

# **LOW COST ROAD SURFACING (LCS) PROJECT**

**LCS WORKING PAPER No**

# **11**

**Proceedings of  
GMSARN Seminar on  
RURAL ROADS**

**Phnom Penh  
Cambodia**

**23<sup>rd</sup> and 24<sup>th</sup> May 2002**



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### **THE LOW COST ROAD SURFACING INITIATIVE**

The Low Cost Road Surfacing (LCS) initiative aims to provide documentation and international guidelines on the provision and maintenance of low cost road surfaces and basic access for rural communities in economically emerging and developing countries (EDCs). It is based on a research project funded principally by the British Department For International Development (DFID) under its Knowledge and Research (KaR) programme. The initiative is led by UK-based specialist consultants Intech Associates. Collaboration is established with a number of organisations with interests or experience in the sector, including CSIR, TRL Ltd, ILO/ASIST Africa and Asia-Pacific, the ILO-SIDA funded Upstream Project and Ministry of Rural Development Cambodia, WSP International, Ministry of Transport Vietnam, Greater Mekong Sub-region Academic Research Network, The Institute of Technology of Cambodia, Chiang Mai University Thailand, the Committee C20 (Appropriate Development) of PIARC (World Road Association) and the International Focus Group. The LCS programme is being implemented over a 4 year period from 2001 to 2004.

The LCS programme is concerned with supporting sustainable improvements in low cost, road surfacing and basic access to support poverty reduction initiatives in rural communities. This implies the effective use of local resources, particularly human resources, locally available and alternative materials, and readily available and low cost intermediate equipment wherever possible. In the situation of scarce financial resources, it also requires the application of affordable and appropriate standards and adoption of techniques suitable for use by the indigenous private sector (particularly small domestic construction enterprises) and local communities. The application of good management practices coupled with adequate technical inputs are also encouraged.

It is intended that dissemination of the guidelines will be through electronic media as well as more traditional publication routes.

### **INTERNATIONAL FOCUS GROUP**

TRL is currently carrying out a number of research projects on low volume sealed and unsealed roads for DFID and other donors. Intech Associates is carrying out research on low cost surfacing with a number of partners. As part of these projects, an International Focus Group (IFG) has been established. The main function of the IFG is to thoroughly examine technical, economic and social issues arising from the project work. The group will also provide a focus to improve opportunities for dissemination of project results. The IFG being developed will comprise technical experts and engineers from a number of African, Asian and other countries as well as other international experts. Participation in the IFG will provide opportunities to:

- *build regional and international partnerships*
- *exchange ideas, experiences, information and data*
- *strengthen local knowledge with new information*
- *build on existing local research*
- *promote wider acceptance of the projects themselves*

Four projects listed below, are of particular interest to the IFG. Projects 1, 2 and 4 are part of the DFID's Knowledge and Research programme, whilst Project 3, is a collaborative research project involving a number of different donors:-

*Project 1: Reducing Whole Life Costs: Environmentally Optimised Design*

*Project 2: Minimising the Cost of Sustainable Basic Rural Road Access*

*Project 3: Engineering Standards for Labour-based Roads*

*Project 4: Low Cost Road Surfacing*

For further details refer to: [www.ifgworld.org](http://www.ifgworld.org)

### **GMSARN**

For further details refer to: [www.ait.ac.th/gmsarn](http://www.ait.ac.th/gmsarn)

**TRANSPORT LINKS**

DFID and previous UK government administrations have a long history in funding, promoting and disseminating transport research for developing countries and countries in transition. Through the Knowledge and Research (KaR) programme, DFID supports a range of research projects addressing technical, economic, management and policy issues in transport development.

Many of the research outputs may be downloaded from:

[www.transport-links.org](http://www.transport-links.org)

**THIS WORKING PAPER**

This working paper is a record of an event supported by the LCS project. This document is intended to inform and provoke discussion, contributions and dissemination regarding surfacing aspects of rural roads. The LCS Project welcomes dialogue with engineers, managers, organisations, communities and individuals active or interested in the rural transport sector with the objective of the promotion of a sustainable rural access approach for EDCs.

Contact for feedback on this document: [intech-trl@fpt.vn](mailto:intech-trl@fpt.vn)

This document is an output from a project funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of the DFID.

**Proceedings of GMSARN Seminar on Rural Roads**

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“GMSARN, ILO, MRD Cambodia, ITC Cambodia”

**Abbreviations**

ASEAN – Association of South East Asian Nations  
 CAFEO – Conference of the ASEAN Federation of Engineering Organisations  
 CSIR – Council for Scientific & Industrial Research  
 DFID – Department For International Development  
 EDC - economically Emerging and Developing Country  
 GMSARN – Greater Mekong Sub-region Academic and Research Network  
 IFG – International Focus Group  
 IFRTD - International Forum for Rural Transport and Development  
 ILO/ASIST - International Labour Office/Advisory Support Information Services & Training programme  
 IMT – Intermediate Means of Transport  
 ITC – Institute of Technology of Cambodia  
 ILO – International Labour Organisation  
 LCS - Low Cost (Road) Surfacing  
 MRD – Ministry of Rural Development  
 TRL - Transport Research Laboratory  
 vpd - vehicles per day

