



Engineering Module1

Low Volume Rural Road Principles

DF 55: Dissemination of LVRR Knowledge and Experience



Summary

Module EM1 lays out the general principles that govern the appropriate design, construction and long term management of Low Volume Rural Roads (LVRRs) within the overall requirements of rural infrastructure development.

This module describes the function that LVRRS have to perform and how this together with the road environment must have a direct impact on their design if they are to be part of a sustainable infrastructure.

DF 55: Dissemination of LVRR Knowledge and Experience



Points to Think About

What are Rural Roads?
What key functions do they perform?
Why should do they need special attention?

DF 55: Dissemination of LVRR Knowledge and Experience



EM1.1 The Importance of Rural Infrastructure

DF 55: Dissemination of LVRR Knowledge and Experience

Rural Infrastructure - Purpose

- Access
- Development and Poverty reduction



DF 55: Dissemination of LVRR Knowledge and Experience



Improved Access



- Access to education for pupils and teachers
- Access to health centres
- Access to markets
- Access to employment
- Access to family
- Access to provincial capitals

DF 55: Dissemination of LVRR Knowledge and Experience



Poverty Reduction



Rural infrastructure development generates significant reductions in poverty by improving the income earning opportunities of rural people and by reducing the costs of the goods they consume.

Reducing transport costs for households without road access is highly pro-poor. There is considerable scope for rural development through improving the quality of rural roads.

DF 55: Dissemination of LVRR Knowledge and Experience



The Requirement

DF 55: Dissemination of LVRR Knowledge and Experience

Levels of Rural Access

A: No vehicular access;
This means that the pathways through which the village is normally reached cannot accommodate conventional motorised vehicles

DF 55: Dissemination of LVRR Knowledge and Experience

Levels of Rural Access

B: Dry season only access; Roads consist predominantly of unpaved roads that are accessible to conventional motorized vehicles during the dry season but not necessarily throughout the year. During the wet season, such roads may be impassable

DF 55: Dissemination of LVRR Knowledge and Experience

Levels of Rural Access

C: All weather access. Finally, all weather access roads can be used by conventional motorized vehicles during the dry and wet seasons. In other words, unlike dry season access roads, these roads would not be subject to frequent closure as a result of flooding during the wet season

DF 55: Dissemination of LVRR Knowledge and Experience

Infrastructure Objective

Although dry season access is the most cost effective, it is very restrictive and the preferred target is year round motorable access

Elimination of Access Type A

Aim for Access Type C

WHY ?

DF 55: Dissemination of LVRR Knowledge and Experience

Why All Weather Access ?

If access is dry season only, communities will be isolated for long periods during the rainy season –issues of **health and education**

If access is dry season only, some vehicles will try to pass when it is raining – if they do, they often cause serious damage which can **block access** in the next dry season and be very expensive to repair

If the access is reliable, farmers are more likely to **increase their production** and traders are more likely to travel to a village to buy their produce

DF 55: Dissemination of LVRR Knowledge and Experience

Basic Concept

Within a low volume traffic environment it is possible to focus on specific design and construction procedures such that **more roads can be built and maintained within constrained budgets.**

DF 55: Dissemination of LVRR Knowledge and Experience

EM1.2 LVRR Definition

DF 55: Dissemination of LVRR Knowledge and Experience

What is a Low Volume Rural Road ?

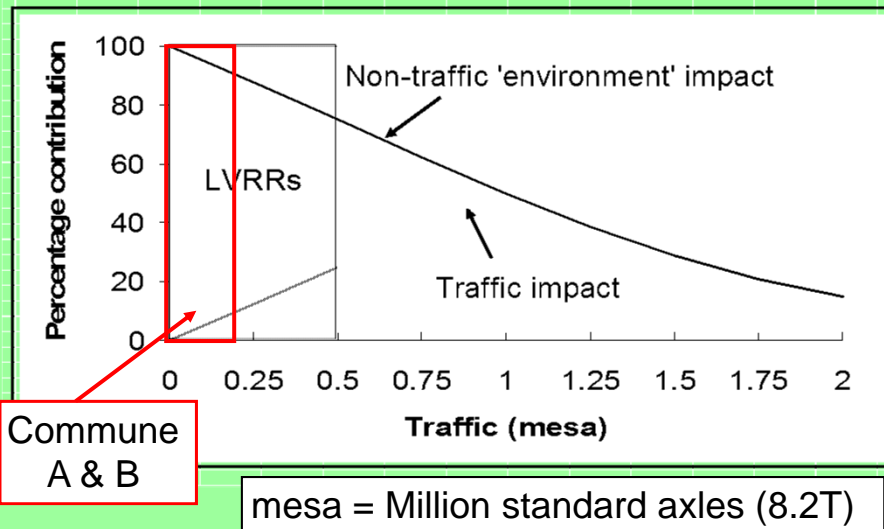
In practical terms for Vietnam these roads fall under the current classification of **Commune Roads A and B**

