

# An Investigation on final provider lifetime of rural roads

1.Jyothi.Bantu, 2. J.Naresh M.tech, 3.Ch.Manikanta Reddy M.tech

<sup>1</sup>M.Tech , Department of Civil Engineering, Anurag Engineering College,Kodad

2.Assistant Professor, Department of Civil Engineering, Anurag Engineering College,Kodad

3. Assistant Professor, Head Of Department of Civil Engineering, Anurag Engineering College,Kodad

## Abstract

Road construction work is well documented in India through an extensive library of technical guidelines, manuals and specifications. As such, the quality standards of road works are well detailed and resulting in high quality outputs reflecting the functional objectives of such guidelines. Road maintenance forms part of the works carried out to provide adequate transport infrastructure. From a technical point of view, there is no shortage of technical guidance on how the works should be carried out. The challenge seems to be more related to how maintenance should be organized and when it should be carried out.

The technical aspects of road maintenance are addressed in several good publications guiding the provision of a functional rural road network in India. A number of these documents are referred to in this Guide. The intention of this document is however not in any way to replace any of the literature currently available on this topic but rather to

complement it by presenting a series of good practices and management arrangements that have proven effective in terms of providing timely maintenance to rural roads.

Observations regarding rural road maintenance practices in this document are based on findings from an extensive situation analysis carried out by the ILO in the states participating in the Rural Roads Project as well as earlier studies carried out in India and elsewhere. As such, it includes lessons learnt and best practices from within the country and elsewhere.

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. Finally, it is recognised 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 Guide has been prepared with inputs from the technical assistance team of the ILO in close consultation with technical staff from the various road agencies in the participating states of the Rural Roads Project.

## INTRUDUCTION

This paper is concerned with rural road maintenance in the Asia region. The term “rural roads” is often used imprecisely. Some countries use it to define all roads which are not national or secondary roads. Others lump together tertiary roads, which are part of the publicly owned network, with other local roads which are not included under the responsibility of the government. In this paper rural roads have been defined as all public owned roads whose primary purpose is to provide direct access for rural village and communities to economic and social services.

Since the early 1980s massive investments have been made in rural roads. There were several reasons for this. In the first place it was a natural extension of investment into the lower parts of the road networks given the major investments that had been made in the national highways of most of the countries of the region. It was

therefore a logical step to develop the whole of the road network.

Underlying this was a belief that rural roads and the vehicles that traveled on them would provide the catalyst for increased economic activity in the rural areas. It also responded to the change in development thinking towards a belief in the necessity to develop the rural areas so that agricultural production is stimulated and to ensure that jobs and livelihoods are created locally to limit the urban drift. The development of the rural road network was seen as, if not the prime mover in this, certainly an important facilitator. Indeed the justification for rural road investments was, and to some extent still is, based on their effect on the rural economy.

With the emphasis on rural development came a major investigation of the dynamics of the rural areas. This included an assessment of the role of rural transport in the economic and social activities of the rural population. It became clear from this work that rural transport involved much more than roads and motorized vehicles and that it had a major part to play in the social activities of the rural population.

The investments made in rural roads therefore seemed to be justified not only in purely transport planning terms but also in both economic and social returns that could be expected from these investments.

This new investment in rural roads was almost totally concentrated on new



construction and improvement works. The fact that the expansion of the road network would require additional funds for its maintenance was, if not ignored, considered a separate issue that could be dealt with at a later stage. Unfortunately this coincided with several other factors which contributed to a lack of concern for maintenance.

Firstly, the funds for road construction came from the capital development budget whilst funds for maintenance were expected to be sourced from government recurrent budgets. Often the investments for road building were financed by bilateral donors or from loans from the international development banks. Whilst the funding agencies often insisted that conditions were included in the agreements regarding the Governments' commitment to maintenance, limited efforts were made to enforce such commitments. If the maintenance dimension was raised in relation to these programmes, it was commonly referred to as a government commitment without any further concerns to either funding or to the capacity to ensure that maintenance actually took place.