**Key Words:** Rural Roads Research Asia

## Proceedings of GMSARN Seminar on Rural Roads

Organized by :

**GREATER MEKONG SUB-REGION ACADEMIC and RESEARCH NETWORK  
INSTITUT DE TECHNOLOGIE DU CAMBODGE  
INTERNATIONAL LABOUR OFFICE (Upstream Project)**

**Date: Thursday 23rd May and Friday 24th May 2002.**

**Venue: Phnom Penh, Cambodia, at the World Vision Office.**

### 1. INTRODUCTION

Representatives of the eight regional academic institutions comprising GMSARN and experts from the transport sector met for a two day seminar 23 and 24 May 2002 in Phnom Penh, Cambodia at the World Vision Offices. This document provides an introduction to GMSARN, the event and the seminar recommendations.

### 2. Greater Mekong Subregional Academic and Research Network (GMSARN)

#### 2.1 Background

The countries in the Greater Mekong Sub-region (GMS) consist of Cambodia, Yunnan Province of China, Laos, Myanmar, Thailand and Vietnam. In 1992 the ADB initiated support for the "GMS Program", which has been successfully arranging a continuous dialogue among the six nations and which has provided financial and technical support to various development projects in the following seven categories:

- Transport,
- Energy,
- Telecommunications,
- Tourism,
- Environment,
- Human Resource Development, and
- Trade and Industry.

**GMSARN**, is a network of GMS academic institutions. It focuses on activities related to human resources development, joint research, and dissemination of information and intellectual assets generated by GMSARN. It aims for the development of holistic intellectual knowledge and assets, to be generated, maintained and shared by organizations within the GMS region for its sustainable development. The primary emphasis is placed on complementary linkages between technologies and social-economic development.

**GMSARN** is composed of eight academic institutions, namely the Asian Institute of Technology (AIT), which is based in Bangkok, Thailand; Hanoi University of Technology in Vietnam; Institute of Technology of Cambodia; Khon Kaen University in Thailand; Kunming University of Science and Technology in Yunnan Province, China; National University of Laos; Thammasat University in Thailand; and Yangon Technical University in Myanmar.

**GMSARN** provides a fresh impetus to development projects that have been initiated in the region to encourage collaboration among GMS countries.

**GMSARN** initiatives are developed based on their scientific and economic orientation, ensuring that the needs of countries and funding agencies are best served. Due consideration is given to the social or community impact of technology, that is, how technology relates to people. There is potential to strengthen collaboration with development agencies, regional organization, such as ADB and ESCAP, and the community at large.

**GMSARN's** success pivots on close cooperation among the eight member institutions as well as on partnerships with government agencies, the private sector, funding sources, and educational and scientific organizations at the national, regional and international levels.

**GMSARN's** commitment to the development of the GMS, complemented by the region's neutrality, and by the organisation's objectivity, credibility and the broad knowledge base generated through GMSARN activities, make GMSARN a viable partner for national and regional bodies.

## **2.2 Objectives of the GMSARN**

1. To enhance the roles and functions of regional academics to take part in project evaluation and development planning for achieving truly self-reliant and sustainable development of the GMS in the long term,
2. To foster multi-disciplinary research and academic development within and among academic and research institutions in the GMS through relevant joint activities,
3. To formulate and resolve, scientifically and objectively, various complex GMS problems covering both cross-border issues and issues that are common to GMS countries,
4. To take stock of intellectual assets developed for the GMS region for transparently accessible reference and for utilization among the GMS.

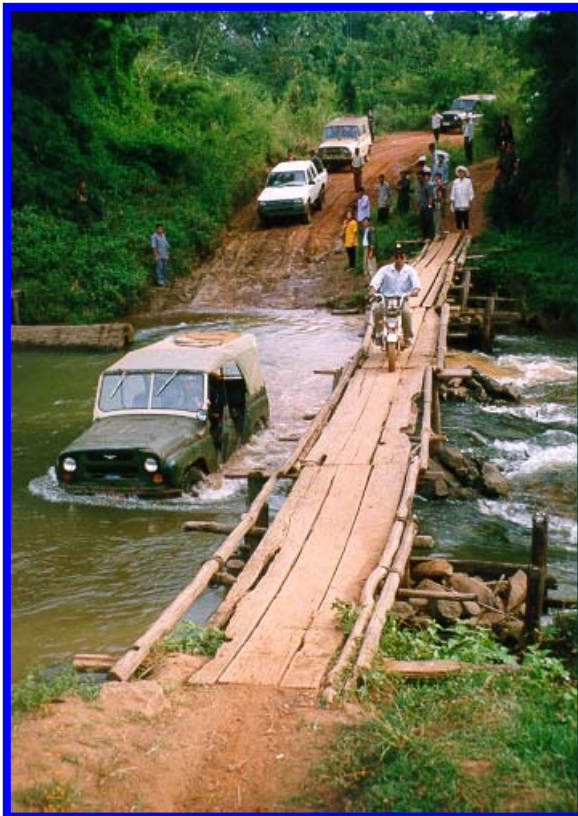
## **2.3 Activities of the GMSARN**

The GMSARN has, among others, the following activities:

