

# A MIDDLE PATH FOR SUSTAINABLE ROAD DEVELOPMENT IN INDIA

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## ABSTRACT

Road development enfold activities such as Planning, Construction, Management and Maintenance of a road network. Technology of road construction, maintenance and operations in advanced countries, with emphasis on automation, is copied in developing world, rather unmindful of its intemperateness. This is inevitable in some sense, the world having come far closer today, than ever before and coalesced into the metaphorical global village. However, for a country such as India, the technology of road construction and maintenance, as is employed in the developed countries, needs to be modulated to its peculiar problems of scarcity of capital and abundance of labour and its predominantly rural setting. At one end of the spectrum of road development is the construction of high traffic density corridors in the form of multi lane national highways and expressways connecting the metros in the country. This is perhaps the sector more amenable for the adoption of the technology that embodies mechanization, automation and high-end specifications. However, the categories of roads connecting smaller towns and bringing together the population that resides in the villages that lie scattered all over the country is a segment that needs to be treated differently. Development of these roads is more suitably done using what can be aptly termed **intermediate** or **appropriate technology**. In a lighter vein this is the adoption of the middle path so vehemently propounded by the Buddhist philosophy. The article deals with the various facets of such intermediate technology along with a few case studies. Successful execution of road construction in the rural areas in Maharashtra, under the Employment Guarantee Scheme combining labour intensive methods with mechanization, provides a perfect example of sustainable road development. Submersible-bridge structures permitting interruption to traffic only for a small duration in the flood seasons, is another example of cost effective and functionally satisfactory solution on relatively unimportant roads. The article proposes to bring out such cases of application of the appropriate or intermediate technology in the state of Maharashtra, considered as a progressive state in India. All these case studies strongly suggest the adoption of the middle path towards a sustainable road development.

## 1. INTRODUCTION

India is a predominantly rural country, with over seventy percent of the population residing in numerous villages across its length and breadth. While that is so, the pace of urbanization in the country is also staggering; with almost all the cities growing at a mammoth pace. Some of the metropolitan town such as Mumbai have registered such a growth that they would qualify to take their place among the largest cities in the World. While agriculture remains the backbone of the economy, rapid industrialization has also been a hallmark of the development in the past quarter of a century.

With the policy of economic liberalization that the country adopted since 1991, awareness came to dawn about the need of a good road infrastructure without which any significant economic growth was impossible. A massive road development programme was launched in the later part of the nineties. A chief component of the programme has been the widening and improvement of the national highways. The national highways are the

network of roads that connects the major metros and important commercial centers all over the country. Although the national highway network carries almost 40 percent of the traffic in the country, it constitutes a tiny fraction (2%) of the road network in the country. For the optimum utilization of this network as also to enable provision of accessibility to the rural populace, a good feeder road network is necessary. The development of this feeder network is the responsibility of the provincial governments.

The national highway network aims at providing a high speed travel between major cities stretching to thousands of kilometers across the length and breadth of the country. It follows obviously that this road network in all its facets viz. construction, operations and management would be deserving of and amenable to the most modern technology. The construction works would usually be large-scale works, both capital and machine intensive. Being high traffic corridors, it is relatively easily amenable to the employment of private finances through the BOT mechanism. In fact, the an exclusive road fund that ensues out of a cess on diesel and petrol sold in the country finds its application in the programme of development of the national highway network, a project that is termed "National Highway Development Programme"( NHDP).

However, road development strategy for a developing country such as India cannot be modeled entirely on the lines of the road development in the developed world owing to attributes that set most developing countries apart from the developed ones. In the context of interurban roads, the need of providing accessible road network to scattered rural habitations, scarcity of capital, abundance of labour, traditional non motorized means of transport are factors that cannot be dismissed out of consideration in the development of a sustainable road development strategy.

## **2. THE MIDDLE PATH**

The term middle path comes from the teachings of Buddha. Buddha experienced in his early life, both over and under indulgence and later through enlightenment, came to the knowledge that both these extremes do no lead to the attainment of true *Nirvana* i.e. salvation. In the same vein, for a country such as India, the strategy of road development has to look for the middle path that steers clear of the capital intensive road development, while it attempts to improve the pastoral and archaic communication that is out of tune with the modern times. Indeed , there is the middle path that truly facilitates road development , and this article aims at unfolding some features of such middle path , in the context or road development in the state of Maharashtra, a major state in the country, with population well over 120 millions and an area of almost 0.3 million sq. km.

