IRF/TARA/gTKP Rural Roads Convention 2009

Appropriate Standards and Specifications: A Key to Rural Road Sustainability

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This presentation focuses on the need for technical Standards and Specification that are appropriate to **Low Volume Rural Roads** (LVRRs).

Recent experience (2006-2009) with DfID funded **SEACAP** projects in **Lao** and **Cambodia** is used to illustrate the key points.

These project were run by TRL-OtB project teams in conjunction with local consultants LTEC (Lao) and KACE (Cambodia**).**

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98°
102° E
106°
110°
Lincang
Nanning
Lao Cai
China
Mandalay
Pingxiang
Vietnam
Hanoi
Tà-kaw
Taunggyi
Haiphong
Myanmar
(Burma)
Muang Xai
Thanh
Hoa
Louangphrabang
Loikaw
Hainan
Gulf
of
Tonkin
Dongfang
(China)
Laos
Chiang Mai
Vientiane
Udon
Thani
Yangon
(Rangoon)
Khon
Kaen
Savannakhet
Hue
Mawlamyine
Da Nang
Nakhon
Sawan
Thailand
Nakhon
Ratchasima
Lopi
Buri
Attapu
Dawei
Play Ku
Bangkok
Qui Nhon
Siem Reap
Andaman
Sea
Chon Buri
Cambodia
Buon Me Thuot
Myeik
Phnom
Penh
Cam
Ranh
Krong Koh Kong
Tay Ninh
Kampot
Ho Chi
Minh City
Can Tho
Gulf of
Thailand
Nakhon Si

Imported standards-specifications largely unsuitable for LVRRs

- Insensitive to local road environments
- Inappropriate Factors of Safety
- Lack of flexibility
- Wrong assumptions

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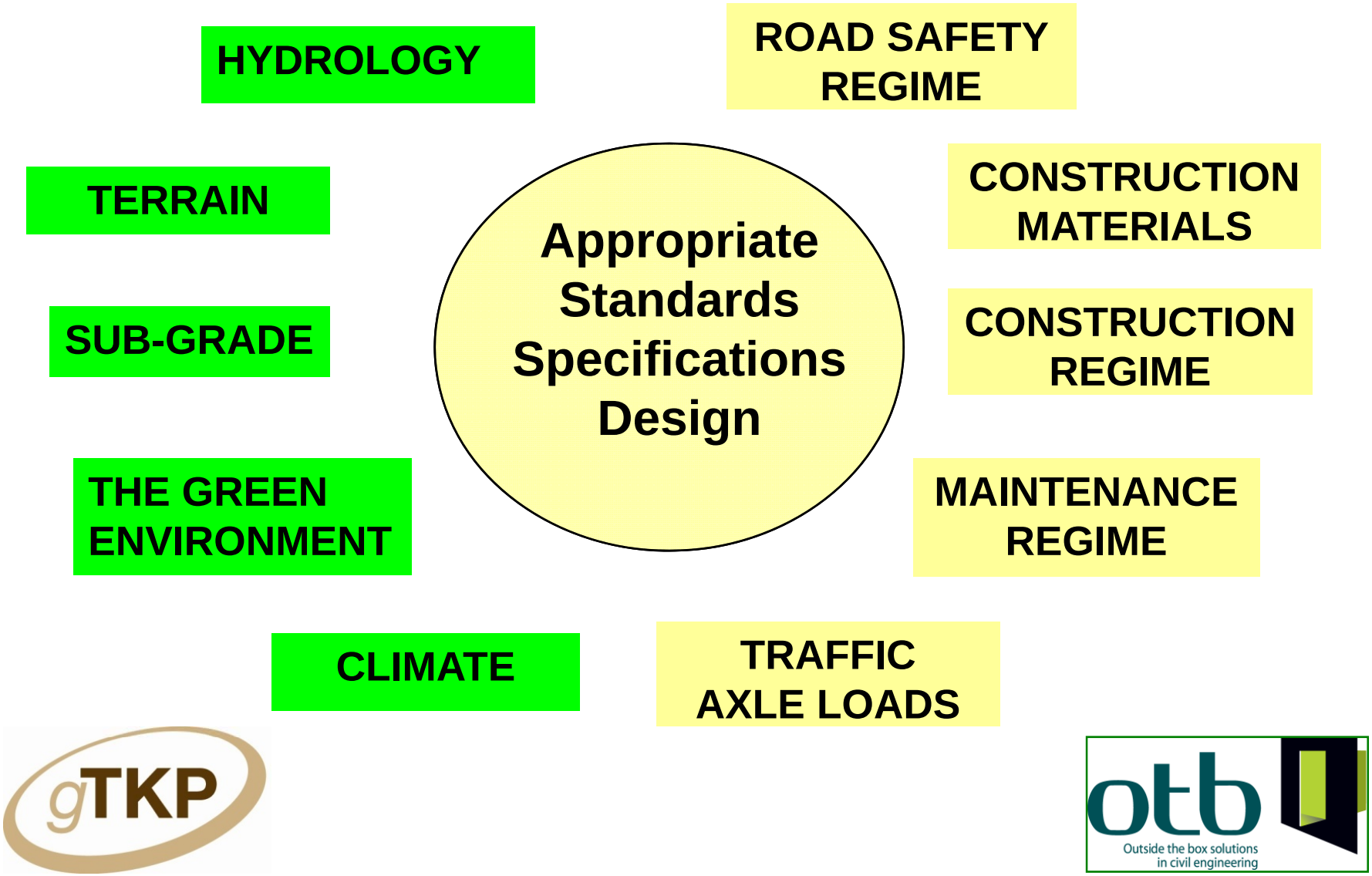
THE ROAD ENVIRONMENT