Secondly, the introduction of maintenance on these roads was not considered a serious problem, in the sense that there was very little money involved and it was often assumed that the authorities would automatically take on this responsibility. Politicians however were more interested in opening new roads than maintaining existing ones. Public road

building agencies were also largely unaccountable for the problems caused by the lack of maintenance. In addition, rural road maintenance did not provide an interesting career path for engineers.

Finally, there was little understanding that effective maintenance required a certain level of technical and administrative capacity. In general, this did not exist to any significant degree as maintenance was considered as a secondary issue.

It should be added that, often, maintenance is not considered as a recurrent, preventive activity but a curative measure when the road has significantly deteriorated.

The dilemma posed by the major investments in rural roads came to a head in the early 1990s. It became clear that the investments that had been made were not providing the benefits that had been predicted. Several reasons were postulated for this amongst which was the lack of understanding that benefits would not accrue if complimentary activities to the road investments were not implemented in parallel with the road improvements. However, it was also becoming apparent that the burden that the increased network had placed on the recurrent budgets was too much for it to bear. Consequently, roads were deteriorating at such a rate that benefits were being lost again.

Other issues also played a part. Decentralization was becoming the order of the day in many countries in the region. This



process was often carried out by transferring responsibilities for centrally based agencies to local authorities without at the same time transferring the required financial resources. The technical and managerial capacity at the local level to provide road maintenance was insufficient. The limited funds available for road maintenance were often used for other activities as, in a cash deficient situation, local authorities commonly placed greater emphasis on road building activities. The basic problem however was that the road network was growing at a greater rate than the recurrent budget could deal with.

It would be simple to say that the problems of lack of maintenance are caused by a lack of understanding of the need for maintenance. However, there are many examples of effective maintenance systems being put into place prior to the growth of the rural road networks in the 1980s and early 1990s. A considerable body of knowledge existed on the benefits of effective maintenance. As early as 1988, the World Bank asserted that one dollar spent on maintenance will save four spent on rehabilitation.

## Definitions and Understanding of Maintenance

The basic objective of road maintenance is implicit in the word itself. It is done to ensure that the road that has been constructed, or improved, is maintained to the extent possible in its original condition.

All roads require maintenance as they are subjected to traffic and the forces of weather. Even with the highest possible quality of construction, maintenance is essential to get optimum service from the road structure during its life period. By applying preventive maintenance, the deterioration of the road and all its components can be slowed down and thus postpone the need for costly investments in rehabilitation.

Maintenance requirements depend upon a number of external factors such as traffic, terrain, soil types and climate. The need for maintenance is also very much determined by the original technical designs applied during the construction of the road, and the quality of the works carried out during the construction works. Depending on these parameters, it is possible to devise maintenance solutions and corresponding management systems which optimize maintenance costs and efforts.

## Classification of Maintenance

The effective organization of maintenance is based upon the concept of damage control. With timely interventions based on regular inspection of the road network, works are planned and carried out at an early stage to counter the detrimental effects of traffic and weather.

A central part of road maintenance works is to get the water away from the road structure as quickly and efficiently as possible. Effective measures against these forces need to be installed at an early stage



during the original design and construction of the road. With a well-designed road, a major function of the maintenance works is to ensure that the drainage system continues to operate effectively.

Maintenance activities are commonly categorized in two distinct groups, depending on the location of the actual works. Off-carriageway works are mostly related to maintaining the drainage system, and halting any damages to the road components outside the road surface. This means that the side slopes, all drains and cross drainage structures are kept in a good condition that permits the free but controlled run-off of water away from the road. The second group of maintenance activities relate to road surface repairs. This work mainly consists of maintaining a good running surface on the road, free from any obstructions and damage and with the necessary cross-fall to secure proper drainage of the surface.

## FAILURE OF RIGID PAVEMENTS

The defects apparent on rigid pavements may be due to deterioration of the concrete, restrained volume-change stresses, or overload evidenced by pumping and/or structural breaks.

