

# Engineering Module 6

## Environmentally Optimised Design



*DF 55: Dissemination of LVRR Knowledge and Experience*

## Summary

Environmentally Optimised Design (EOD) is the over-arching framework for the application of appropriate LVRR designs. It covers a spectrum of solutions for improving or creating low volume rural access – from dealing with individual critical areas on a road link (Spot Improvements) to providing a total whole rural link rehabilitation (Whole Length Improvement). This module is a combination of a presentation of the principles for EOD and a field exercise that allows these principles to be clearly demonstrated in a hands-on field exercise .

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## Points to Think About

How can we use EOD ?

What is the difference between Spot Improvement and maintenance?

What are the practical advantages of EOD?



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## EM6.1 Description of EOD



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## EOD: The Concept

A flexible design approach based on the need to support **road tasks** as well as taking into account the **road environment** is the key principle of the EOD concept; which is that :

***LVRr designs by being compatible with the governing road environment factors can be modified along the road length if appropriate within overall Vietnamese regulations.***

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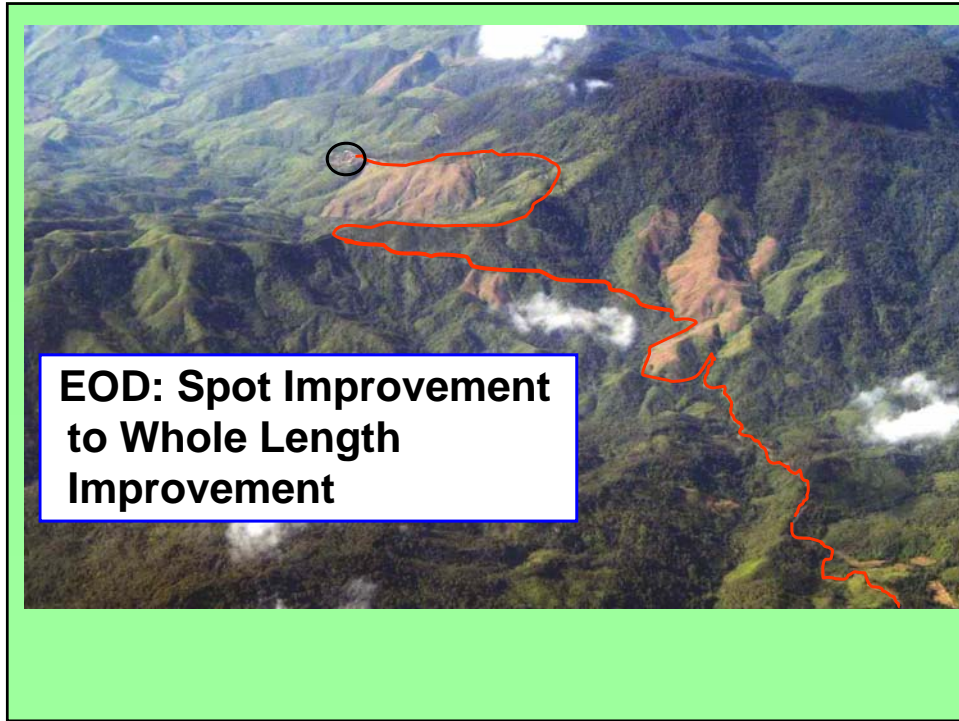
## The EOD Framework

Identifying and **applying** road designs that are specifically suited to the governing Road Environment factors.

This applies not only to pavement and surfacing but also to earthworks, slope protection, drainage and structure.



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## EOD Application

EOD can be considered as the over-arching principle for a range of practical strategies for improving or creating low volume rural access – from dealing with individual critical areas on a road link (Spot Improvements) to providing a total whole rural link design (Whole Length Improvement)



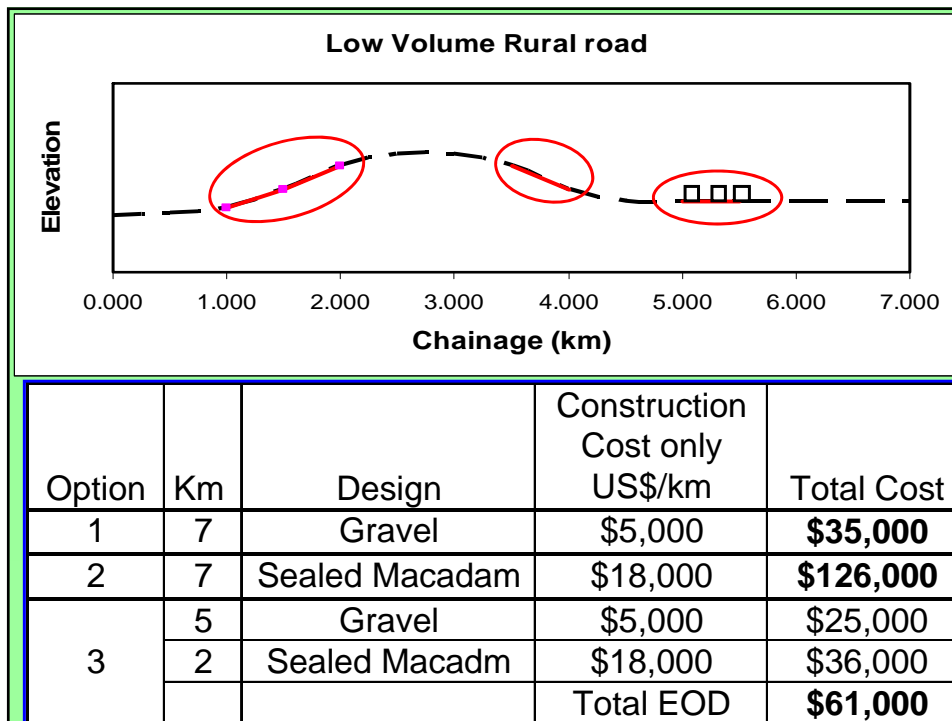
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## Spot Improvement