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The Appropriate LVRR Sequence

- **NEED**
- **TASK**
- **CLASSIFICATION**
- **GEOMETRIC STANDARDS**
- **SPECIFICTION**
- **DESIGN**
- **CONSTRUCTION**
- **MAINTENANCE**

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Need and Task- Lao

- In Lao proposed poverty-targeted rural infrastructure improvements will require around 10,000km of either upgraded or new construction.
- If funds are to be spent cost efficiently on a sustainable network then it is essential that rural roads are designed and built to appropriate standards and with achievable technical specifications

Sustainable Basic All-weather Access

Appropriate LVRR Standards & Specifications: Key Aspects

- **Task Based**

  Traffic; vehicles-people
- **Local Resource Based**

  Natural; Economic; Human
- **Flexibility**

  Regional Variation

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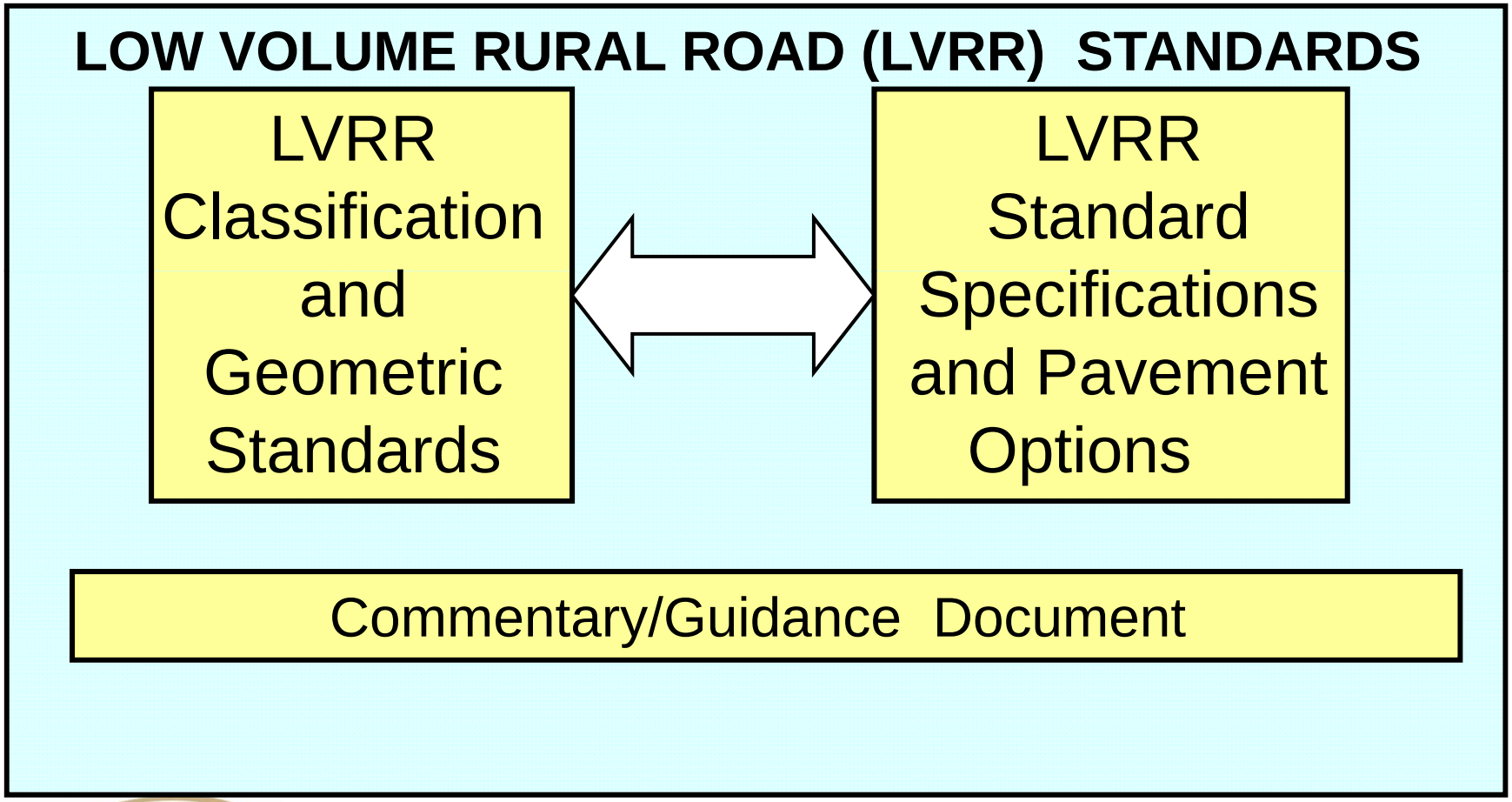
Key Elements of a Working Package



