



**global Transport Knowledge Partnership**

**Transport Power Points:  
10-minute briefing series**

# **Rural Road Surface Options - Introduction**

**Rural Transport**





## The Problem

In many developing regions less than 20 percent of rural transport routes are developed to all-weather access. There is a proven link between Poor Access and Rural Poverty.

Rural roads can be expensive to construct and difficult to maintain. Bad roads constrain the impact of all rural initiatives and can cause community isolation from services and markets, high transport costs, spoilt crops, retarded development, deprivation and poverty.

It is therefore vitally important to provide sustainable low volume rural roads (LVRR) with affordable surfaces, compatible both with their transport tasks and their physical environment.



## Engineered Natural Surface

An Engineered Natural Surface (ENS), or Earth Road, is the cheapest form of road construction, using the compacted soil at the road location. This solution can be used for low traffic flows (normally up to 100 light motor vehicles per day) in gentle terrain with rainfall less than about 2,000mm per year if the soil is moderately strong (CBR of about 15 or more). Use may be restricted during and immediately after heavy rain.

*Measuring California Bearing Ratio (CBR) using a low cost Dynamic Cone Penetrometer (DCP).*





## Engineered Natural Surface

The ENS camber and drainage system may be constructed and maintained using either local labour or simple low cost equipment. Basic structures are required at watercourse sites. More durable surfaces may be required on some sections of the route (e.g. steep gradient or weak soil). It is **ESSENTIAL** that the camber and drainage are regularly maintained. Soils can be improved by mechanical or other types of stabilization.







## Natural Gravel

This is more expensive than ENS and can provide an all-weather surface at moderate cost if suitable gravel can be located nearby. However this is a high maintenance option due to the surface material losses caused by traffic and weather. The gravel needs to be replaced at regular intervals. It is therefore sensible to restrict its use if maintenance capability is weak.





## Gravel Surface should not be used where:

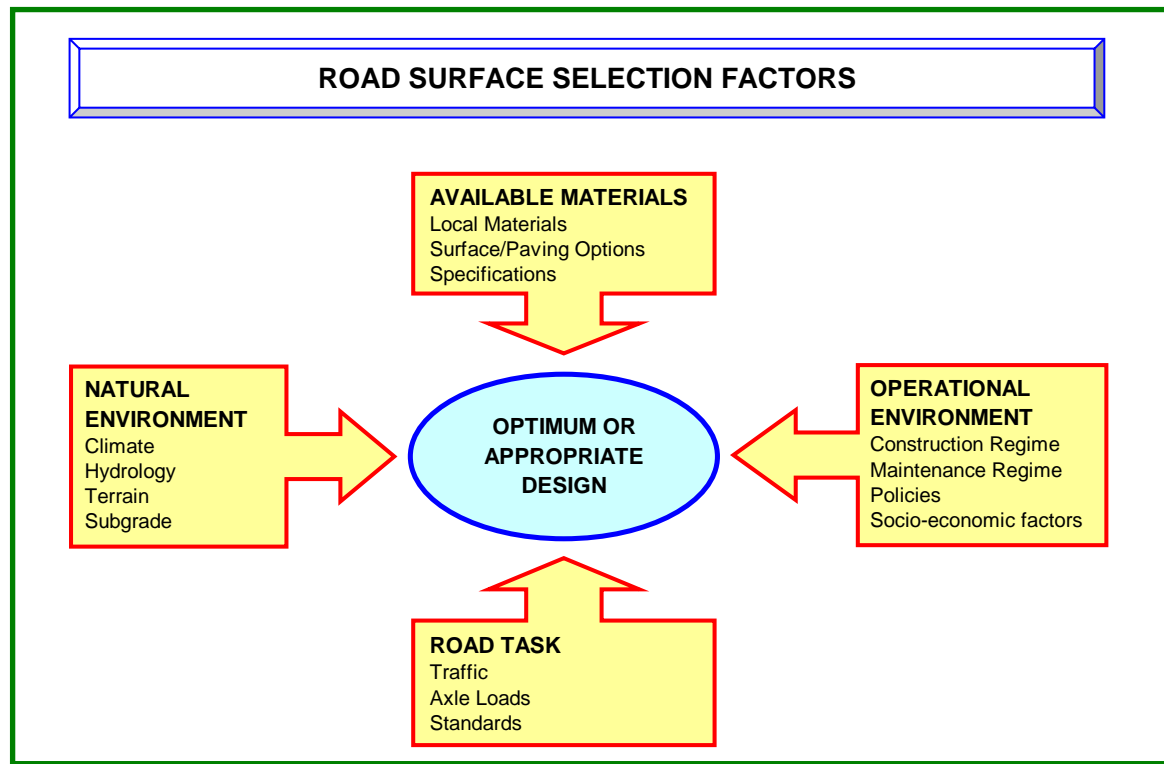
- **Gravel quality is poor** (*it should meet local durability, grading and plasticity specifications/recommendations*)
- **Gravel deposits are limited/environmentally sensitive**
- **Haul distances are long** (*suggest cost analysis for haulage >10km*)
- **Rainfall is very high (>2m/year), or dry season dust problems**
- **Traffic levels are high** (*more than 200 motor vehicles/day*)
- **Longitudinal Gradients > 6%** (*>4% if rainfall >1 metre/year*)
- **Sub-grade is weak or soaked (flood risk)**
- **Compaction & thickness cannot be assured** (*bad quality control*)
- **Camber and side Drainage are not provided, or**
- **Adequate maintenance is not provided** (*on say >50% of network*)



