



INDIAN ROADS CONGRESS  
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## ***Rural Road Surfacing Research for Sustainable Access and Poverty Reduction in South East Asia***

by

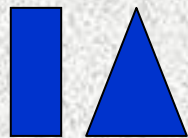
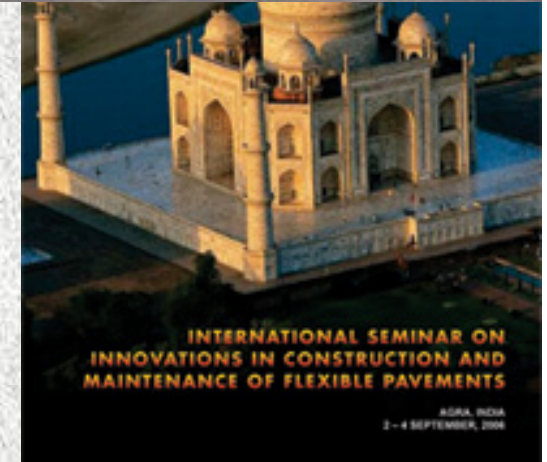
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*Based on a regional research  
programme funded principally by  
DFID*

*September 2006*



# The Message

- ❑ There is an ‘unhealthy’ and unsustainable reliance on gravel roads to solve the access problems of poor rural communities. Proper Maintenance is rarely achieved.
- ❑ A new approach is required, using a ‘menu’ of more durable, low cost, low maintenance, local-resource-based surfaces, and even engineered natural surfaces. Using gravel only where appropriate.
- ❑ These techniques are ideal for use by SMEs.

