical application of research findings. Publications in this series are usually a culmination of many years of research and are often a final output of DFID funded research.
- Papers (for journals, conferences, etc.). These tend to relate to research findings, and in many instances are complementary to Research Reports. For the most part, papers are published documents, which may be widely catalogued and referenced.
- Information Notes that address a specific topic, and mostly provide a brief summary of research findings (or other information sources) which have practical application relevant to that topic.
- Overseas Technical Advice Notes, which provide a one or two page guide to a particular topic or equipment. This is a relatively new series aimed to provide succinct information to satisfy regular enquiries such as those on road roughness measurement; skid resistance; the Dynamic Cone Penetrometer (DCP); and salt damage to surfacings.
- Leaflets summarising a particular piece of research
- State of the Art Reviews (SOARs) produced by TRL on a variety of transport topics. The titles particularly relevant to developing countries are: Road Building in the Tropics; Terrain Evaluation Manual; Public Transport in Third World Cities and Cement Stabilisation.
- Library searches with compendiums of abstracts such as 'Current Topics in Transport'. The information source is the TRL Library Database System which compiles abstracts under the International Road Research Documentation (IRRD) partnership.

Apart from these series the other main means of publication format used for disseminating DFID's transport research findings and advice are through:

- The biannual newsletter *Transport* which is published by TRL on behalf of DFID
- Transport research project profiles, which have recently been compiled and loaded onto the DFID KaR page on the main TRL web site.
- Lectures, courses and lecture notes produced for courses.
- Lectures and presentations provided to visitors to TRL and to external courses.
- Courses, workshops, seminars provided as part of the research projects.
- E-mail, telephone and postal correspondence with individual enquirers (largely undertaken by TRL as part its role as a Transport Resource Centre for DFID).
- Transport software and videos.

Table 2 identifies what information (to a greater or lesser degree) each of these series currently purports to provide to the transport community.

Table 2: Publication formats used for information types

Publication Format	Research findings	Guidance and tools	Policy and planning lessons	Training materials	General and source information
Research Reports/ Working Papers/ Unpublished Reports	√√				
Overseas Road Notes		√√	√	√	
Papers (journals, etc.)	√√	√	√	√	√
Information Notes		√√	√	√	√
Advice Notes		√√	√	√	√
Leaflets	√				√√
Library Search					√√
Software		√√		√	
Video	√	√	√	√	√
Transport (DFID Newsletter)	√				√√
Project Profiles (DFID Research)	√√				√√
Lecture notes	√	√	√	√√	√
Other contractor reports	√√				
Correspondence	√	√	√	√	√

√ important √√ very important

Around 5,000 publications are officially dispatched to enquirers each year. (A substantial number of copies are also mailed or handed out by individual officers in the field). The readership of the biannual newsletter *Transport* is currently well over 3,500 and is increasing annually.

The publications most in demand are the Overseas Road Notes (ORNs), accounting for over 47% of the annual requests. The largest number of recipients of all published material continues to be those from the African continent, which takes over 60% of all recorded items.

4. EFFECTING TRANSPORT RESEARCH DISSEMINATION AND UPTAKE

4.1 STAKEHOLDER INVOLVEMENT

The substantial benefits accruing from transport research can remain untapped due to ineffective or untargeted dissemination or barriers blocking the implementation process. Where research results are utilised, the effective application of the knowledge gained rarely extends beyond the country where the research was undertaken, despite the fact that it may be entirely relevant in other countries with similar conditions. Furthermore, much of the technology, innovation and knowledge developed for application on the primary road network could, with minimal modification, be re-focused and used for rural district or township roads where benefits to poorer and vulnerable groups are more direct

To promote ownership and sustainability of research outputs, programmes need to be collaborative and to involve (at least on a consultative basis) input and involvement by all stakeholders. Within the transport sector there are a large group of these potential stakeholders, including:

- Politicians, policy makers, strategic planners and all national and local government ministries and departments financing and managing the transport sector
- Researchers, both local and international who are carrying out the programme
- Civil society, communities, road users and other ultimate beneficiaries of the research implementation (including the poor)
- NGO's and specialist groups involved in the sector
- Private sector who will increasingly implement research findings
- Enforcement agencies such as the police and implementing agencies
- Donor community, other local research financiers and ultimately foreign or local tax payers
- Engineers, planners and specialist advisors in consultant or contractor companies
- Transport associations such as hauliers and local contractor institutions
- Tertiary education and academic institutions

There exists little guidance for the researcher on the institutional processes, mechanisms and procedures needed to address how such a diverse stakeholder group can be involved or even adequately informed of the research. It is arguable indeed whether this responsibility should lie with the researcher (who is often a technical specialist) or whether responsibility for the dissemination or uptake should lie elsewhere within the relevant stakeholder grouping. In reality it is probably the researcher or the parent research organisation who will lobby support of the stakeholders.

It is very often the case that the research programme would be deemed complete on delivery of the output or result. The logical framework approach is now increasingly used to track delivery of research. This approach sets the research on a logical path from activities to output, output to purpose and purpose to the ultimate goal. Traditionally the researcher has concentrated on the activity and output components. However, recently it appears that the onus now sits with the researcher to follow the route through its purpose level and to track the impacts on the ultimate goal.

With the increased responsibility of the researcher to identify key research areas, attract the necessary funding, implement the research programme and deliver the outputs, together with improving dissemination and uptake, there is now a real need to consolidate research activities and maximise scarce resources through improved national and international co-operation. DFID have welcomed this approach and efforts have resulted in a number of joint transport research programmes with other enlightened donors such as SIDA, NORAD, DANIDA and institutions such as ILO and more recently PIARC. This approach enables research suppliers such as TRL to work regionally rather than nationally and increases the:

- resources available to carry out the research
- opportunities for wider national and cross-border collaboration
- dissemination and uptake opportunities

More formally it is perhaps also time to suggest convening of a Donor Conference aimed at exploring how research in the transport sector can be further developed, co-ordinated and mainstreamed to fit their overall development and poverty alleviation objectives.

4.2 TRANSPORT RESEARCH COMMUNITY

The transport research community includes not only the university milieu and specialist consultants, but also a strong band of research institutions, many of which were modelled on the original UK Road Research Laboratory and its sister organisations under the erstwhile Council for Scientific and Industrial Research. These include ARRB (Australia), BRR (Ghana), CRRI and CIRT (India), NTRC (Pakistan), CSIR (S. Africa), IRE (Indonesia), and INRETS (France). TRL has had working relationships with a number of these organisations over the years and TRL continue to welcome opportunities to strengthen these relationships through collaboration on new research programmes and dissemination activities for the benefit of the development community at large.

Many of these organisations also hold valuable information much of it directly applicable to other users in the sector in developing countries. In this respect TRL is seeking the opportunity to develop a modus operandi to share knowledge, experience, data and dissemination pathways. A forum is needed whereby the transport research community can interact on this basis and TRL would welcome establishment of such a group focusing on the transport research needs of the developing world.

4.3 PIARC

There is also a general need to strengthen the relationship of the research suppliers with international organisations affiliated with the transport sector. Organisations such as PIARC have a key role to play in mainstreaming and disseminating research and improving opportunities for uptake. Many research suppliers would wish to attain a closer relationship to the specialist committees within PIARC. At present the structure of PIARC prevents such interaction even though it seems eminently sensible to develop such opportunities, particularly as in recent years the developing country representation has significantly increased. A core group of a transport research forum, such as that proposed above, could, as a minimum, have active links with the Technology Transfer (C3) group of PIARC.

The World Interchange Network (WIN), launched in 1995 at the 20th World Road Congress in Montreal aims to promote the transfer of road related information around the world. WIN works through a network of some 73 nodes (TRL is the node for the UK). Users with questions and queries can be put in touch with experts capable of providing answers, if not directly then through another countries node. Access to the WIN network is free, although there may ultimately be a cost once the expert has been identified. The charging policy for information accessed through WIN varies and rest with the individual institutions policy.

