ASSET MANAGEMENT OF LOW VOLUME RURAL ROADS

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ABSTRACT

A wide range of government institutions are building rural roads in India. Rural roads comprise about 85 per cent of total road network. The massive rural road network has several benefits, both in economic and social terms. Since December 2000, the Government of India has through the PMGSY embarked on a massive programme to provide connectivity to habitations through the rural road network across the country. Asset Management is "a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost". It include: (i) a systematic evaluation of asset needs and available resources, (ii) consideration of entire asset lifecycle, (iii) combining engineering and economic principles, (iv) data driven decisions and investments, and (v) efficiency and cost effectiveness as primary outcomes. Maintenance practices vary in different parts of the country. Equally, the environment and traffic patterns show a high level of diversity depending on the location. It is recognized that the organization of the road sector and its technical and managerial resources vary from one state to the other. It is therefore important to acknowledge that there is no standard solution to be applied in terms of reaching optimal arrangements. Still, there are key issues which apply everywhere and which need proper attention in order to secure adequate and timely maintenance of the rural road network. This paper assesses the contents of asset management policies, identifying strengths and weaknesses of the policies and implications for infrastructure performance, role of technology in optimizing solutions while highlighting successful implementation strategies.

INTRODUCTION

A wide range of government institutions are building rural roads in India. The Village Roads (VRs) and Other District Roads (ODRs), two categories of roads referred as Rural Roads, are normally under the jurisdiction of the Public Works Departments or Rural Development Departments within the State government administrations. There are also various agricultural marketing boards and similar agencies mandated to build and maintain rural roads. In addition, the Panchayati Raj Institutions at local government levels are in charge of some portions of the rural road network. Since December 2000, the Government of India has through the PMGSY embarked on a massive programme to provide connectivity to habitations through the rural road network across the country. The programme aimed to connect all habitations with a population of more than 500 inhabitants with all-weather roads in plains and 250 in hill states, desert areas and tribal areas. Rural road connectivity remains a highly important priority and as a result similar programmes are on-going in many states to connect smaller communities. The year 2013

saw the launch of PMGSY-II with the objective to consolidate the existing rural road network and upgradation of existing rural roads particularly that provide connectivity to rural growth centres and other critical rural business hubs. As a result of the PMGSY and other programmes, the rural road network has experienced a considerable growth in terms of its total length. Also, these programmes have contributed to a significant improvement of the quality of the rural road network. This massive improvement of the rural road network has several benefits, both in economic and social terms. Communities are no longer isolated and can partake in mainstream economic and social activities and access to basic services such as health and education is improved as a result of the improved roads. Better access provides the opportunity for increased income and employment thus contributing to the alleviation of poverty. The continued extension and improvement of the rural road network does however create new and growing challenges in terms of an increasing maintenance burden. In order to sustain the benefits of the investments made in improving village roads, there is a need to boost capacity in terms of providing adequate maintenance. After all, the expected benefits in terms of social and economic development will only materialize if the good transport infrastructure is maintained over time. When road networks mature as a result of reaching the desired coverage of the rural population, more emphasis needs to be placed on the maintenance of already existing infrastructure assets. This implies that a growing portion of funding and technical and managerial capacity need to be allocated to protecting the investments made earlier in building the road network. In order to sustain the quality of the all-weather roads built to service rural areas, there is a need to mobilize political support for this change process to take place. Secondly, it involves significant changes within government institutions in charge of the road networks. This process is already on-going, although at various levels of progress. In some states, these new challenges are to a large extent recognized and adequate measures are being put in place to address the increasing maintenance challenge, while in other parts of the country, the emphasis still remains on construction works with too little attention given to maintenance of existing assets.

RATIONALE FOR RURAL ROAD MAINTENANCE

To achieve the highest possible service levels, a key priority when preparing a maintenance programme would ideally be to ensure that available funds are used in a preventive rather than in a reactive manner. Timely action should be taken before major damages occur and the roads break down. Action should be taken while damages are still minor, thereby halting the deterioration process at an early stage and thereby maintaining high service levels for the users. The economic benefits of a preventive approach are three-fold. First of all, it lowers total maintenance costs since the defects are attended to before any serious damage takes place. Secondly, the transport user costs remain low since the road is kept in a good condition at all times, and thirdly it improves the regularity (and reliability) of the service provided by the road.