In general terms a Low Volume Rural Road is a road carrying limited traffic whose performance is not wholly dominated by the traditional factors of traffic and sub-grade strength.

Its performance and design are governed by a much wider range of factors known collectively as the Road Environment – which will be discussed shortly.

DF 55: Dissemination of LVRR Knowledge and Experience

Traffic and Non-Traffic Impacts



EDUCONS



Low Volume Rural Roads (LVRs)

Upper Limits

- < 200 motor vehicles/day
- < 6 t axle loads
- < 150,000 esa

DF 55: Dissemination of LVR Knowledge and Experience



LVRR Upper Limit

This limit has been identified as appropriate for a substantial portion of the Vietnam rural road network in consideration of current and likely future traffic demand, and the pragmatic management of the road network with the limited resources available

DF 55: Dissemination of LVRR Knowledge and Experience

Traffic (Vietnam)

	Vehicles Per Day		
	Motor Vehicles	Motor-Cycles	Cycles
Mekong Delta	0	1718	1085
	2	1110	646
Central Highlands	101	134	1064
	176	1150	106
	277	469	56
Northern Highlands	101	907	1025
	20	266	726
	148	1249	1304
	31	540	305
	67	572	776



DF 55: Dissemination of LVRR Knowledge and Experience

Working within the LVRR Envelope

It is important to note that the LVRR Classification does not imply that all Rural Roads must comply with a 6T limit; only that roads to be designed under the LVRR principles must do so.

If some Rural Roads are deemed to require a higher axle load or higher traffic standard then logically they must be dealt with under other design procedures.

DF 55: Dissemination of LVRR Knowledge and Experience

Be Clear when NOT to use the LVRR Approach

There are clearly areas within Vietnam where the rate of **economic development** is such that the application of LVRR principles is inappropriate.

There are also roads where the risk of **axle overloading** is such that they should be subject to special design procedures outside the LVRR approach..

LVRR Engineering Objectives

Construction of sustainable rural roads compatible with:

The **TASK** they have to perform

The **ROAD ENVIRONMENT** in which they exist

Available **WHOLE LIFE BUDGETS**

DF 55: Dissemination of LVRR Knowledge and Experience

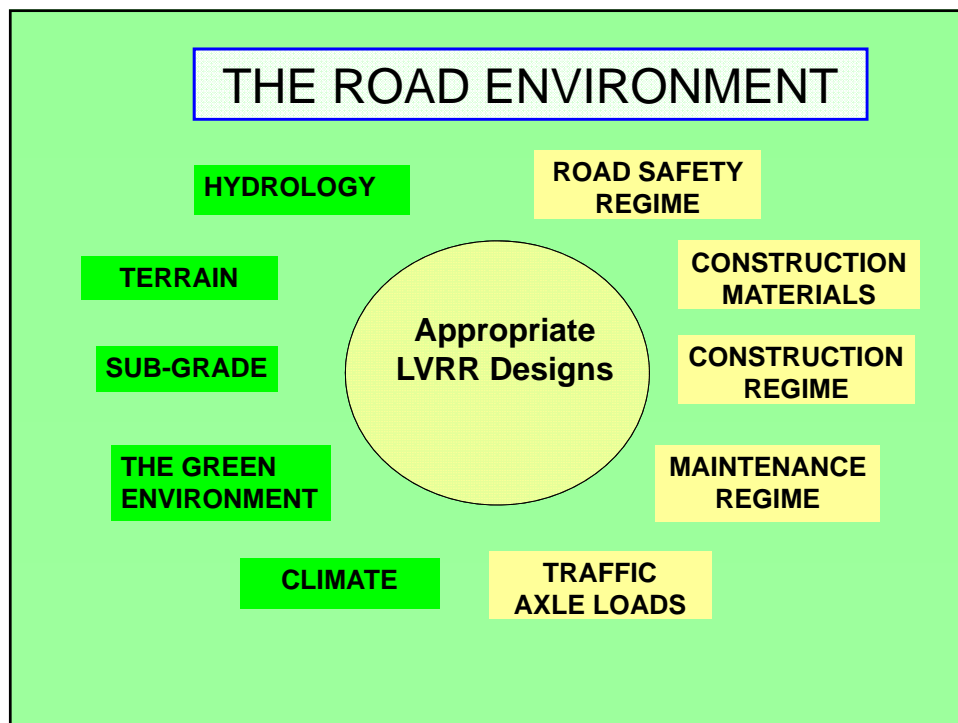
EM1.3 The Road Environment and its Impact