A list of all nodes and a list of the names of the person responsible for the node is available at: www.piarc.lcpc.fr/rme/anglais/template/noeudent.html

4.4 TECHNOLOGY TRANSFER CENTRES

In disseminating transport research links need to be formalised between the research suppliers and the emerging Technology Transfer (T²) Centres in Africa. Such centres

have already been established in Tanzania, Zimbabwe and South Africa. These centres are an obvious focal point for accessing research information generated both nationally by other international transport research providers. TRL would certainly seek the opportunity to support and use such networks for improving dissemination of its work and would welcome such an approach.

4.5 THEMATIC NETWORKING

Thematic networking may best be described as the continuous collaboration between researchers and research users (the network) to address specific issues which have a common theme. A Thematic Network is all about debate, but ideally it should be reaching out for consensus on the resolution of issues. The real value of a Thematic Network may not yet have been fully developed: it provides a platform for discussing and identifying research needs, based on a wide spectrum of opinion from all stakeholders and across many frontiers.

The development of email has provided a significant fillip to the pursuit of these activities as debates are no longer constrained to the conference hall and journal pages; email gives a much greater sense of immediacy and continuity.

Thematic Networks do need champions or organisers, as exemplified by organisations like IFRTD and SUSTRANS which receive support from DFID and UNCHS respectively. IFRTD addresses rural transport development, while SUSTRANS covers urban transport issues. Other champions are needed to cover other fields, and it would seem reasonable to look to these in the international bodies representing transport (e.g. PIARC, GRSP and CODATU), with possible secretariat support from the research agencies or forums as suggested above.

4.6 INCREASING USE OF ELECTRONIC MEDIA

There is now a need to more effectively use the dissemination tools available and furthermore to investigate new methods and technologies to increase both the dissemination and uptake.

The proliferation of use of electronic media in the workplace has opened a number of avenues to improve dissemination and access to transport research, documentation and information. These include the use of the Internet, email (as mentioned above) and storage of substantial amounts of information on CD-ROMs. Electronic dissemination has a number of attributes which encourages the exchange of ideas and information. Amongst other things it provides a:

- permanent, accessible and current mechanism for raising the 'visibility' of research;
- real-time platform for the monitoring of research progress;
- mechanism for instant response to enquiry;
- means to facilitate distance thematic networking;
- means to store information sources which are then easily and quickly accessible;
- means to support distance education and training.

These are powerful attributes, which, if properly managed, should encourage a much greater interaction between research providers and users. With this in mind, TRL (with the support of DFID) has developed a new web-site (www.transport-links.org) which it is hoped can provide an important hub for transport research in developing countries. The new web site contains information on DFID's transport programme generally. The site is intended to encourage participation in the development and running of research programme. Users will be informed of new projects as they come on stream, and be able to follow their progress and even comment upon the work through an email discussion facility. The site will connect users to DFID and other organisations operating within DFID's engineering KaR programme. It will also enable users to link with technology transfer centres and international organisations such as the World Bank Transport site, the PIARC and Win sites, ILO and many others, as well as linking to other companion sites which capture development issues (like the Livelihoods-Connect site). The network hub should also provide access for others to 'post' their work, and TRL are looking at ways in which this can be accomplished. As electronic data become available so the site will be developed to encompass all the following components:

- Transport Newsletters
- E-mail conference facility and user-group facility for networking/feedback.
- Publications (ORNs, project reports, papers, other miscellaneous documents)
- Education and training information (course details, knowledge bases)
- News (current developments in transport)
- KaR project information (profiles, activities, progress, and interactive partner specific pages)

TRL is also producing a CD ROM on behalf of DFID that contains all of the Overseas Road Notes, four road safety manuals, and the International Road Maintenance handbook. Expansion of the CD approach is planned in three areas: to include work of research organisations other than TRL; to produce themed CD's covering issues such as road maintenance and road safety; and to produce on a single disc manuals and documents translated into several languages.

It is recognised that electronic publication puts the onus on the recipient to produce any hard copy required. It also requires that the recipient has the equipment necessary for accessing and downloading the information; this access is becoming more widespread, but will not become universal for some time. To produce hard copy from the electronic transmission also requires adequate printing equipment and consumables (e.g. paper and ink). The net cost to the recipient could easily be greater and the difficulties may deter users where communications are difficult (probably those countries which have the greatest need for the material).