Maintenance ensures that the road remains serviceable throughout its design life. Maintenance is important because it: reduces the rate of deterioration, thereby safeguarding previous investments in construction and rehabilitation, lowers the cost of operating vehicles on the road by providing a smooth running surface, improves safety of road users, improves the reliability of the road allowing it to remain open for traffic on a continuous basis and thus contributes to more reliable transport services, and sustains social and economic benefits of improved road access. No matter what technical designs are chosen, all roads, from major highways to local roads,

require regular and timely maintenance in order to secure a reasonable lifetime on the construction investment.

TYPES OF MAINTENANCE

Maintenance work is classified according to its timing or frequency as well as the scale or complexity of activities. Although emphasis is always on preventive measures, there will still be damages that cannot be prevented. Minor repairs are therefore part and parcel of the regular maintenance activities. Before rectifying a defect, the underlying cause of the problem should be identified. In many cases therefore the corrective activity alone may not be enough, the underlying cause must also be dealt with.

Routine maintenance

Routine maintenance activities are usually small-scale, widely dispersed, and often performed using manual labour. The need for routine maintenance can to a large degree be forecasted.

Common routine maintenance activities

- Remove debris from roadway and drains
- Clear drains, allowing free passage of water
- Clear culverts and other water crossings
- Repair shoulders and side slopes
- Patch potholes, seal cracks and repair edges of pavement
- Cut grass and bush
- Maintain road signage

Periodic maintenance

Periodic maintenance is a major overhaul of the road typically carried out after a period of 5 to 10 years, depending on traffic levels, pavement type and geographical and weather conditions. The work involved is normally larger and require more equipment and specialist skills. As a result, this work is considerably more costly than routine works. The most common periodic maintenance activities include renewal of road surface and major repairs of structures.

Emergency maintenance

Emergency maintenance responds to occasional, unforeseen events such as landslides, washouts, large trees or debris on the road and broken drainage structures.

ELEMENTS OF MAINTENANCE POLICY

National Rural Road Development Agency (NRRDA) has proposed four major elements under Maintenance Policy. They are:

- Government commitment
- Adequate funding

- Institutional reforms
- Implementation efficiency

Government Commitment

Rural roads represent a huge asset base. Any inadequacy in funding and implementation on the ground will result in the erosion of the asset base. According to some experts, the erosion of road asset base in India due to neglect in maintenance is in the range of 5 to 10 per cent depending upon the funding and implementation capacity of the States. It is, therefore, extremely critical that there is full government commitment by every state to ensure adequate funds for maintenance of the entire rural road network within its jurisdiction. Every State needs to work out realistic requirement of funds for maintenance of its road networks. To this end, the state government may declare that rural road maintenance is an essential public service and mandate the following policy actions:

I. Introduce system of working out asset value of the network at the close of each financial year.

II. Constitute a Committee at state level and national level to work out realistic norms for maintenance of rural roads covering routine periodic and emergency maintenance. The maintenance cycle should be in harmony with the design life of the road. A ten-year cycle may be considered for rural roads.

III. Entrust the overall responsibility for efficient planning and management of rural road maintenance to one nodal road agency. Apart from delivery of its own programme, the nodal agency will coordinate with other departments handling the work of rural roads. Gradually, however, the state government may consider bringing all rural roads within the jurisdiction of its SRRDA.

IV. Ensure allocation of adequate and timely availability of funds needed for maintenance of rural roads as per Annual Maintenance Plans prepared by the road agencies. Currently, funds for maintenance of PMGSY roads are deposited into the scheduled bank approved by the state government. Similar strategy can be adopted for other rural roads as well.

Adequate Funding

Bulk of the budget allotted to rural roads is getting incurred in repairs and rehabilitation / reconstruction activities. Much less is spent on maintenance. It needs to be recognized that a good part of upgradation of existing rural roads is resulting from previous neglect in preventive maintenance. Therefore, there is need for assured availability of funds for maintenance of rural roads. This will also help in proper maintenance planning.

The policy actions proposed for State govt to adopt for ensuring adequate funding for rural roads:

V. Constitute a standing Empowered Committee to decide on annual allocation of funds for maintenance of different categories of roads with reasonable share for rural roads. Further, the funds for rural roads maintenance need to be distributed between routine, periodic and emergency maintenance in an equitable manner with first charge on available funds being for routine maintenance and restoration of works to keep the roads open to traffic.

VI. Explore avenues for mobilising of additional funds for reducing the gap between the funds required and those made available for maintenance of rural roads.