When funds are limited and it is not possible to improve an entire road, it may be necessary to prioritise the improvement works along the road. The improvements can be prioritised according to certain criteria, typically the importance of safe and reliable access or a dust-free road through a village.

A section of unsealed road may be left while other sites are improved.

Improvement works which are not connected to each other are referred to as 'spot improvements'.



## EOD Application

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## Spot Improvements

It is important to distinguish Spot Improvement applications from routine, periodic or emergency maintenance.

Spot Improvement is **engineering based** and involves pavement options and other solutions compatible with the **design life** of the road.



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## Variable Longitudinal Design

EOD provides a framework for the effective application of the RRST trial outcomes, particularly for the common situation where aspirations of local communities have to be balanced with fixed budgets. The EOD approach allows budget resources to be concentrated on areas that may,

Some conditions are constant along a road (climate) but some vary (eg gradients). Therefore the design may also vary from gravel on gentle slopes to sealed surface up a steep hill. This is referred to as 'variable longitudinal design' )

## The EOD Spectrum

Spot  
improvement

Whole Length  
Improvement

- **Whole Length Improvement or Variable Longitudinal Design:** Allows differing pavement options to be selected in response to different impacting factors along an alignment and hence a more focussed use of limited construction resources.
- **Spot Improvements:** Allows the appropriate application of limited resources to be targeted at key areas on existing earth or gravel road links to improve access throughout the year.

## RRST and EOD

The RRST pavement and surfacing option and their associated selection procedure are applicable both to Spot Improvement and Variable Longitudinal Design solutions.



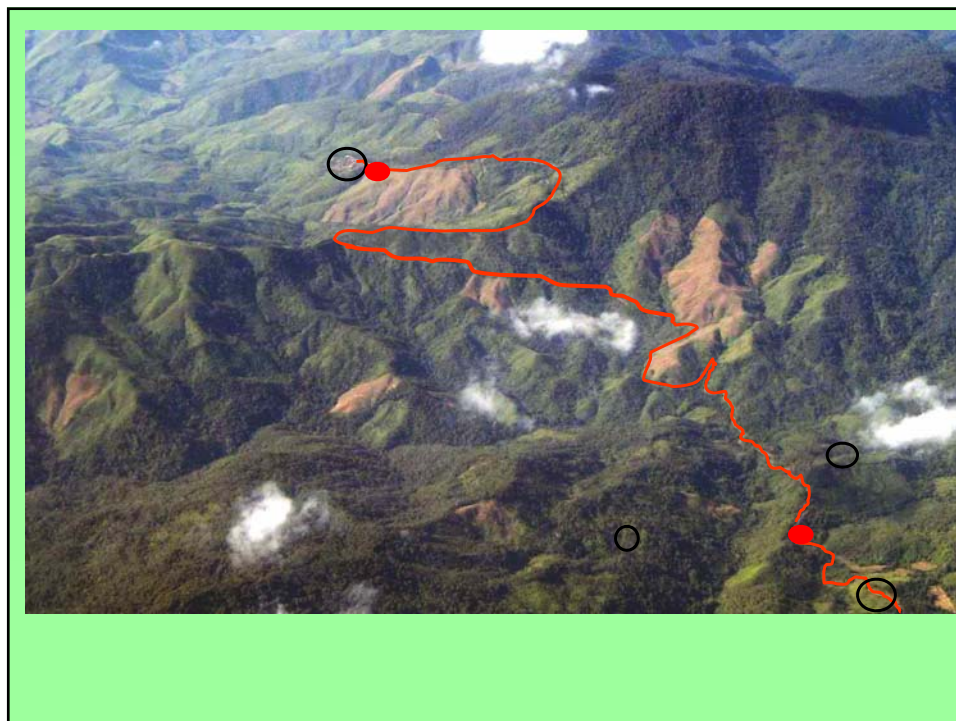
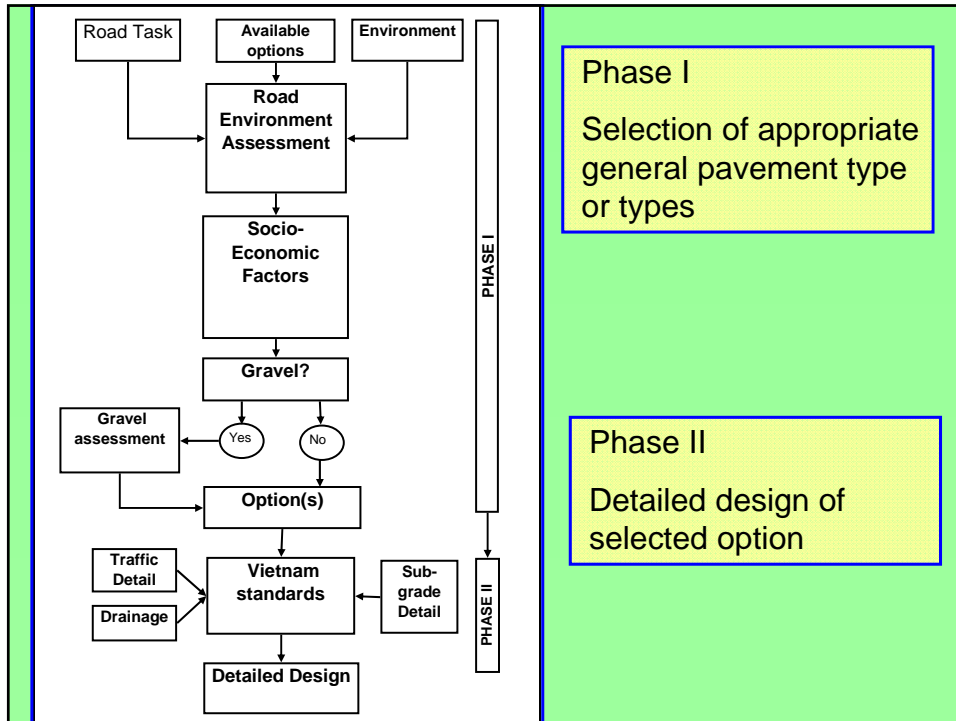
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## EM6.2: FIELD EXERCISE