It is regarded that the transport technology innovations now found worldwide were developed in the north and exported very quickly to the countries of the south where the social, economic, political and environmental conditions were or are usually quite different. It is also alleged that scant regard has generally been paid by those responsible (in either the exporting or the importing country) to the appropriateness, affordability and maintainability of the transport technologies in these very different contexts.

The purpose of this article is to demonstrate the modulation of the technology to the needs of the road development requirement in the context of sustainable and meaningful development that enhances the overall quality of life in a country such as India. This can be aptly termed as the middle path of road development. The various case studies

bringing out distinctly the features this middle path, that enhance sustainability of road development in the state of Maharashtra; are covered in the following:

### 3. LABOUR INTENSIVE METHODS

#### 3.1 Employment Guarantee Scheme

The rural population India comprising 720 million (which is over 70% of the total population of 960 million) lives in over six hundred thousand villages. In spite of a ceaseless and substantial migration to towns, which reduces marginally its percentage, the rural population continues to increase in numbers. It is also noteworthy that over 30% of India's population is below the poverty line, and most of these people reside in villages. The objective of any rural development programme has, obviously to be the amelioration of the poverty in the rural populace. Employment generation in the rural areas has, therefore, to be central to any developmental activity; including road development. The Employment Guarantee Scheme (EGS) implemented in the state of Maharashtra is a fitting example of such a sustainable development. While developmental activities that come within the fold of the EGS comprise programmes of soil conservation and small irrigation, water supply programmes; the major component of developmental activity carried out under the EGS has been construction of rural roads.

#### 3.2 Aims and Objectives of the EGS

The employment Guarantee Scheme in the state of Maharashtra was started in the year 1972, through the enactment of the Employment Guarantee Act. The principal aim of the EGS is to provide a gainful and productive employment to the people in the rural areas; who are in need of work and are not able to find it on their own. The Guarantee of work under the scheme is **restricted to the unskilled manual work**. Creation of durable community assets is a fundamental objective of the scheme. The wages paid to the workers are linked to the quantity of work done; and this ensures the element of productivity in the scheme.

#### 3.3 Salient Features of the Scheme

The following are some of the salient features of the Employment Guarantee Scheme:

1. All adults residing in the rural areas are eligible to be benefited from the scheme.
2. The guarantee is given at the district level. Nevertheless, the person, who demands the work, has no right to a **particular** work. However, operationally, works are provided around the villages where these persons reside
3. Works are implemented through the Government agencies such as the Public Works Department.
4. Only such works are permitted under the employment guarantee scheme that have an unskilled labour component forming more than 50% of the total cost of work.
5. The labourers are paid on the basis of the quantum of work they carry out. The rates of wages are so fixed that a diligent worker working for seven hours should draw a wage on par with the minimum wage fixed for the zone in which he resides.
6. Amenities such as drinking water facilities, shelter for rest at the time of interval of work, first aid box, creches *etc.* are provided to the labourers at the sites of work .

7. Accidents compensation benefits in the unfortunate events of accidents or deaths of workers; maternity benefits are also offered to women workers in the form of leave with wages.

### 3.4 Planning and Organization of the Works

The scheme is operated through a three tier administrative structure. At the state level, the planning department is the overall administrative authority to implement the scheme. At the district level, the district collector looks after the operation of the scheme. The individual departments e.g. Public Works Department (PWD) looks after the field level implementation of the scheme.

### 3.5 Resources

Government levies special taxes such as tax on professions, trades and employment; additional tax on sales in the state (and similar other surcharges) towards raising resources for the financing of the EGS; and distributed through the budgetary mode.