## More Durable Surfaces & Paving

There is a wide range of durable surface/paving options for Low Volume Rural Roads. Selection should be based on consideration of the factors shown below.

*Local guidelines should be developed based on **Whole Life Costing** of the various feasible surface/paving options, including realistic maintenance assessment.*







# Stone Paving



*Natural stone can be used in a crushed or shaped form, for example:*

- *Stone Macadam*
- *Cobble Stone Paving*
- *Pavé*
- *Dressed Stone*







# Brick Paving



*Burnt Clay Brick paving can be an important option in areas lacking hard stone resources, for example in delta regions. The clay can be fired to high quality bricks using small scale kilns and renewable energy sources, such as waste rice husk. Materials haulage can be minimized and local employment created in brick production for roads and building construction.*



# Bitumen Surfaces



*A range of surface and paving options is available using bitumen as a seal or binding material. They can be particularly suitable for labour based methods if emulsions are used. Techniques include 'chip' seals, sand seals, Ottaseals, and bitumen macadams. The thin seals will require suitable pavement layers to be constructed between the road foundation and surface.*





# Concrete Paving



*Concrete paving can be a high initial cost paving option. However this can be more than offset by Whole Life Cost benefits to make this a very attractive solution. It is possible to achieve very high quality, durable paving with high traffic carrying capacity, resistance to overloading and very low maintenance, using simple local building trade skills.*

*Paving may be in the form of incremental brick laid within restraining kerbs, or un-reinforced or reinforced slab. As with all surfacing/paving options, quality control is essential to ensure a good, durable, value-for-money investment.*



# Further Information

The following important dissemination forums are supporting Low Traffic Volume Rural Roads (LVRR) knowledge:



**global Transport Knowledge Partnership:**

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

**SEACAP**

**Southeast Asia Community Access Programme:**

[www.seacap-info.org](http://www.seacap-info.org)

**AFCAP**

**Africa Community Access Programme**

[jeff.turner@afcap.org](mailto:jeff.turner@afcap.org) & [rgeddes@africaonline.co.zw](mailto:rgeddes@africaonline.co.zw)

Further information on LVRR may be obtained from the above websites and the gTKP Rural Transport Theme Champion:

[rob.petts@gtkp.com](mailto:rob.petts@gtkp.com)

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