1. Activities for human resources development cover short courses, workshops, visiting research fellowships, postgraduate degree programs (including establishing new ones and upgrading the existing ones) etc. making the best use of information technologies. Areas to be emphasized include, but are not limited to, environmental management, infrastructure planning and management, information technology, small and medium enterprises development.
2. Activities for joint research include but are not limited to the following issues: environmental issues, infrastructure issues, socio-economic issues, database issues, and conflict resolution and management; and research on decision making processes.
3. Information and intellectual assets generated by the GMSARN will be disseminated using internet technology for easy access and sharing by the GMSARN partners. Specifically a GMSARN website will be developed and regularly maintained.
4. All funding possibilities from national, international and bilateral funding sources, regional education and scientific organizations, regional funding agencies, and the private sector will be explored for their financial support to promote regional

research, cooperation, and development.

### THE CHALLENGES





### 3. GMSARN AND RURAL ROADS

One of the topics of interest selected by the GSMARN is that of rural roads. It is around the topic of rural roads that May 2002 seminar was oriented.

Three billion people in developing countries, or about two-thirds of their population, live in rural areas. The majority of them survive on less than two (US) dollars a day, and about 1.2 billion live on less than a dollar a day. Their lives are characterized by isolation, exclusion, and unreliable access to even the most basic economic opportunities and social services. It is estimated that about 900 million rural dwellers in developing countries do not have reliable all-season access to main road networks, and about 300 million do not have access at all. For the majority of their transport needs, they rely on non-motorized means and on rugged paths, tracks and roads which are typically in poor condition and often only passable in dry weather<sup>1</sup>.

Rural roads, tracks, paths and footbridges are referred to as rural transport infrastructure (RTI). The RTI network in developing countries consists of an estimated 5-6 million kilometres of designated rural roads and an additional expansive network of undesignated roads, tracks, and paths. While the length of the undesignated network is unknown, it is estimated to be several times the extent of the designated network. The vast majority of trips that take place over RTI (more than 80 percent) are short distances (less than five kilometres) and made by non-motorized means, including walking, animals, bicycle, and portage.

The majority of RTI in developing countries carries traffic of less than 50 motorized four wheeled vehicles per day (VPD), but often a substantial number of intermediate means of transport, such as bicycles and animal-drawn carts. In most cases, the appropriate standard for these are single-lane, spot-improved earth or gravel (or low-cost surfaced) roads provided with low-cost drainage structures, such as fords and submersible single-lane bridges.

Rural transport networks in most developing countries are still underdeveloped and generally of poor quality. Rural households, and particularly women, spend much time and effort on transport activities to fulfill their basic needs. Too many communities still do not have reliable access to main road networks or motorized access, while at the same time resources are being spent upgrading roads to economically unjustified standards for populations that already have a sufficient level of access.

In recent years, renewed emphasis on assisting very poor populations through sustained rural development has led governments and donors to accelerate resource flows to rural infrastructure, with a large proportion being directed at improving transport infrastructure. While these projects are sometimes sector-focused, they are increasingly taking the shape of multi-component rural development projects or social funds with an emphasis on local government and community based program management. While a cross-sector orientation in such projects is desirable, there is a need for sound technical advice on the design of sub-components and, in particular, on appropriate design and appraisal methods for RTI.

Ensuring an effective RTI system is an essential requirement for rural development, although by itself, it is not sufficient to guarantee success. Without adequate RTI, communities lack the necessary physical access for basic domestic chores, agricultural activities, social and economic services and job opportunities. Without reliable access to markets and productive

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1 Lebo J., Schelling D., Design and Appraisal of Rural Transport Infrastructure - Ensuring Basic Access for Rural Communities, World Bank Technical Paper No. 496, 2001.

resources, economic development stagnates, and poverty reduction cannot be sustained. Improvements of the intra- and near- village path and track network, and the provision of all-season basic motorized access — if affordable and appropriate — are therefore essential conditions for rural development. There is clear evidence that poverty is more pervasive in areas with no or unreliable (motorized) access as compared to more accessible areas.

For example, in Nepal, where the percentage of people below the poverty line is as high as 42 percent, in un-connected areas 70 percent of people are living below the poverty line.

In Bhutan, the enrollment of girls in primary schools is three times as high in connected villages compared to unconnected ones.

In Andhra Pradesh, India, the female literacy rate is 60 percent higher in villages with all-season road access compared to those with unreliable access. Plenty of further evidence of the socio-economic impact of rural roads exists.

Worldwide experience from past rural development programs and policies suggests that improving the poverty impact of RTI interventions requires attention to three guiding principles:

- An emphasis on reliable, cost-effective access to as many of the rural population as possible, rather than high access standards for a few;
- Cost-effective and innovative techniques such as spot improvement, labor-based approaches, and low-cost structures. Particularly, labor-based approaches are well suited for the implementation of RTI interventions. By transferring financial resources and skills to the local level, labor-based strategies can have a substantial poverty-reducing impact. They also have the potential to improve the gender distribution of income, providing employment opportunities for women where wage employment is scarce;
- A decentralized and participatory approach with strong local government and community involvement in decision making on local transport investment and maintenance.