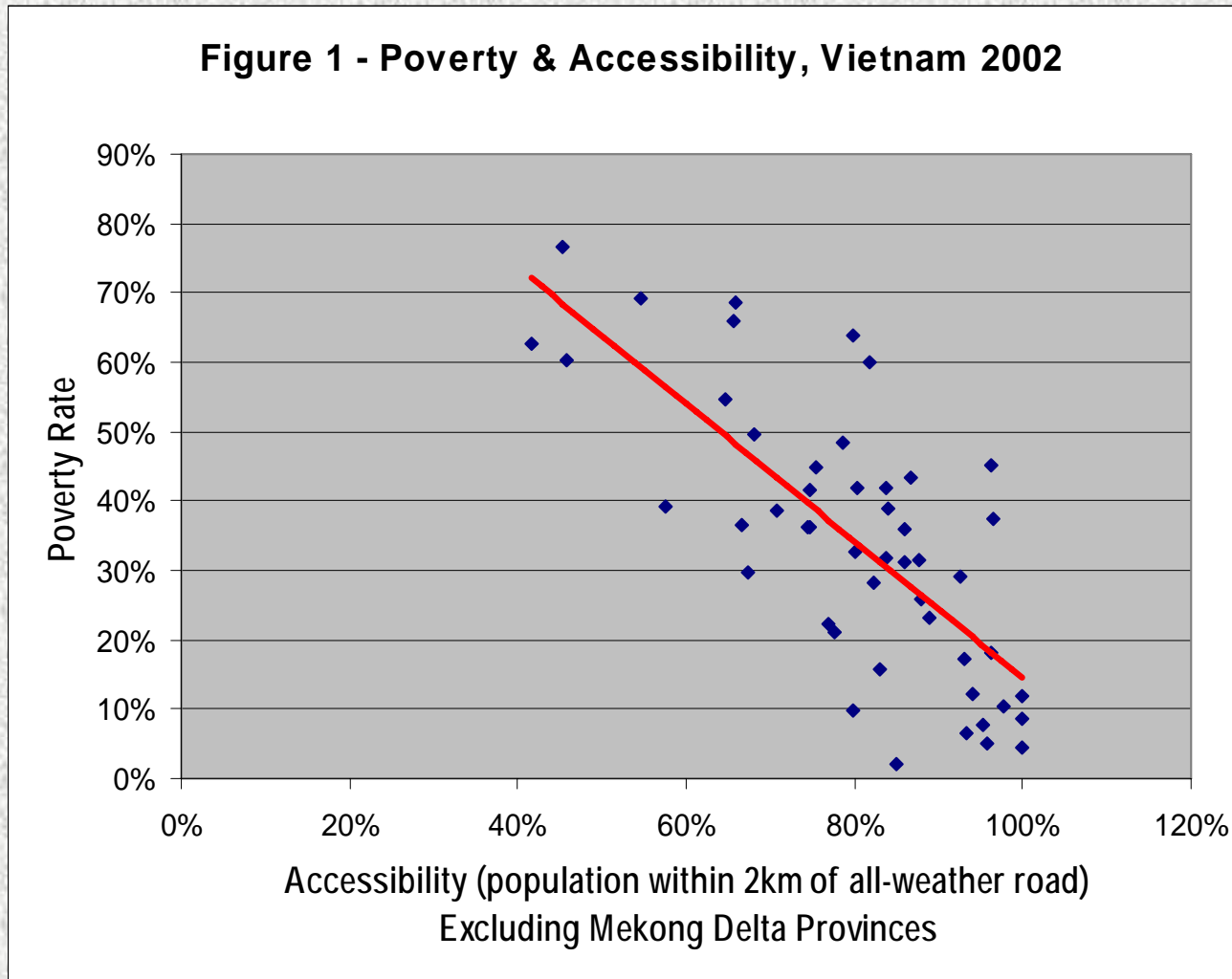


# Presentation Contents

- ❑ **Poverty is linked to Poor Road Access**
- ❑ **The Limitations of traditional 'Gravel' use**
- ❑ **Alternative Surface Options → Low Maintenance**
- ❑ **Suitability for Small & Medium Enterprises**



# Poverty is linked to Poor Access



# Poverty is linked to Poor Access



Rural Economic and Social development needs commercial, educational, health and infrastructure initiatives that rely on **GOOD PERMANENT ACCESS**.

Unfortunately, Poor Access for millions in rural communities limits the effectiveness of these initiatives, because of:

- ❑ unreliable travel or impassability, especially in the rains,
- ❑ high unit transport costs for goods, services & people.

***Investment is discouraged by poor access.***

## Traditionally Gravel is used for rural access roads

They are low (initial) cost and relatively easy to construct.

However, they are expensive to maintain (In Cambodia, typically **US\$1,600/km/year**)