The basic distress in concrete roads is formation of cracks. Uncontrolled transverse and longitudinal cracks that occur during concrete pavement construction are due to various reasons and full-depth repairs are the only solutions in most of the

situations. Further, unfortunately some concrete pavements do not crack at the saw cuts and instead crack at unplanned locations. The common terms for these early cracks are “random cracks” or “uncontrolled cracks.” The reasons for uncontrolled cracks are due to factors like saw timing, saw cut depth, weather & ambient conditions, conditions of base and sub base, quality of concrete, joint spacing, rapid evaporation of surface moisture and so on.

Concrete structure is an assembly of operating systems that experience temperature, air pressure and vapor pressure gradients. Seasonal and diurnal fluctuations in outdoor conditions provide variability and direction of the gradients and these operating conditions can aggravate or accelerate premature failure of the structures. Concrete roads are vulnerable to attacks from atmospheric agents.

Collepari in his technical paper has mentioned that delayed ettringite formation (DEF) in the hardened concrete which occurs after months or years due to sulphate attack in rigid hardened concrete was responsible for cracking and spalling of concrete. The paper explained that the sulphate attack could be internal which occurs in a sulphate free-environment by the late sulphate ions release from either cement or gypsum-contaminated aggregates or could be external when environmental sulphate (from water or soil) penetrates into a concrete structure.

## SITUATION ANALYSIS





Rural roads are a fundamental element in the provision of access in the rural areas. However, such access has to be sustained otherwise the benefits will be lost. To be able to make meaningful suggestions regarding the provision of effective maintenance it is necessary to have an understanding of the current situation. This chapter looks at the physical, institutional and financial issues related to rural road maintenance in the region

### **The Road Network**

Roads are considered to be crucial to economic and social development. It is surprising therefore that the data on roads in the region are not only difficult to find but also questionable regarding their veracity. Data on the national highways is relatively abundant, however the further one progresses down the network the more difficult it is to find reliable statistics.

Rural roads form part of an overall network and they are dependent on the higher order roads to serve their purpose and vice versa. In the first place it is useful therefore to see rural roads in the overall context of the road networks of the region

### **CONCLUSIONS:**

Rural Roads form a major part of the total road network of a country. According to UN-ESCAP definitions on average 71 % of the total road length are rural roads. The definition of rural roads differs. The Asian ESCAP-study defines the connection from

villages to markets or to the nearest road of a higher category as rural roads, but also those which directly serve farms. The funding for Rural Roads follows quite different patterns: Sometimes no effort is made to mobilize funds for rural road maintenance, sometimes voluntary organizations are involved in funding. In some cases the agricultural sector pays for it through an agricultural levy. Emerging countries like Thailand or the Philippines allocate funds from Central Government on a per kilometer bases, decentralize the execution of works or allocate 20% to 25% of the national annual road maintenance budget for the Rural Roads It should be noted that, generally, no effort is made to handle rural roads individually or to establish cost-benefit analyses for them. The funding approach is a global one, sometimes more or less parallel to the political decisions on other rural infrastructures such as clean water or rural electrification. (Therefore funding and - eventually - the cross-subsidization procedures of other rural infrastructure measures may display possible solutions for the necessitated constant flow of funds). Maintenance of rural roads has been highly neglected over the years in India. However, with the huge programmes that have been undertaken in the recent years through PMGSY and Bharat Nirman programme, it is but natural that maintenance of these assets be taken seriously, otherwise the country will lose huge amount of money in the end. The initiative has already been taken by the National Rural Roads Development Agency



(NRRDA) in this regard. However, it will take some time to come up with a proper management programme as many issues are involved in terms of funding, division of responsibilities among various departments and levels of the government, training of personnel and development of manuals. There is need to learn from the experiences of other developing countries and efforts need to be made to involve social development aspect in the maintenance of rural roads. In addition, the involvement of the community is to be ensured to make the rural roads maintenance sustainable.

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