### INTRODUCTION



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16km Alignment

Pavement Budget – US\$200,000



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	<b>Unit</b>	<b>US\$</b>
Seal (DBST)	m2	3.50
Poor Hill Gravel	m3	4.00
Good Hill Gravel	m3	9.00
Macadam (DBM/WBM)	m3	20.00
River gravel	m3	7.00
Crushed Stone Agg (CSA)	m3	30.00
Non Reinforced Concrete	m3	90.00

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	Big Trucks	Small Trucks	Pick-up	Con Nong	Moto Cycles	Cycles	Walkers
	>6t	<6t					
A	2	23	40	100	500	900	1600
B	1	19	34	210	650	75	300



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Key Trial and Control Pavement layer	Key Markers												
	Local material Use*	Labour-Based	Ease of Construction	Maintenance reduction	Sustainability	Resistance to Rainfall/Flooding	Load Spreading on Weak Sub-Grades	Small Contractor Suitability	Local Economy Advantages	Resistance to Axle Overloading	Local Women Employment	Likely Whole Life Cost Advantages**	User advantages (Low/Roughness)
Emulsion Sand/Stone Chip Seals	0	1	0	2	2	2	0	1	0	0	2	2	2
Lime stabilised Base/Sub-base	1	0	2	0	1	0	X	1	0	0	X	2	0
Cement Stabilised Base/Sub-base	1	0	2	0	1	0	X	1	0	0	X	2	0
EmulsionStabilised Sub-Base	1	X	0	0	0	0	X	X	0	0	0	0	0
Sealed Dry-Bound Macadam	0	0	2	2	1	2	0	2	0	2	0	2	2
Sealed Water-Bound Macadam	0	0	2	2	2	2	0	2	0	2	X	2	2
Dressed Stone	1	1	2	1	1	1	1	1	1	1	2	2	X
Fired Clay Bricks	1	1	2	1	2	2	1	1	1	2	1	2	0
Concrete Bricks	2	1	2	1	2	2	1	1	2	2	1	2	0
Sealed Armoured Gravel	2	0	2	2	2	2	0	2	0	X	0	2	2
Steel Reinforced Concrete	0	2	0	1	1	1	1	1	0	1	0	0	1
Bamboo Reinforced Concrete	2	2	2	1	1	1	1	1	2	1	1	2	1
Non-Reinforced Concrete	2	2	2	1	1	1	2	1	2	2	0	2	1
Hot Bitumen Stone Chip seals	0	2	0	2	2	2	0	2	0	0	X	2	2
Unsealed Natural Gravel	1	0	1	X	X	X	0	1	2	0	0	X	X
Penetration Macadam	X	X	0	2	2	2	0	0	0	0	0	0	2
Unsealed Water-Bound Macadam	0	0	2	X	X	X	0	2	0	0	2	0	X

Notes : 1 Positive advantage      0 No advantage/disadvantage  
2 Probable advantage      X Definite disadvantage  
\* Assuming material locally available  
\*\* Anticipated "Best Performers".