## 4. THE SEMINAR

The Rural Road Seminar was convened to enable recent developments and important issues in the sector to be presented and discussed with regional stakeholders. It was also an opportunity to identify research needs in the sector and, through working group sessions, to prioritise these needs for development into research proposals.

### 4.1 Seminar Aims

The principal aim of the GMSARN Seminar has been the identification of **three** priority topics relating to rural roads where there are important sector needs, but where significant gaps in knowledge or experience exist. After the seminar these priority topics will be elaborated into detailed research proposals.

The Seminar aims were achieved through presentations, discussion and work group debates on a short list of topics identified by the participants.

## 4.2 Presentations

The following presentations were made as knowledge exchange prior to working group work:

**Opening of Seminar** - H.E. Ly Thuch, Minister of the Ministry of Rural Development

**Welcoming Remarks of the GMSARN** - Prof. Worsak Kanok-Nukulchai

**Welcoming Remarks of the ILO** - David Salter, International Labour Organisation, The Upstream Project

**Rural Transport Infrastructure in Cambodia: Current Situation and Challenges** - H.E. Ngy Chanphal Under Secretary of State, MRD

**Integrated Rural Accessibility Planning** - Mr. Doekle Wielinga, Sub-project Manager, ILO

**Rural Roads Surfacing Investigations and Economic Aspects of Rural Roads** - Robert Petts, Principal, Intech Associates

**Utilization of Local Resources** - Samer Fayadh, Programme Coordinator, ILO Upstream Project

**Hydrological Assessment of Rural Road Design** - Mr. Sok Saing Im, MRC

**Flood Estimation Under Limited Data for Design of Rural Roads** - Fergus Gleeson, M.Eng. Student, and ILO Intern, & Prof. Tawachai Tingsanchali, AIT

**Reuse of used rubber tyres to improve the quality of asphaltic pavement** - Prof. Worsak Kanok-Nukulchai, AIT

**Otta Seal** - Harald H Julsrud Norwegian Department of Transport

**SADC Guideline for low-volume sealed roads** - Tony Greening, TRL

**International Focus Group** - Colin Gourley, TRL

**Animal Towed Compaction Equipment for Community Based Unpaved Rural Roads Construction** - Mustafa Azam, Civil Engineer, ILO

### **Opening Statement**

*H.E. Ly Thuch*

In his opening statement, H.E. Ly Thuch, highlighted many important issues of concern to the MRD and it became apparent during the proceedings of the conference that these concerns are shared by many within the sector, nationally and internationally. The challenge of protecting initial investments through sustainable and appropriate maintenance schemes and the difficulties of establishing such schemes was highlighted in H.E.'s statement to the participants. H.E. continued with comments on current donor trends and lack of funding for maintenance of rural road networks. The compliance of alternative surface options with current availability of funds and donor trends, in that initial investment will be funded while maintenance is seen as the duty of the MRD, was highlighted. H.E. proposed that a higher initial investment, which would reduce the maintenance burden, could be a wiser choice in view of the current funding situation.

***Rural Transport Infrastructure in Cambodia: Current Situation and Challenges***

*H.E. Ngy Chanphal*

The first presentation imparted a broad overview of the current situation, development of the sector to the current stage and future requirements within the sector. H.E. Ngy Chanphal described the development from an emergency response to the requirements for basic access to the current policy of poverty alleviation. The link between employment generation, rural infrastructure and poverty alleviation was emphasised. A description of how technology choice and use of local materials through the labour based appropriate technology (LBAT) approach demonstrated the MRD's implementation of poverty alleviation policy. The importance of technology choice in construction and maintenance of rural infrastructure has an important effect in terms of instigating a sense of ownership amongst the communities that the infrastructure serves.

Further pro-poor steps taken by the MRD were also described such as division of responsibility between the MRD and the Ministry of Public Works and Transport (MPWT) through a memorandum of understanding, establishment of a rural roads policy through a participatory process, establishment of the Rural Roads Department (RRD) of the MRD and use of the Integrated Rural Accessibility Planning (IRAP) tool. The importance of the planning process and the IRAP planning tool in prioritising access routes and level of access required was reiterated throughout the presentation. The MRD has adopted IRAP as its planning tool for its Provincial Departments for Rural Development (PDRD) for the planning of Rural Transport Infrastructure (RTI). H.E. then continued with a brief description of maintenance requirements of RTI in Cambodia and demonstrated that though the funds required for maintenance of rural roads is considerably less than for national and provincial roads, these funds are, and are likely to be, scarce. In closing H.E. Ngy Chanphal posed a number of questions to the participants in relation the standard of rural roads currently being constructed, the surfacing materials being used, rehabilitation of roads and source of funds for maintenance.