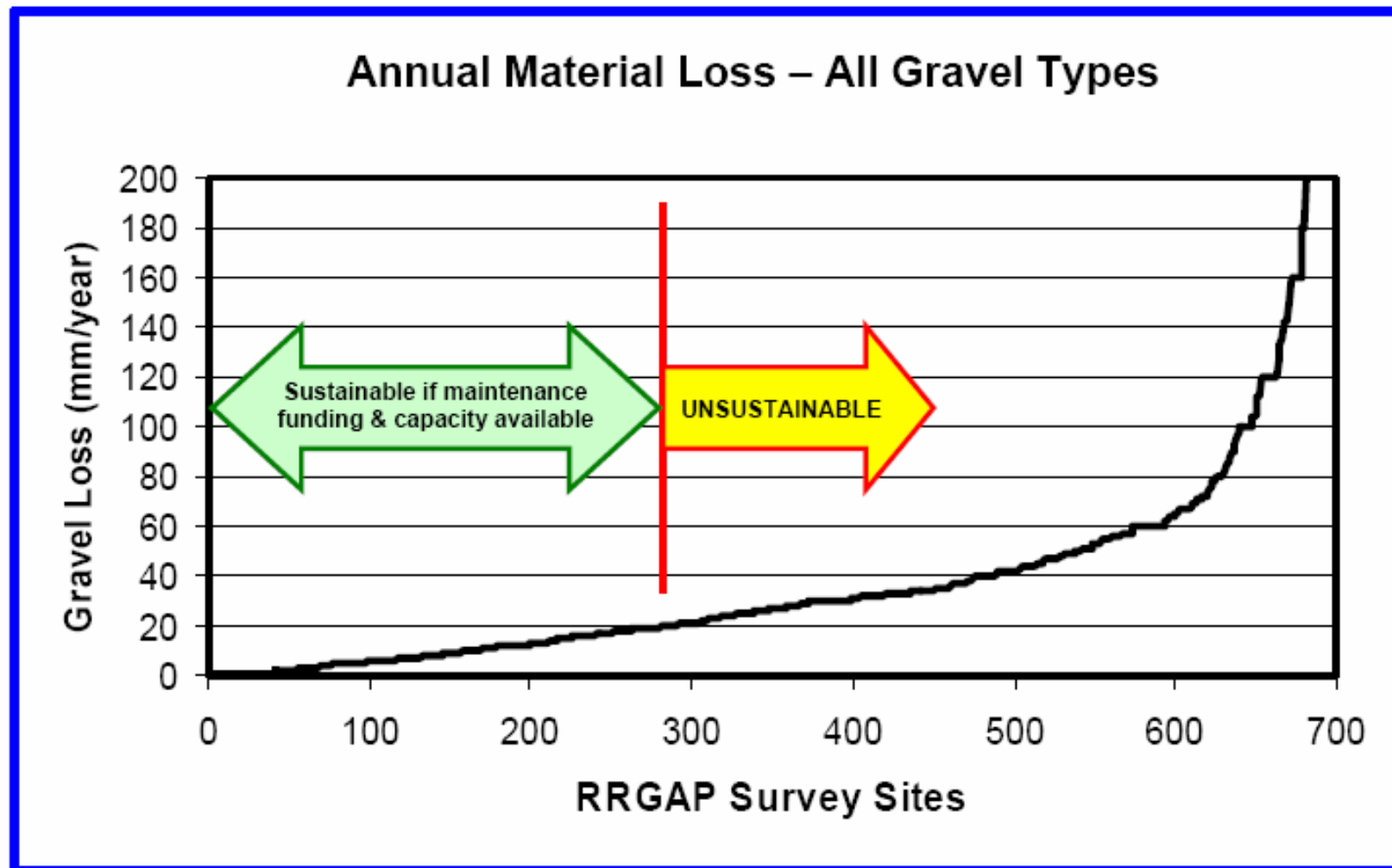
A Km of gravel road typically loses more than **70 cubic metres** of material **EACH YEAR** in South East Asia.

A range of constraints means that **maintenance is rarely carried out**, leading to impassability, or the need to repeatedly reconstruct.

.....**SENSIBLE?**



# RRGAP – Survey Gravel Loss on 700 Sites



Vietnam Rural Road Gravel Assessment Programme (RRGAP) 2004 – ANNUAL RATE OF GRAVEL LOSS FROM ALL SITES