### 3.6 Road Development through EGS

The road development in the state (as also in the country) is shaped according to the road development plans prepared in the state spreading over every two decades. Road works that feature in the rural roads category in the road development plan are usually taken under the EGS. Generally the components of the road such as earthwork, water bound macadam base course on the rural roads are taken up under the scheme. The excavation works in borrow pits, activities of spreading of the earthwork in roads; stone-metal breaking to the required sizes are those components of the road work that are amenable to labour intensive methods. The unskilled components of the works such as compaction are taken up through small sized contracts. It is seen that labour intensive component is more than 50% of the total cost of the road work, in keeping with the fundamental requirement of the scheme.

### 3.7 Poverty Alleviation:

One of the chief aims of development in a country such as India is that it reaches the poor, particularly to rural poor. With abundant labour available in the countryside; Labour intensive methods in rural road construction make a profound economic sense. Road development through EGS in Maharashtra, has thus been able to meet the needs of rural road development, while making an effort at alleviating rural poverty by providing employment generation in the rural areas.

## **4. SUBMERSIBLE BRIDGES**

### 4.1 Connecting Villages by all weather Roads

One of the chief aims of the road development planning has been to provide connectivity to all the villages by roads. However, such connections would involve a large number of bridges over small, medium and large rivers; and the cost is typically over 40% of the cost of the road and higher if large rivers have to be crossed. Most rivers in the state are seasonal and high floods occur for small durations in the rainy season. It is impossible to contemplate bridges that clear the high floods from the standpoint of costs. A cost effective solution would be to construct bridges of such heights that would enable

operation of the bridge for most part and restrict interruption to traffic when floods pass over the bridges for at most a few hours at a time; and such interruptions not exceeding to about six times in an year. Such medium height bridges are termed as submersible bridges and have proved an enormously cost effective solution in rural road projects. In fact some submersible bridges have been constructed even on relatively less important district roads; where the costs of construction of fully high level bridges would be prohibitively high.

#### 4.2 Permissible Interruptions to traffic

The criteria adopted as regards the permissible interruptions to traffic restricts the number of interruptions to six times an year for any bridge. However, the duration of such interruption is to be restricted to three to six hours at a time for important roads and seventy two hours in case of rural roads.

#### 4.3 Cost Considerations

From the perspective of economic viability, a submersible bridge is usually provided where the cost of construction of a submersible bridge is less than about sixty percent of the cost of a high level bridge clearing the highest flood.

#### 4.4 Design and Construction Features

Most of the submersible bridges have solid slabs or multi girder superstructure whereby the weight of the superstructure can resist the forces of water current, floating debris and buoyancy. The upstream faces of the superstructure is usually rounded to reduce the obstruction to the flow. Such bridges are invariably provided with discontinuous kerbs and removable type railings; so that during floods, these cause little or no obstruction to the flow. Most of the bridges are without bearings; and in larger span bridges, elastomeric bearings are used. Approaches are usually blacktopped for full width to prevent damages by overtopping during floods. Additionally, the provisions of the design guidelines/specifications in respect of bridges obviously apply to such bridges.

#### 4.5 Variations Paved Dips (Pipe Causeways/Arch causeways):

There are instances where the rural roads cross fairly large streams with bed widths exceeding 100m and the construction of a submersible bridge would also amount to considerable investment that would prevent the project being funded from the budgetary grants. In such cases, paved dips almost flush with the bed of the river, or alternatively a pipe causeway where the height above the bed is about 1.2 m; are quite common. These structures are highly cost effective and although these cause some interruptions during floods; these enhance the accessibility of the otherwise inaccessible rural tract. Figures provide pictures of some such structures having performed highly satisfactorily on large river crossings

#### 4.6 Bridge Cum Bandhara

With rivers flooding in the monsoon season that lasts for at best four months; the need to store the water for the post-monsoon season is felt intensely. A bridge structure is quite often combined with a small water storage structure to enable both a river crossing structure as well as a small water storage structure. Guidelines for structures incorporating the elements of safety, functional performance and economic viability are evolved. A typical bridge cum bandhara is indicated in the the figures.