H.E. then concluded his presentation by highlighting future policy needs. These included a need for identification of appropriate technologies, development of awareness, knowledge and capacity to use these new technologies, along with standards and specifications for their use.

***Integrated Rural accessibility Planning***

*Doekle Wielinga*

This presentation began by defining the various types of road under MPWT responsibility and those, which the MRD is responsible for. Some statistics related to length of maintainable road within Cambodia were then presented. Following this the IRAP planning tool was described, as well as the rationale for its use.

The products of the planning process, for which the IRAP tool is used, are an assets inventory, manual and digital maps and district accessibility profiles. These all contribute to the district accessibility action plan. The IRAP tool may be used to identify the location and value of resources such as improved wells, firewood, schools, health centres, markets, transport infrastructure and quarries. Thus the unit replacement value and average annual maintenance value may be calculated. A Transport Infrastructure Inventory may be compiled through commune meetings, global positioning system (GPS) verification, modification of maps and classification of roads. The accessibility of the villages may then be determined. Access to safe drinking water, schools, health care, markets and transport infrastructure may all be quantified and mapped. Following this, the use of IRAP in improving accessibility was presented. By analysing the accessibility of an area, areas may be prioritised. Following this investment may be identified and prioritised in relation to the

accessibility analysis.

A number of prioritisation criteria, currently being used in the application of IRAP in Cambodia

was then presented. An accessibility score of 1 to 4 is given, 1 being above average accessibility and 4 being the poorest accessibility. A 2.5km “catchment area” around all roads in maintainable condition is used for the analysis. The next prioritisation criteria is the route taken by the villagers to reach the nearest all weather road. The fourth criterion involves comparing sectors in order to determine which should be prioritised. This all forms part of an investment planning process in which roads are compared on importance, number of villages and people that will benefit. Thus roads may be selected with a view to prioritising investment.

### ***Rural Road Surfacing Investigations***

*Robert Petts*

This presentation questioned the wisdom of choosing lowest initial cost surfacing while assuming maintenance will be funded and organised, in light of whole life cost comparisons and lack of maintenance arrangements. A number of questions were posed to the participants in relation to responsibility for maintenance, availability of funds for maintenance, existence of a credible maintenance organisation and representation of the key stakeholders. A World Bank publication related to maintenance problems was quoted in order to demonstrate the difficulty in setting up a satisfactory basic maintenance system. Following this the importance of comparison of whole life cost when choosing one surface option over another was clearly demonstrated using the example of gravel surfacing which proved to be the more expensive option in terms of whole life cost for long haulage distances but much less costly for short haulage distances. The distribution of project funds for various surfacing options was then presented in which gravel by heavy equipment demonstrated clear disadvantages over other options. The presentation proceeded by proposing guidelines for choosing the “right” surface. In closing, the participants were reminded that gravel/laterite is a finite natural resource and as such should be used with care rather than indiscriminately.

The presentation also presented the surfacing option studies currently being undertaken through DFID funding. Firstly the factors leading to a need for alternative surfacing were presented. Appropriate and inappropriate use of gravel was then demonstrated and the parameters, which affect gravels appropriateness as a surfacing material, were given. Following this the disadvantages of gravel surfacing were described in detail. The need for adequate maintenance of gravel roads was reiterated. Once the problems associated with use of gravel surfacing had been clearly highlighted, alternative surface options were discussed. A brief description of these followed, clearly outlining the advantages and disadvantages of each surface option. Revelations from investigations of the Rural Road Sector in many countries were then shared with the participants. These included; a need for improvement in construction and maintenance standards, guidelines and specifications, limited surface options, “loose” gravel specifications, insufficient quality control, constrained maintenance resources, ineffective maintenance systems and poverty reduction potential not being realised. A brief description of the policy needs relating to rural road surfacing options followed. In closing, the issues which rural road surfacing choice should take account of, were presented and these may act as guidelines when choosing the most appropriate surface option for a specific rural road.

### ***Utilisation of Local Resources***

*Samer Fayadh*

In this presentation, maximising the use of local resources including materials, skilled and unskilled labour was demonstrated. The design requirement of an all-weather road, maximum use of local resources, labour based construction methods, a long life span and simple maintenance methods can be met through maximising the use of local resources.

These include; local material, labour, finances, contractors. The presentation also highlighted the advantages for the use of each of the resources mentioned above and the reasons behind the resistance for this utilisation.

### ***Flood Estimation Under Limited Data for Design of Rural Roads***

*Fergus Gleeson, Prof. Tawachai Tingsanchali, AIT*

An extreme lack of precipitation and runoff data in Cambodia has resulted in great difficulty in designing cross drainage structures for a definable statistical storm occurrence. The countries turbulent history, which has resulted in this lack of historic data, has also resulted in difficulties in gathering field data required due to the dangers of unexploded ordnance. These difficulties are further compounded by a human resources deficiency and combined these factors render many more common methods of hydrologic analysis inapplicable. The limited data available at present is of use to the generalised tropical flood model. This method of hydrologic analysis was investigated using data from the border region of Thailand and Cambodia and found to give good estimates of discharge. Furthermore comparison of rainfall data for the extreme floods of the year 2000 in Cambodia, with the data from the closest rainfall station on the Thai border have revealed the year 2000 flood levels to approximate closely to a 1 in 20 year statistical occurrence. Use of this data and the generalised tropical flood model method results in more trustworthy estimates of discharge for the safe and economical design of cross drainage structures for rural roads than was previously possible. Further work in identifying data resources and dissemination of the method through appropriate channels is recommended.