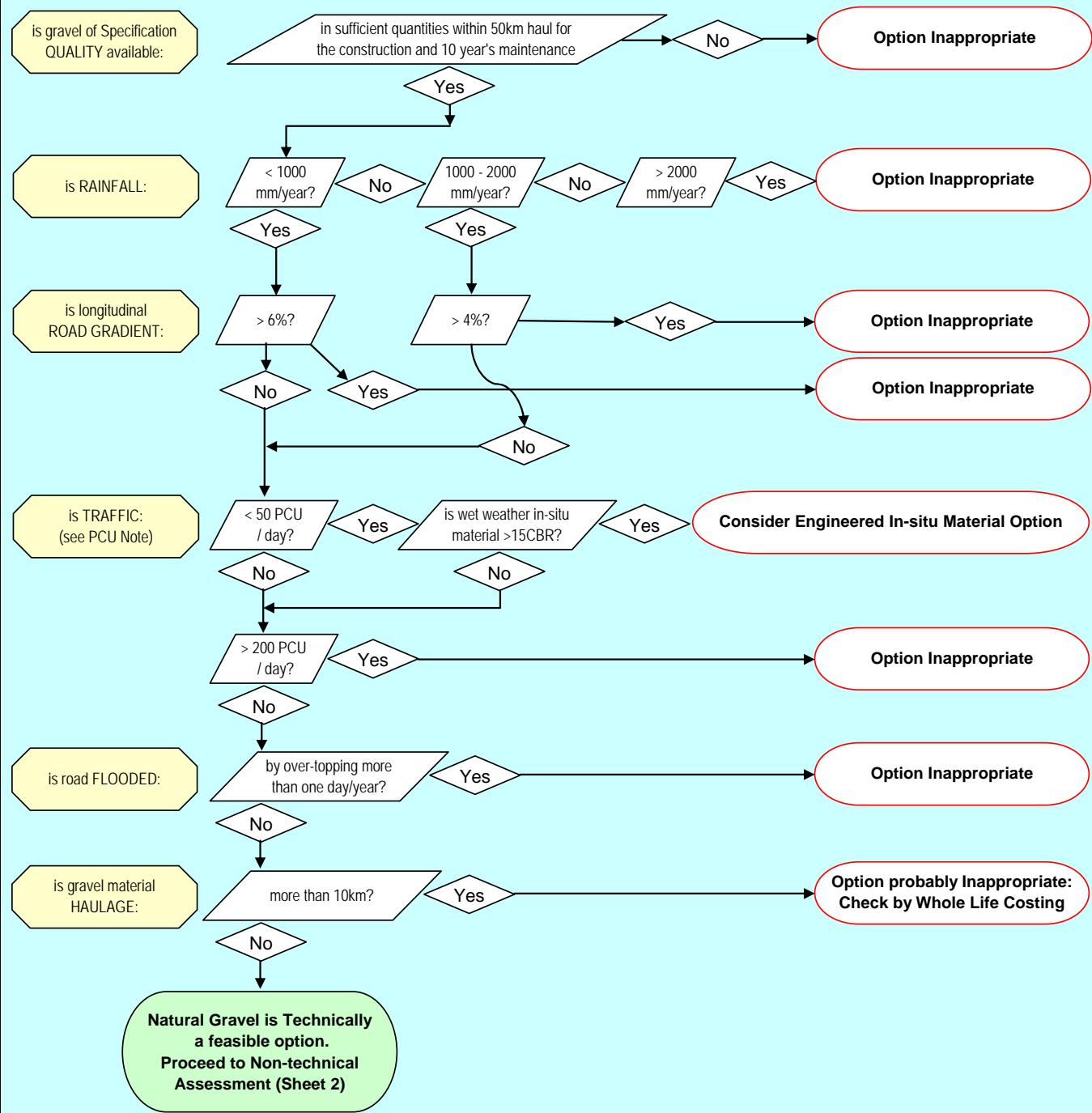


Recent Intech-TRL research suggests that **Gravel may NOT be appropriate, if any of these conditions apply-**

- ❑ **Gravel quality is poor** (*Majority surveyed outside recognised specs*)
- ❑ **Compaction & thickness cannot be assured**
- ❑ **Drainage is not provided** (*>50% camber & drainage defective*)
- ❑ **Haul distances are long** (*suggest WLC for >10km*)
- ❑ **Rainfall is very high** (*>2m*), or **dry season dust problems**
- ❑ **Traffic levels are high**
- ❑ **Longitudinal Gradients** (*> 4% if rainfall >1,000mm/year*)
- ❑ **Adequate maintenance cannot be provided** (*75% not*)
- ❑ **Sub-grade is weak or soaked** (flood risk), or
- ❑ **Gravel deposits are limited/environmentally sensitive**