VII. Formulate an Action Plan for time bound removal of maintenance backlog of the rural road network so that the network is brought to maintainable shape. Funds for such a purpose should be met out of plan funds.

Institutional Reforms

As opposed to construction works, the funds spent on maintenance do not create any new assets – although they do preserve and protect the assets that already exist. The following policy actions towards institutional reforms may be mandated by the state government:

VIII. Require the Road Agency to institute performance evaluation system to inform the government about the delivery of maintenance and condition of the rural road network as a result of funds allocated for the purpose.

IX. Require the Road Agency to institute a simplified Asset Management System to prepare Annual Maintenance Plans for each PIU based on scientific condition assessment of the road network. The NRRDA could consider preparing a template of AMS for rural roads to support the states in this effort.

X. Set up Special Task Force to deal with emergency situations arising due to natural disasters.

XI. Regular technical and financial audits of sample stretches subjected to maintenance under the umbrella of the Comptroller and Auditor General of the state concerned. The condition of roads should be captured through photographs and videography and such details should be uploaded suitably on the government website so that they are in public domain.

XII. Steadily move towards devolving maintenance responsibility in respect of rural roads to Panchayat Raj Institutions along with funds and functionaries together with the needed technical support. Start on this with undertaking pilots for routine maintenance of non-core rural roads with the joint effort of the PIU of the road agency and the relevant block/gram panchayat.

Implementation Efficiency

While rural road maintenance is not a complicated technical issue, it does require improved operational capacity on the part of the road agency in the area of planning for maintenance and prioritizing in the face of resource constraints, ability to manage the procurement process, supervision of work done by contractors and performance evaluation of the road network. Human resource development and capacity building are to be an integral and continuous activity of the road agencies for efficient and cost-effective delivery of the road maintenance programmes. The following policy actions for achieving efficiency in delivery of maintenance of the rural road network may be mandated by the state government.

XIII. Require the road agency to formulate a calendar of training programmes for its technical officers at various levels to enhance their skills in planning, procurement and supervision of maintenance works for rural roads. This should include study tours to national/international best practice examples.

XIV. Support in providing outreach programmes in enhancing the training facilities for Class C and Class D contractors in implementation of maintenance works. For this, the Contractors Association may work out the details of training modules, training providers including on-the-job exposures in close association with the road agencies. Such modules could be in the form of booklets / handouts in various maintenance operations as also in audio-visual mode.

XV. Require the road agency to identify and pilot innovative and cost-effective technologies in maintenance operations. The equipment industry could be requested for coming up with a dedicated small Mobile Maintenance Unit for rural roads. Such units could even be placed at the disposal of PIUs who could provide the same to small contractors/entrepreneurs on hire basis.

XVI. Require the road agency to undertake road user satisfaction surveys on its rural road network and put the result on the website.

TECHNICAL CONSIDERATIONS

Functional requirements of rural roads

The main function of rural roads is to provide access. As such, rural roads have a distinctly different function from the main arteries of a road network. While highways are designed to cater for high levels of traffic, travelling longer distances at higher speeds, the main purpose of rural roads is to provide a reliable connection throughout the year between local communities and the main arteries in the road network. Since traffic volumes are low and the fact that local roads are shorter, there is no demand for very high design standards on this part of the network. However, they need to be well engineered.

Axle loads

An important role of rural roads is to facilitate the transport of agricultural produce from farm to market. The transport is normally organized through the use of trucks. Such traffic requires properly engineered roads with adequate consideration given to the pavement design and cross-drainage structures. The pavement and cross-drainage structures need to cater for the same axle loads as the rest of the network.

Dealing with excessive traffic

When establishing new connectivity in rural areas, it is often difficult to predict the resulting traffic once construction works have been completed. Increased traffic volumes may dictate higher designs standards than to which the road was originally built. If this is not done, there is a risk that maintenance works becomes ineffective due to the inconsistency between the road design and traffic loads. A lot can be done by strengthening the pavement to cater for an increase in traffic, and is probably the most common solution. Considering the uncertainty involved in predicting future traffic when building new roads, it is therefore useful to have a clear strategy for stage construction in the cases where traffic increase to unexpected levels rather than overburdening the maintenance programme.