### ***Otta Seal***

*Harald Julstrud*

This presentation highlighted experiences in other countries regarding the use of alternative bitumen seal, Otta Seal, in roads construction. The use of this type of seal has been successfully introduced in a number of developing countries. The Otta Seal can be used where high grade aggregates are expensive due to scarcity or long haul distances.

### ***SADC Guideline for low-volume sealed roads***

*Tony Greening, TRL*

The presentation introduced the work done in the SADC region to produce guidelines for low volume sealed roads. The work was done to reduce the life-time costs of unpaved rural roads by promoting appropriate engineering standards, planning tools and work procedures for road construction and maintenance. The guidelines aim to promote sustainable livelihoods and contribute to the economic development of rural populations through the provision of improved road access.

### ***International Focus Group***

*Colin Gourley, TRL*

The presentation introduced a newly formed international group that is looking at the improvement of knowledge exchange and support for the rural roads sector. TRL, INTECH and ILO are currently carrying out a number of research projects for the UK Department for International Development (DFID) on low volume sealed and unsealed roads. As part of these projects, an International Focus Group (IFG) has been established. The main function of this IFG is to thoroughly examine technical, economic and social issues arising from and related to the projects. It also provides a focus to improve opportunities for dissemination of project results.

### ***Use of Animal Power for Rural Roads Construction and Maintenance***

*Mustafa Azam*

This presentation highlighted experiences in other countries regarding the use of animals for rural roads construction and maintenance. The use of animal power was successfully

introduced for compaction equipment. This will minimise the cost of the equipment needed for both rehabilitation and maintenance of low level roads. The presentation mentioned that these types of interventions can be applied for community based road-works, where the use of machines can be difficult due to available skills, maintenance requirements and costs.

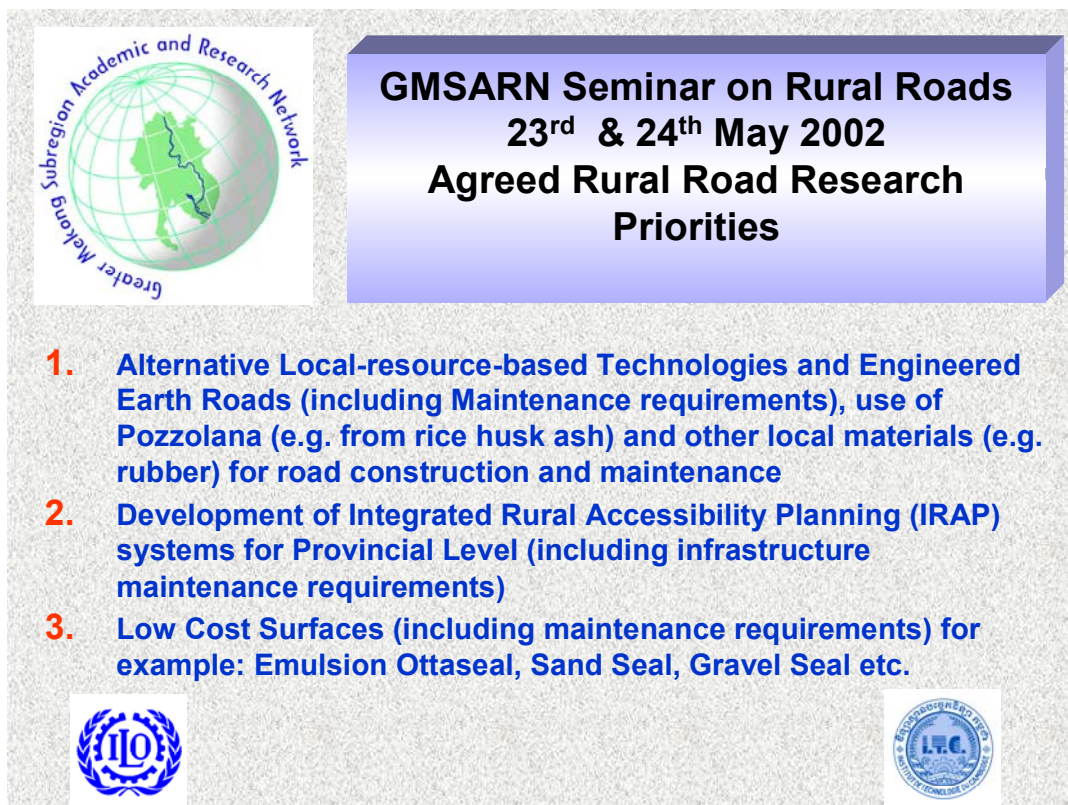
## 5. SEMINAR OUTPUTS

After the presentations and discussion arising from them, the seminar participants were organised into working groups to formulate recommendations on future research priorities in the Rural Road Sector for the GMSARN. The working groups made their presentations and these were prioritised in the full seminar forum.