DF 55: Dissemination of LVRR Knowledge and Experience

What is the Road Environment?

In reality the performance of a LVRR depends on a whole range of factors that cumulatively can be described as the “road environment”.

Factors important to the road environment can be broadly grouped as those on which we can have some influence and those on which we have little or no influence – as illustrated in the following slide



Construction Materials

The nature, engineering character and location of construction materials are key aspects of the road environment assessment for LVRRs where the use of locally available materials is a key issue.

DF 55: Dissemination of LVRR Knowledge and Experience

Construction Regime

The construction regime governs whether or not the road design can be applied in an appropriate manner. Key elements include:

- Appropriate plant use
- Selection and placement of materials
- Compliance with specification
- Technical supervision

LVRRs should be designed to be within the capabilities of the construction regime.

Maintenance Regime

All roads, however designed and constructed will require regular maintenance to ensure that the design life is reached.

LVRs should not be designed on the basis of unrealistic maintenance expectations.

The capacity and available funding to carry out the necessary maintenance works is a primary consideration in selecting LVR options



Traffic

Traffic is still a key issue in the appropriate design of sustainable LVRs. In particular the assessment of risk in terms of heavy trucks or axle over-loading is a vital issue.

DF 55: Dissemination of LVR Knowledge and Experience



Road Safety



LVRs are very likely to carry mixed traffic; light trucks to pedestrians.

There is a significant risk to non-motorised users that must be addressed by appropriate design measures



DF 55: Dissemination of LVRR Knowledge and Experience



Terrain



Terrain reflects the geological and geomorphological history. Apart from its obvious influence on the grade of the road, the characteristics of the terrain will also influence the type of soil present, and vegetation and availability of materials.

DF 55: Dissemination of LVRR Knowledge and Experience

Climate.

The prevailing climate will influence the supply evaporation and movement of water. Climate impacts upon the road by erosion and on the moisture regime within the pavement. It has a particular influence on unsealed pavement options

DF 55: Dissemination of LVRR Knowledge and Experience

Hydrology

It is often the interaction of water, or more specifically its movement, within and adjacent to the road structure that has an overarching impact on the road performance. High water tables and flooding are a particular influence

DF 55: Dissemination of LVRR Knowledge and Experience

Sub-grade Conditions

The sub-grade is essentially the foundation layer for the pavement and as such the assessment of its condition is fundamental to an appreciation of the road environment.

DF 55: Dissemination of LVRR Knowledge and Experience

The “Green” Environment

Construction and ongoing road use have impacts on the natural environment, including flora, fauna, hydrology, health and safety. These have to be assessed and mitigated as by appropriate design and construction procedures.

DF 55: Dissemination of LVRR Knowledge and Experience

Impact on Design Approach

The road environment factors should be a significant influence on the the various aspects of LVRR design:

- Earthworks,
- Drainage,
- Structures,
- Pavement

Later Modules will expand on this

Therefore LVRR Should Be ?

Task based – they should suit the road function and its traffic.

Local resource based – be compatible with the the engineers and technicians who will design the roads; the contractors and labourers who will construct them; the villagers who maintain them; and, the construction materials that are available.

Affordable – they must facilitate the construction of roads that will not exhaust budgets or place excessive burdens on local communities..



Discussion

Do you know why we build rural roads?

Why are they a “Special Case” ?

What is your opinion on the need for a new approach to rural road design and construction ?

DF 55: Dissemination of LVRR Knowledge and Experience