Surface

Most rural roads are either earth roads or provided with a gravel surface, which is often adequate on roads with very limited traffic. The most important components of such roads are those

related to drainage, since the main wear and tear is caused by rainfall. Where traffic numbers are higher, it is necessary to consider more durable pavements including a bituminous surface seal. Bituminous seals provide a more durable surface which is less prone to erosion from traffic and surface water. Both at the time of original construction and while undertaking periodic maintenance of road surface, the requirement of skid resistance should also be considered to reduce risk of aquaplaning which is a safety hazard.

Drainage

A key design parameter determining future maintenance requirements is the drainage system. The drainage system needs to cater for intensity of rains, evacuating surface water in a controlled manner without causing erosion or silting of road components or surrounding areas. Equally, the drainage system needs structures for streams and rivers crossing the road alignment. The cross drainage structures are designed for peak flows during the rainy season to avoid causing any damage to the road. Investing in proper drainage is therefore an important preventive measure to limit future maintenance demands.

Road safety

Road maintenance works essentially aim to preserve the design and quality standards applied when the road was built. This principle also extends to the safety measures installed as part of the road design. This implies that signage and line markings, speed regulating and other measures need to be given due attention also during planning and implementation of maintenance works. Some road safety concerns can be dealt with through interventions such as additional signage and speed regulating measures. Very often, such measures are simple and inexpensive to install and can be included in on-going maintenance programmes

Classifying the condition of the road

An overall assessment of the condition of the road network is useful for long-term planning and budgeting purposes. Keeping updated records of the overall condition of the road network can over time confirm whether the budgets are used in an effective manner which preserves the total asset value of the network. Whether the road is in good, fair or poor condition indicates what type of interventions is required in order to reach the desired service levels expected by its users. Roads in good or fair condition would be characterized as maintainable roads and are included in the annual maintenance programmes. Although, poor and very poor condition roads may have some assets worth maintaining, they need significant reconstruction or improvement works in order to reach desired service levels. Equally, their poor condition renders most common maintenance activities useless resulting in limited impact since the key functional standards of the road are not in place.

ROLE OF TECHNOLOGY IN OPTIMIZING SOLUTIONS

There is considerable scope for increasing efficiency in road maintenance by adopting work methods and approaches relying to a large extent on locally available resources. A combined use of labour and machines often provides the most appropriate solution. Certain maintenance tasks are more effectively carried out using machines, while others work activities are best carried out using manual labour. The most appropriate technology depends on the nature of the work and the availability of labour and equipment in the area. Most routine maintenance activities consist of work that requires limited amounts of equipment, mainly relying on basic hand tools and manual

labour. When such works are carried out on a regular basis, the amount of work required on a road in good or fair condition is limited.

Engaging local contractors in road maintenance is not only boosting the local construction industry, it is also useful in terms of building local capacity to deal with emergency maintenance works. Local firms with a competence in road maintenance works can be mobilized more easily and quickly when an emergency occurs and traffic access needs to be restored.

The technology for maintenance also requires to be modernized. Micro surfacing, Slurry Seal, Chip Seal and use of emulsions in sealing of bituminous surfaces are promising options. The road agencies in the state need to identify relevant technologies that could be applied to their rural road network in a cost-effective manner. Thereafter, the pilot demonstration projects may be undertaken in the first instance. On successful performance, such technologies need to be disseminated and up scaled not only for the benefit of its own state but also for other states across the country. The Standing Committee on Technology Initiatives set up by the National Rural Roads Development Agency under the Ministry of Rural Development, Government of India is supportive of such initiatives.

CONCLUSION

The challenge before us is both expansion of the network to provide road links to unconnected habitations and at the same time maintenance of the existing vast rural road network built at huge cost to the economy over the past over fifty years. A balance between road building and road maintenance has to be achieved. Timely upkeep and maintenance would help in availability of roads for passage of traffic continuously particularly in monsoon, reduce time of travel besides reducing rate of deterioration and adding to safety of road users. For sustainable maintenance of the road assets, strong political will backed with administrative and technical support is required. There is evidence of increasing awareness and commitment to maintenance by the States in the recent years. The tempo needs to be built up and continued.

REFERENCES

1. Development of a sustainable rural roads maintenance system in India –Key Issues: Ashoke K. Sarkar
2. Managing Maintenance of Rural Roads in India: NRRDA
3. Managing Maintenance of Rural Roads - Guidance Note for States: NRRDA
4. Policy on Maintenance of Rural Roads - Guidance Note for States: NRRDA
5. Rural Roads: J.K. Mohapatra and B.P. Chandrasekhar