# MoT Vietnam proposed new Gravel use guidelines

ENGINEERING ASSESSMENT



# There are many PROVEN Alternative Surface Options using:

- Stone
- Bitumen
- Concrete
- Brick



**They can have better Whole Life Cost and Local Resource Use attributes, & LESS MAINTENANCE.**

# MENU of Proven Rural Road Surface Options:

Number	Type of Surface/Roadbase/Subbase	Cambodia Phase 1	Cambodia Phase 2	Vietnam RRST 1	Vietnam RRST 2	Laos SEACAP 17
1	Engineered Natural Surface		◆			◆
2	Soil Stabilisation-Lime		◆	◆	◆	
	Soil Stabilisation-Cement			◆	◆	
	Soil Stabilisation-Emulsion			◆		
3	Natural Gravel / Laterite	◆	◆	◆	◆	◆
4	Water Bound Macadam			◆	◆	
5	Dry Bound Macadam			◆	◆	
6	Crushed Stone Macadam	◆	◆	◆	◆	
7	Hand Packed Stone	◆	◆			◆
8	Telford Paving					
9	Cobble Stones				◆	
10	Stone Setts or Pavé					
11	Dressed Stone	◆		◆		
12	Mortared Stone					◆
13	Stone Chippings		◆			
14	Slurry Bound Macadam					
15	Bitumen Emulsion Sand Seal	◆		◆	◆	◆
16	Bitumen Emulsion Chip Seal	◆	◆	◆	◆	◆
	Bitumen Multi-Chip Seal				◆	
17	Slurry Seal					
18	Ottaseal					◆
19	Penetration Macadam (Bitumen)			◆	◆	
20	Pre-Mix Macadam (Bitumen)					
21	Burnt Clay Brick			◆	◆	
22	Concrete Brick			◆	◆	◆
23	Un-reinforced Concrete		◆		◆	
24	Steel Reinforced Concrete		◆	◆	◆	
25	Bamboo Reinforced Concrete	◆		◆	◆	◆
26	Geo-cell Paving					◆
27	Natural Sand subbase			◆		
28	Quarry-Run Gravel subbase				◆	

*Guidelines  
being  
prepared*

Cambodia Phase 2 = SEACAP 19 & NRDP (proposed)  
RRST-2 = Proposed

## Some options of particular interest:

**Bamboo  
Reinforced  
Concrete**



**Cobble Stone  
Paving**



**Clay bricks burnt  
with Rice Husk**



## The Use of Earth

**Engineered Natural Surfaces (i.e. with maintained camber and drainage) have enormous potential for providing low cost basic access to many poor communities**

**However, we need to develop guidelines on suitable conditions for engineered earth roads based on:-**

- **Soil type & strength**
- **Crossfall & drainage arrangements**
- **Rainfall characteristics**
- **Traffic (volumes and type)**
- **Maintenance arrangements**



## Low Cost Surfacing - Suitability for SMEs

- ❑ **Possibility to be based in the rural areas with low mobilization costs,**
- ❑ **Low capital and set-up requirements,**
- ❑ **Inter-sector flexibility; possibility to provide services to a range of sectors and clients,**
- ❑ **Good market entry point for small entrepreneurs,**
- ❑ **Possibility to use affordable simple equipment, either owned or hired,**
- ❑ **Possibility to use local labour skills such as carpentry and masonry,**

## Suitability for SMEs (continued)

- ❑ **Less pressures for corrupt practices, as they are part of the local community,**
- ❑ **Less opportunities for HIV-Aids infections due to less imported labour into the community,**
- ❑ **More of the costs recycled into the local community in employment of local labour, local tools production, local transport, local materials and profits,**
- ❑ **Construction skills developed in the local community which can be utilized for maintenance and other activities,**
- ❑ **Low overhead costs.**

## **Constraints/Challenges that need to be tackled**

- ❑ **Inadequate Government policy framework to support the SME sector for rural roads,**
- ❑ **Insufficient public awareness of the potential benefits of SME rural roadworks implementation,**
- ❑ **Lack of appropriate contract documentation, pre-qualification & bidding procedures, standards and specifications, financial and performance audit, dispute resolution for small scale works,**
- ❑ **Contract pre-qualification too demanding, for example 3 years experience of similar work,**
- ❑ **Contracting procedures and requirements usually (unnecessarily) demand heavy equipment holdings,**
- ❑ **Lack of access to capital or credit for equipment purchase or cashflow,**