Key Decision

Many rural roads carry only relatively light vehicles

- Do we design just for these light vehicles or do we try to cater for the possibility that heavy vehicles may use the road ?
- If we design for the light traffic only, how do we prevent heavy vehicles from destroying the road ?

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Classification: Traffic

- Classification based on numbers of 2-axle vehicles (4-wheel) per day
- Standards should depend on the largest vehicles that the road is to carry on a regular basis (The “Design Vehicle”). If the vehicles are small, lower standards can be used

Lao Design vehicles

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Safety Issues: Lao

The alternative 2.5 and 3.5m carriageway widths

Variation of shoulder width depending on traffic mix

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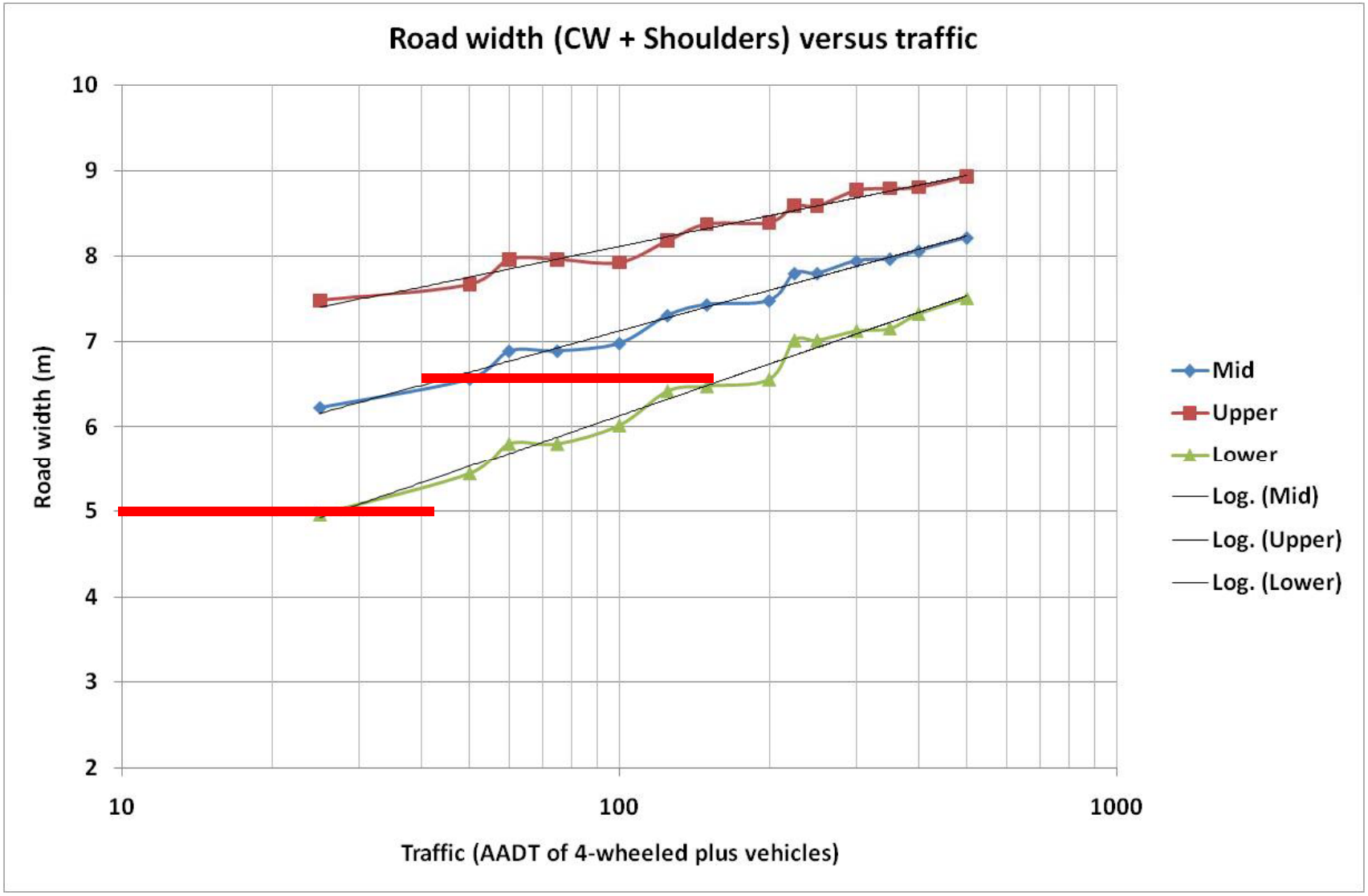
LVRR Classification for Lao