Much of the road research already carried out has been aimed specifically at targeting disadvantaged groups such as the rural poor; whereby better roads and transport services add to sustainable livelihoods. The pace of these technological developments should not outstrip the hardware and other capabilities of users in developing countries. Neither should the demand for electronic media alienate or marginalise access to information by poorer groups and individuals.

In this respect TRL will continually monitor the impact and effectiveness of its dissemination methods on disadvantaged groups and users. In the short term hard copy may be only effective means to disseminate information to these users outside larger institutions and Governments. However, the proliferation of Internet clubs and Cafes over recent years within many of the urban and peri-urban areas of Africa has been very noticeable and such establishments are expected to spread with time into the rural centres.

4.7 LANGUAGE OF DISSEMINATION

English is the primary language of dissemination for all the TRL publication series and training materials. There are, however, a few examples of key documents being translated for a wider international audience. The first editions of ORN1 (TRL 1981) and ORN2 (TRL 1981) were translated into French and Spanish but since that date translations have been specifically produced by overseas countries. Recent examples are Overseas Road Note 31 (TRL 1993) translated into Chinese by the China Road & Bridge Corporation with DFID support, ORN9 (TRL 1992) translated into Portuguese in Mozambique by an external project. These latter two are not distributed by TRL. In addition, the International Road Maintenance Handbook (PIARC 1994) (translated into 7 languages to date: including French, Spanish, Portuguese and Khymer) and Towards Safer Roads in Developing Countries (TRL 1991; Spanish version) have been so treated with the support of other agencies.

While English is the lingua franca for many professional engineers, it is by no means universally understood. There is undoubtedly a ready market for local language transport research materials and guides. The route taken with the International Road Maintenance Handbook shows that by using an international network, such as PIARC, a large number of language versions can be effected, using local resources.

While there is an obvious need for other language versions of publications, there is a need to consider the management and distribution of these. It is apparent that supplies held in the UK are not readily accessed by countries whose main language is not English. Translation and distribution would appear to be more effective if carried out by an organisation within the relevant language network. TRL will therefore seek to develop relationships with other organisations willing to take on the challenge of breaking down the language barrier.

4.8 DISTANCE EDUCATION AND TRAINING

Electronic media is an ideal way of promoting distance learning. The content of transport education and training materials should evidently be related to the types of course for which they are intended. The target audiences will range from technician to more senior engineers and policy advisors, and the content of the materials will need to reflect the differences in their requirements. A new audience that must also be targeted is the non-transport professional (for example, civil society and educational authorities), who have a strong interest in transport development. Road safety teaching materials for schools are a good example of this need.

There are a variety of different scenarios in which training and education materials are required, including those for use in:

- technical short courses run within or out of country (e.g. by TRL and others);
- technical long courses run within or out of country (e.g. University courses);
- distance technical learning (for acquisition of some diploma, awarded by an accredited institution);
- instruction of trainers and teachers (e.g. training the trainers);
- educating children (e.g. most notably road safety education).

How these different 'markets' are identified, prioritised and how the materials are appropriately packaged is largely a new venture for the transport sector. In this respect the transport research fraternity need to liaise more closely with both the academic institutions and the bodies who award professional status on the basis of examination.

One strategy for approaching this problem is through the development of a 'knowledge base' which covers a particular topic and which can be easily up-dated and re-packaged to suit particular course needs. These knowledge base consists of a set of modular course lecture notes and associated presentation materials, case-studies and other relevant papers. These can be 're-cycled' in a variety of different courses, and can be presented by other speakers. The knowledge bases can be published as both hard copy and in electronic format, the latter being the most sensible for continual updating and re-organising. TRL is actively pursuing this approach and it is hoped that the knowledge bases can eventually be posted on the transport-links web site for access and use by all.