## Constraints/Challenges that need to be tackled

- ❑ Lack of opportunities to hire equipment,
- ❑ Poor contractors' capacity in costing and planning works,
- ❑ Inadequate access to low cost training and guidelines on small scale roadworks,
- ❑ Contract technical solutions are usually restricted to gravel and macadam surfaces,
- ❑ Lack of sustainable local funding for small rural road works contracts and maintenance,
- ❑ Lack of market and sustainable workload for SMEs,
- ❑ Lack of representation of SMEs (e.g. association),
- ❑ Poor transparency in award and payment for work,
- ❑ Late and/or non-transparent payments for locally funded work.

# Conclusions

## The Good News - Successes:

- ❑ Guidelines on use of Gravel now available
- ❑ 25 proven alternatives to gravel identified, many with better maintenance & WLC attributes, suitable for SMEs
- ❑ Guidelines on use of alternative surfaces for Rural Roads will be available later this year

## The Challenges:

- ❑ Dissemination of the surfacing knowledge
- ❑ Demonstrating & Mainstreaming the knowledge in road authorities, academic and training programmes
- ❑ Creating an “enabling environment” for SMEs to implement appropriate surfacing options

# Further details:-

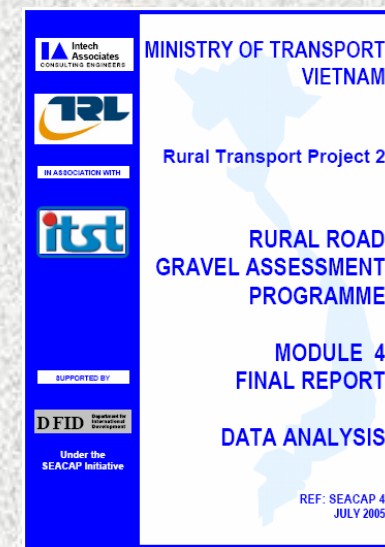
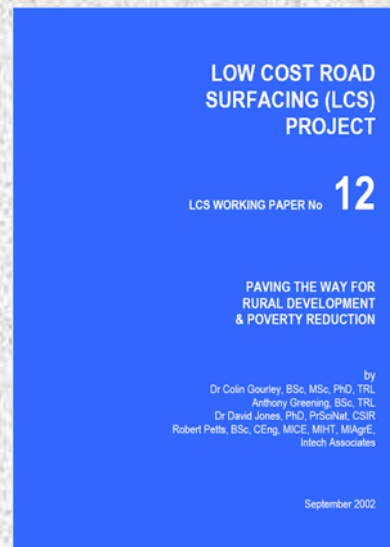
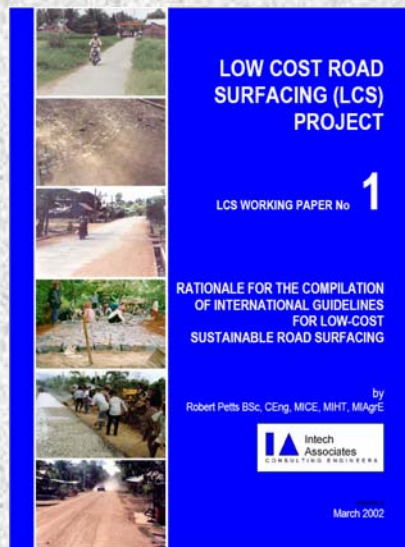
Full details of the research findings, documentation and guidelines for downloading are being made available on the following websites:-

[www.cnctp.info](http://www.cnctp.info)

[www.mt.gov.vn/ruraltransport/rrsr](http://www.mt.gov.vn/ruraltransport/rrsr)

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

E-Mail:- [rob@intech-consult.demon.co.uk](mailto:rob@intech-consult.demon.co.uk)



Thank you  
Robert Petts