Parameter	Carriageway	Definition	
Classification	Widths: 2.5m 3.5m Function of Design Vehicle	Traffic lane	One
		Maximum 4-wheeled vehicles	150 per day
		Maximum axle load limit	4.5Tonnes for any vehicle
		Maximum vehicle width	2.3m

Proposed classification for Cambodia

Class	AADT of 4-wheeled vehicles	Width of running surface (m)	Sub class	PCUs of non 4-wheeled vehicles	Width of shoulders (m)	Total width (m)
RR 1	200 to 500	6.0	A	>300	1.5	9.0
		6.0	B	< 300	1.0	8.0
RR 2	100 to 200	5.0	A	> 300	1.5	8.0
		5.0	B	< 300	1.0	7.0
RR 3	30 to 100	3.5	A	> 300	1.5	6.5
		3.5	B	< 300	1.0	5.5
RR 4	5 to 30	3.0	A	> 300	1.0	5.0
		3.0	B	< 300	0.75	4.5
RR 5	< 5	2.5	A	>300	1.0	4.5
		2.5	B	<300	0.75	4.0

Classification Leads to Geometry



LVRR Basic Geometrics: Lao

Design Parameter	**Comment**		**Definition**		
Design speed	Defined by Terrain		Design speed for Terrain:		
			Flat to Rolling	High Hills-Mountainous	
			40km/h	30km/h	
Carriageway	Defined by vehicle body widths and number of non-motorized road users		Minimum 2.5m, Maximum 3.5m See Table 4.3for selection		
Shoulder			Minimum 1m, maximum 1.5m each side of road, See Table 4.3 for selection		
Maximum gradient	Defined by terrain with a limit of 6% for gravel surfacing		Flat	Rolling	Mountainous
			6 %	8 %	10 %
Cross fall	Defined by surfacing type	Gravel	6 %		
		Sealed	4 %		

Specifications: Local Materials the Start Point

Key Question

What appropriate road can I build with these local materials ?

NOT

Where can I find materials to meet these general specifications?

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Locally available, but possibly non-standard, pavement construction materialsmust play a significant role within LVRR Specifcations

Specifications and Design
Key Design Principles

1: Reduction in pavement thickness

2: Allow variation in material quality

3: Use of capping layer material

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Pavement Specifications

Unsealed

Natural Gravel

Flexible- Sealed (stone chip or Otta Seal)

Natural Gravel

Armoured Gravel

Waterbound or Drybound Macadam

Rigid

Non reinforced concrete

Design Matrix for Sealed LVRRs

Subgrade CBR%	Pavement Layer	Traffic Group A Layer (mm)	Traffic Group B Layer (mm)
2-3.9	Base Sub-Base Capping Layer	100 100 200	100 150 275
4-6.9	Base Sub-Base Capping Layer	100 100 100	100 150 175
7-10.9	Base Sub-Base Capping Layer	100 100 0	100 150 100
>11	Base Sub-Base Capping Layer	100 100 0	100 150 0