4.9 DISSEMINATION RESOURCES

Dissemination of research is an on-going process and as such demands resource input to be sustainable. With TRL's dissemination programme DFID has been wholly supportive in bearing the costs of providing materials to professional staff in the developing world. With a user base for the information that includes other Donors, the ex-patriate consultant and contractor fraternity, developed country educational institutions and other relatively well supported institutions and individuals the question might be asked as to whether DFID should continue to wholly shoulder the responsibility for the dissemination. Are there are other mechanisms for supporting the costs of dissemination? Perhaps pooling of resources through organisations such as PIARC is one example of how the dissemination process can be strengthened and widened and this avenue will certainly be explored further by TRL.

For the most part there is no clearly defined market for transport research and knowledge, and its current 'purchasers' are largely limited to governments and donors, who act on behalf of the community. Certain fields can attract private research investment, particularly where there is a final saleable product: examples include traffic signal (hardware and software) development; transport planning software; pavement management systems and development of tolling equipment. However, in most cases the intellectual property generated would lie with the private financier and wider public access to the information would be restricted.

Another funding model is to attract commercial and industrial support to undertake research on issues which reflect external costs to those industries. Thus for example, the Global Road Safety Partnership (which is organised by the World Bank) is seeking funding from the transport industry (transport operators, oil and insurance

companies) who have some vested interest in, or social responsibility for, road safety improvement.

Yet another funding model involves the use of road fund sources. Road funds are being established in many countries with the aim of making the road sector more accountable. It is based on the 'user-pays' principle; funds for roads development are raised directly from road users through fuel taxation, vehicle licensing and other transport related duties. Given that these monies are raised specifically for the betterment of the road sector, there is a very good case for allocating a small proportion to local research activities, dissemination and training.

Ultimately, however, if funding sources are to continue to be attracted then the research cadre has a responsibility to demonstrate the value of its work. This is a responsibility not only for individual researchers, but also for the professional organisations representing transport interests and world-based bodies like PIARC and T², who need to advocate and promote transport research. Research organisations like TRL already help to facilitate this through improved dissemination activities and the development of the research ideas and arguments. This will continue to be a principle objective for TRL in the future.

5. CONCLUSIONS

Effective dissemination is the key for eventual uptake and implementation of research.

Transport research is carried out within an environment of resource constraint, a situation that can be turned around with more effective post research impact studies, monitoring of implementation impacts and providing resources for accurate cost/benefit studies.

The role of research suppliers (local and international) is changing to the extent that they should be expected to:

- Participate with the research stakeholders within the research cycle including identification of the demand for the research and review on-going research with this group.
- Act as political lobbyists and influence agenda and policy.
- Articulate demand and influence financiers to support involvement, including the private sector.
- Identify the dissemination pathways as part of the research process and review the intended route throughout the project.
- Develop and improve local research capacity where this is weak.
- Focus dissemination and review activities at all stakeholders from grass roots to financiers.
- Conduct appropriate training and awareness raising.
- Link to national and global knowledge pools and contribute to thematic networks.
- Influence education, training and University curricula.
- Promote and log feedback and maintain databases of networks and research partners.
- Identify and minimise barriers to eventual uptake of the research outputs.

- Maximise the value from the investment placed in the research.

The International Division of TRL wishes to consolidate and develop its dissemination role within the transport sector on behalf of DFID and in this respect our vision is to:

- Develop stronger relations and partnerships with other like-minded research organisations, including the Technology Transfer (T²) centres working in the sector in developing countries.
- Increase the annual dissemination of our research into non-anglophone countries through partnership with local or international groups with a similar goal to break down language barriers.
- Consolidate and develop more effective linkages with international organisations such as PIARC and to continue as a WIN node.
- Lobby for establishment of a global or regional transport research forum.
- Maximise opportunities to share transport research information.
- Contribute to and support the emerging thematic networks.
- Continue to maximise the dissemination opportunities provided by electronic media; including continued contribution to DFID's Transport-Links web site and provision of further thematic CD ROMs.
- Maximise the use of these media within the research process including opportunities for continual feedback and update.
- Regionalise many of the training courses normally conducted in the UK and to develop distance learning training tools for the Transport-Links web site.

The authors would welcome feedback on any of the issues raised within this paper.

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