Lessons from Experience:

Use of low cost material & innovative technology in rural roads in Uttarakhand

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■ Low Cost:

Low Cost in comparision to which cost??

Optimum cost in life cycle of road

About Uttarakhand

- Uttarakhand State is mainly a hilly state.
- No industrial waste is available for use in construction of rural roads.
- Generally hills in Garhwal region have boulders/stones.
- Hills of Kumaon region have less boulders/stones in comparison to Garhwal.
- Plain areas of Uttarakhand have boulders/stones in the rivers.

- How to Redunce the cost?
 - ✓ Either dilute the specifications of hill roads—Not advisable

Or

- ✓ Use the local available material.
- Reduce the cost of retaining wall by hill side cutting.
- Use bio engineering for slope stabilisation.
- Where stones of good quality are not available, use alternate technology like cement stabilisation/RBI-81 etc.

Methods of reducing the cost of rural roads in Uttarakhand

- In hills, sub grade is obtained in cutting and average CBR found is more than 10, therefore, no need of preparing subgrade.
- Aggregate obtained from hill side cutting is used for sub base & base course layers.
- Shortest length of the proposed road is decided at the time of alignment.

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Others means of reducing the cost of Rural Roads

- Costly protection works such as retaining wall can be avoided by use of:
 - Bio engineering.
 - Gabion Walls.
 - Back Cutting.
- Dumping yards should be made at suitable places & good material found in hill side cutting & slip clearance should be staked in these dumping yards for further use in construction.
- Where discharge in less, vented causeway or RCC pipes should be used.
- Bitumin/Emulsion can be procured in bulk as has been done in case of cement, thus reducing the cost of bitumin/emulsion considerably.
- Closely graded premix surfacing or mix seal surfacing may be adopted in place of open graded premix carpet, compacted thickness of 20mm & followed by seal coat. In this method of construction the life of road will be increased & maintenance cost will also be decreased.



MDR51 of KM 72 to Kishanpur Motor Road, Distt.-Uttarkashi



Seraghat-Kunj Kimola Motor Road, Distt.-Almora



Quarali-Talli Motor Road, Distt.-Pauri



MDR51 of KM 72 to Kishanpur Motor Road, Distt.-Uttarkashi



Bazarto Simar Motor Road, Distt.-Bageshwar



Kot Randhar-Bandhanital Motor Road, Distt-Rudraprayag



Kot Randhar-Bandhanital Motor Road, Distt.-Rudraprayag



Gangori to Nald Motor Road, Distt.-Uttarkashi



Kot Randhar-Bandhanital Motor Road, Distt.-Rudraprayag



Sarasgaon-Khola Motor Road, Distt.-Tehri



Chakrata-Mussoorie Road Km 64-Sawai Motor Road, Distt.-Dehradun



Jadankhand to Kochiyar Motor Road, Distt.-Pauri



 ${\bf Malpura\ Deodhar\ Motor\ Road,\ Distt.-\ Udham\ Singh\ Nagar}$



MDR51 of KM 72 to Kishanpur Motor Road, Distt.-Uttarkashi



Purola Khalori - Khalari Motor Road, Distt-Uttarkashi



Quarali-Talli MotorRoad, Distt.-Pauri



Quarali-Talli Motor Road, Distt.-Pauri



Seraghat-Kunj Kimola Motor Road, Distt.-Almora

Thank You