The principal output of the GMSARN seminar has been the identification of three priority topics relating to rural roads where there are important sector needs, but where significant gaps in knowledge or experience exist. After the seminar these priority topics will be elaborated into detailed research proposals.

The workgroup recommendations are contained in Annex C.

### 5.1 Seminar Agreed GMSARN Rural Road Research Priorities



The image is a presentation slide with a light blue background. At the top left is the logo for the Greater Mekong Subregion Academic and Research Network, featuring a globe with a green map of the region. To the right of the logo is a blue 3D-style box containing the title: "GMSARN Seminar on Rural Roads 23rd & 24th May 2002 Agreed Rural Road Research Priorities". Below the title is a numbered list of three research priorities. At the bottom left is the ILO logo, and at the bottom right is the ITC logo.

**GMSARN Seminar on Rural Roads  
23<sup>rd</sup> & 24<sup>th</sup> May 2002  
Agreed Rural Road Research  
Priorities**

- 1. Alternative Local-resource-based Technologies and Engineered Earth Roads (including Maintenance requirements), use of Pozzolana (e.g. from rice husk ash) and other local materials (e.g. rubber) for road construction and maintenance**
- 2. Development of Integrated Rural Accessibility Planning (IRAP) systems for Provincial Level (including infrastructure maintenance requirements)**
- 3. Low Cost Surfaces (including maintenance requirements) for example: Emulsion Ottaseal, Sand Seal, Gravel Seal etc.**

### 5.2 Related Initiatives

The GMSARN Rural Roads Seminar was a follow up and was complementary to two other

notable events held in Cambodia with the facilitation of the ILO Upstream Project, Ministry Of Public Works & Transport and Ministry of Rural Development, Cambodia.

These events were:-

#### **PIARC INTERNATIONAL SEMINAR ON RURAL TRANSPORT**

This event was held in Siem Reap, Cambodia, 14, 15 & 16 May 2002.  
Details of this event will be made available through the PIARC website:-

[www.piarc.org](http://www.piarc.org)

#### **INTERNATIONAL FOCUS GROUP for Rural Transport Research**

This event was held in Siem Reap, Cambodia, 20, 21 & 22 May 2002.

Details of this event will be made available through the TRL website:-

[www.transport-links.org](http://www.transport-links.org)

and

[www.ifgworld.org](http://www.ifgworld.org)

**Annex A: List of Participants****THAILAND**

- 1 Dr. Watcharin GASALUK (KKU)
- 2 Dr. Pongrid KLUNGBOOKRONG (KKU)
- 3 Dr. Manit SUJUMNONG (KKU)
- 4 Dr. Tawatchai Tingsanchali (AIT)

**VIETNAM**

- 5 Mr. Eng Bach THE DUNG (RT2 WSPI )

**CAMBODIA****Department of Water Supply**

- 6 Mrs NEO Sokha
- 7 Mr. LAY Sitha
- 8 Mr. SAM Bonal
- 9 Mr. SOK Chhun Hok
- 10 Mr. SOK Kunthea

**Department of Commune Development**

- 11 Mr. CHAN Soha
- 12 Mr. CHIN Sosamphoas
- 13 Mr. HING Samnith
- 14 Mr. KOY Trong
- 15 Mr. SOEUNG Nim
- 16 Mr. SOM Van
- 17 Mr. UM Sambath

**Department of Rural Roads**

- 18 Mr. CHHUR leang Srun
- 19 Mr. NUON Sokha
- 20 Mr. TUN Chandara
- 21 Mr. UK Piseth

**Department of Planning**

- 22 Mr. CHEY Chanthân
- 23 Mr. EK Sidên

**Department of Rural Economy**

- 24 Mr. CHAN Sokha
- 25 Mr. LOCH Reamdeth

**Ministry of Public Works & Transport**

- 26 Mrs CHEA soveasna
- 27 Mr. CHEV Sokhéng
- 28 Mr. EM Ponnara
- 29 Mr KANG Phirith
- 30 Mr. KIM Phun
- 31 Mrs NHEM Lieng
- 32 Mr. NGET Ratha
- 33 Mr. PRACK Chantha
- 34 Mr. ROS Sréng
- 35 Mr. SAM Sothea
- 36 Mr. VONG Dareth