Environmentally Optimised Design

Spot improvement

Composite Roads

Design depends on local conditions

Design varies as conditions vary

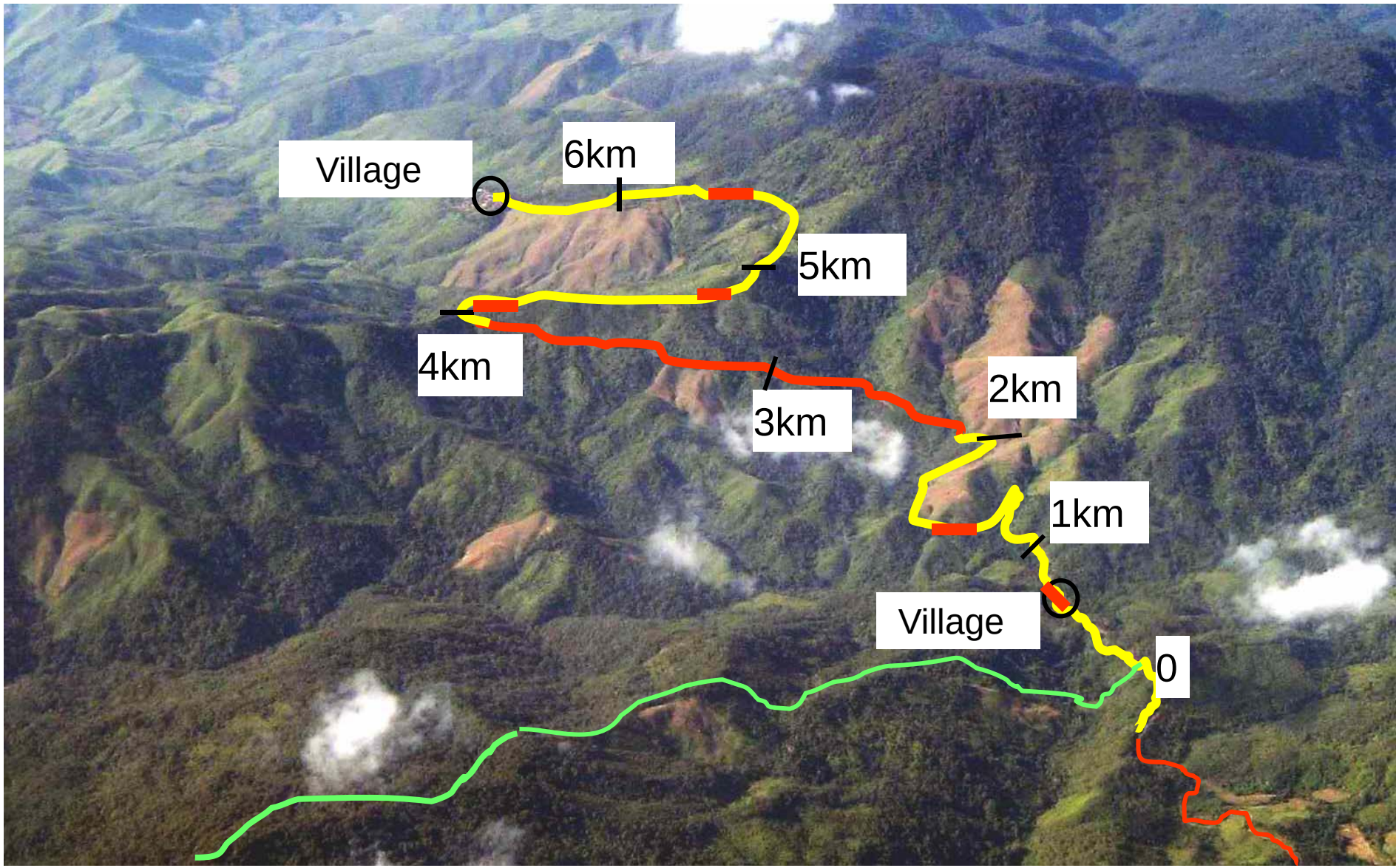
Spot improvements when funds restricted

MINISTRY OF PUBLIC WORKS AND TRANSPORT

Low Volume Rural Road
Environmentally Optimised Design Manual

April 2009

EOD



Lao: Key Documents

1, Classification and Geometric Standards,

2: Technical Specifications –technical specifications for an initial short list of pavement options and a matrix of standard designs.

3: Guidelines – containing advice on the application of Documents 1 and 2 within a Lao EOD strategy.

4. EOD Field Manual – for use at provincial and district level

MEETING THE LVRR CHALLENGE

- **Appropriate Standards and Specifications:**

  Local roads designed and built within a nationally accepted system of appropriate standards and specifications – not varied for each Donor

- **Sustainable local roads:**

  Design and construction appropriate to the road function; available funding; and local resources.

- **Maintenance:**

  The constructed roads must be capable of maintenance within available budgets and resources.

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