

Session 1

Low Volume Rural Road Principles



Summary

Session 1 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 session 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.



Points to Consider

What are Rural Roads?

What key functions do they perform?

Why should do they need special attention?

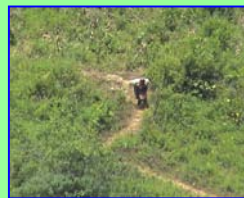


The Requirement



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.**



Budget



Road
Environment

Road Task

SUSTAINABLE RURAL ROADS



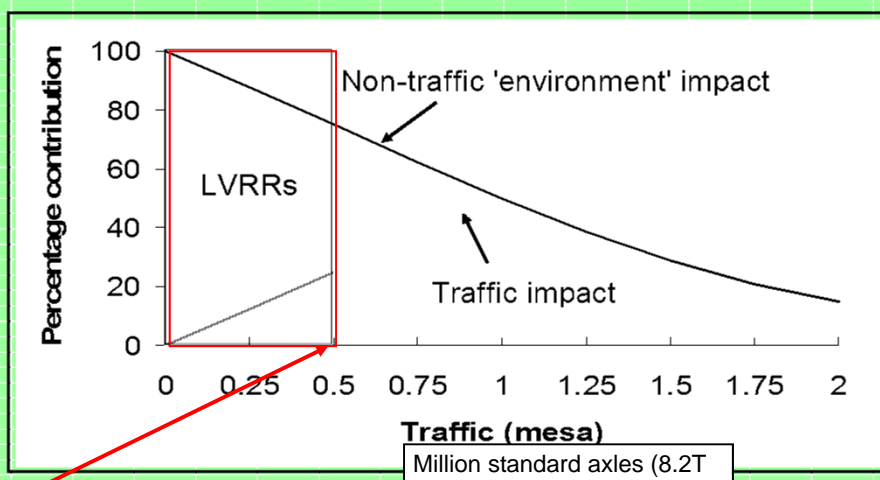
What is a Low Volume Rural Road ?

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



Traffic and Non-Traffic Impacts



About 150 motorised ADT with up to about 20 medium trucks/day



Low Volume Rural Roads (LVRRs)

Upper Limits

- ❑ < 150-200 motor vehicles/day
- ❑ < 4 to 6 t axle loads
- ❑ < 250,000 esa



LVRR Upper Limit

This limit has been suggested as appropriate for a substantial portion of the Cambodian 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.

Bigger roads cost more money



Working within the LVRR Envelope

It is important to note that the LVRR Classification does not imply that all Rural Roads must comply with say 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.



Be Clear when NOT to use the LVRR Approach

There are clearly areas within Cambodia 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 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**



The Road Environment and its Impact



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



THE ROAD ENVIRONMENT

HYDROLOGY

ROAD SAFETY
REGIME

TERRAIN

CONSTRUCTION
MATERIALS

SUB-GRADE

CONSTRUCTION
REGIME

THE GREEN
ENVIRONMENT

MAINTENANCE
REGIME

Appropriate
LVRR Designs

CLIMATE

TRAFFIC
AXLE LOADS



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.



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.



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



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 availability of materials.



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



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



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.



The “Green” Environment

Construction and ongoing road use have impacts on the natural environment,. These have to be assessed and mitigated by appropriate design and construction procedures.



Impact on Design Approach

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

- Earthworks,
- Drainage,
- Structures,
- Pavement



Therefore LVRR Should Be ?

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

Local resource based – be compatible with 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” ?

Why is there a need for a new approach to rural road design and construction ?