**Department of Roads MPWT**

- 37 Mr. BILAN Vila
- 38 Mr. NEY Sokna
- 39 Mr. NOP Keylarith

40 Mr. SUN Chan

**Institut de Technologie du Cambodge (ITC)**

- 41 Mr. CHREA Rada (GCI)
- 42 Mr. HAN Virak (GCI)
- 43 Mr. VONG Séng (GCI)
- 44 Mr. CHEA Sokhom (GRU)
- 45 Mrs CHEVREL Agnès (GRU)
- 46 Mr, LIM Sok Tay (GRU)
- 47 Mr, PEN Khémora (GRU)
- 48 Mr. SOK Khom )GRU)
- 49 Mr BOREI Wongsaniith I4 GCI
- 50 Mr. CHEA Sam Ath
- 51 Mr. HAY Rainsey
- 52 Mr. LIM Sok Kheang
- 53 Mr. LIM Sovan Vichet
- 54 Mr. LONG Veasna
- 55 Mr. LY Soeu
- 56 Mr. NGIM Olika
- 57 Mr. SENG Sakborin
- 58 Mr. PHANTHOUVONG Séng Athit
- 59 Mr. TEP Visal
- 60 Mr. YOEUEN Kunthearak
- 61 Mr . CHAY Lo I4 GRU
- 62 Mr. HENG Bolina
- 63 Mr. HORNG Vuthy
- 64 Mr. SEM Samnang
- 65 Mr. SOY Ty
- 66 Mr. THONG Va
- 67 Mr. THORNG Ratharith
- 68 Mr. VAMOEURN Nimol
- 69 Mr. YOU Try
- 70 Mr CHHIV Vanna I5 GCI
- 71 Mr. HENG Méng Ho
- 72 Mr. HENG Sok Bil
- 73 Mr. HENGSAI Piseth
- 74 Mr. INTHAVONG Vanthong
- 75 Mr. KOV Monyrath
- 76 Mr. KOV Phyrum
- 77 Mr. SAING Po Héng
- 78 Mr. SANN Ratha
- 79 Mr. SIHANOUVONG Anousack
- 80 Mr. TAN Thira
- 81 Mr HENG Lim I5 GRU
- 82 Mr. HOUR Kim Theang
- 83 Mr. KEO Rachana
- 84 Mr. LORN Maky Lyn
- 85 Mr. LY Sarann
- 86 Mr. PONG Veasna
- 87 Mr. TAING Yoeun

**Annex B: List of Presenters**

1. H.E. Mr LY THUCH, Minister MRD
2. H.E. Mr POK Than
3. Mr. Mr NGY Chan Phal, MRD
4. Mr. SOK Saing Im
5. Mr SRANG Kiet
6. Mr. Doekle WIELINGA, ILO
7. Mr. Robert PETTS, Intech Associates
8. Dr. Colin GOURLEY, TRL
9. Prof Tawatchai TINGSANCHALI
10. Mr. Fergus GLEESON, ILO
11. Mr. Samer AL-FAYADH, ILO
12. Mr. Harald JULSRUD, Norwegian Road Administration
13. Prof. Worsak KANOK NUKULCHAI
14. Prof. D.T. BERGADO
15. Prof. S. YOUWAI
16. Mr. Mustafa I-AZAM
17. Mr. Tony GREENING, TRL
19. Mr. Pichai NIMITYONGSKUL, AIT

## Annex C: Workgroups Discussion Presentations

### GROUP I

**TITLE** : Appropriate Soil Stabilization Methods for Rural Roads Construction and Maintenance:-

- Pozzolana
- Rice Husk Ash.
- Rubber
- Lime
- Cement
- Short list to be produced after initial feasibility study.

### **OBJECTIVE**

- 1 - Improve physical properties through use of local materials for the construction and maintenance of rural roads.
- 2 - Cost reduction
- 3 - Produce Mix designs
- 4 - Produce Practical Guidelines.

### **POSSIBLE SOURCE OF FUNDS**

- ADB
- Bilateral Country donors (SIDA, DFID etc...)

### **DETAILED PROPOSAL**

ITC, KKU, AIT  
 Draft to be considered by MRD for transmission.  
 Draft to be distributed to ITC and AIT  
 Meeting required to develop proposals further

### **PROJECT OUTPUT :**

- 1 - Cost-effective, environmentally-friendly soil stabilization methods
- 2 - Practical mix designs
- 3 - Construction and Maintenance guidelines
- 4 - Quality control measures.

### **COORDNATOR**

ITC, KKU, AIT, MRD, ILO/ PROJECT.

### GROUP II

**TITLE** : Development of IRAP at Provincial level.

### **OBJECTIVE :**

- 1 - For rural development
- 2 - Determination the needs of rural communities
- 3 - Amelioration the capacity service in rural area

### **PROJECT OUTPUT**

- Planning for basic development
- Principal planning (market, health, school, drinking water, transport needs)

### **COORDINATOR**

MRD, local community/NGO, ILO

**POSSIBLE SOURCE OF FUNDS :**

ADB, WB, Government.

**Who will develop detailed proposal ?:**

MRD, Ministry of Public Works & Transport, ILO

**GROUP III**

**TITLE:** Low cost surfaces, for example : Emulsion Otta seal, Sand Seal, Gravel Seal etc ...

**Objective/ what Project for ?**

- For surface road pavement in the rural areas. Sustainable all-weather access particularly for poor communities
- Low initial cost
- Low maintenance cost
- Safe technology

**Coordinator / Institute / Person**

ITC (Civil and Rural Engineering Department) in coordination with MPWT and MRD.

**Possible source of Funds**

- Government
- Donors (ADB, WB, etc...)

**Who will develop detailed proposal**

ILO + ITC in association with MPWT and MRD