## **5. ROAD DEVELOPMENT PLANNING :**

### **5.1 Multi-pronged Strategy**

Roads within the jurisdiction of the state government fall in the following categories

1. Major State Highways (Roads connecting important towns)
2. State Highways (Roads connecting district places)
3. Major District Roads ( Roads connecting important places within a district)
4. Other District Roads and Village Roads (Rural Roads)

Normally, a road development would lay almost its entire emphasis on the development of the roads that carry heavy traffic; since that fuels the growth of the economy. However, in a country such as India, it would be a skewed approach as it would not ensure road development in an equitable manner. With a view to accomplish a balanced road development; the state's road development planning focusses both on the high end roads such as the state highways, which form the arteries of the state's economy , as so on the village connectivity programme by earmarking considerable resources on the development of rural roads. Also, a unique mechanism has been developed that ensures that the various regions and the districts of the state benefit equitably from the road development. The road density of the state is identified and a separate budget provision is earmarked for the districts where the road density is lower than the state's average; whereby an attempt is made to remove the deficiency of road development in the regions and districts on a continuous basis. This is also a feature of the middle path followed for road development. For it embodies the pursuit of road development both from the aspects of commercial merit and equitability.

## **6. CONCLUSION**

Narrated above in brief, are some of the features of road development in Maharashtra state of India, whereby the features of mobility, accessibility and equitability of roads is attempted in the road development. This may aptly be regarded as the adoption of the middle path of towards road development.

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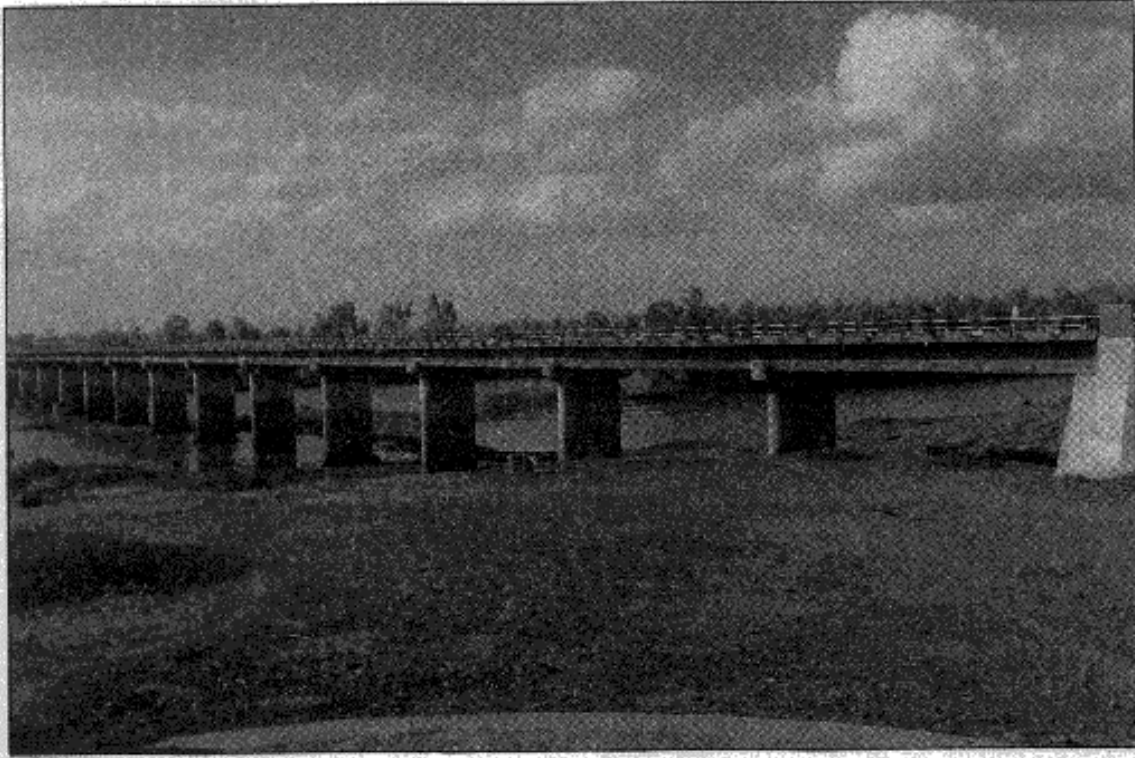


Fig. 1 : (A Typical Submersible Bridge)

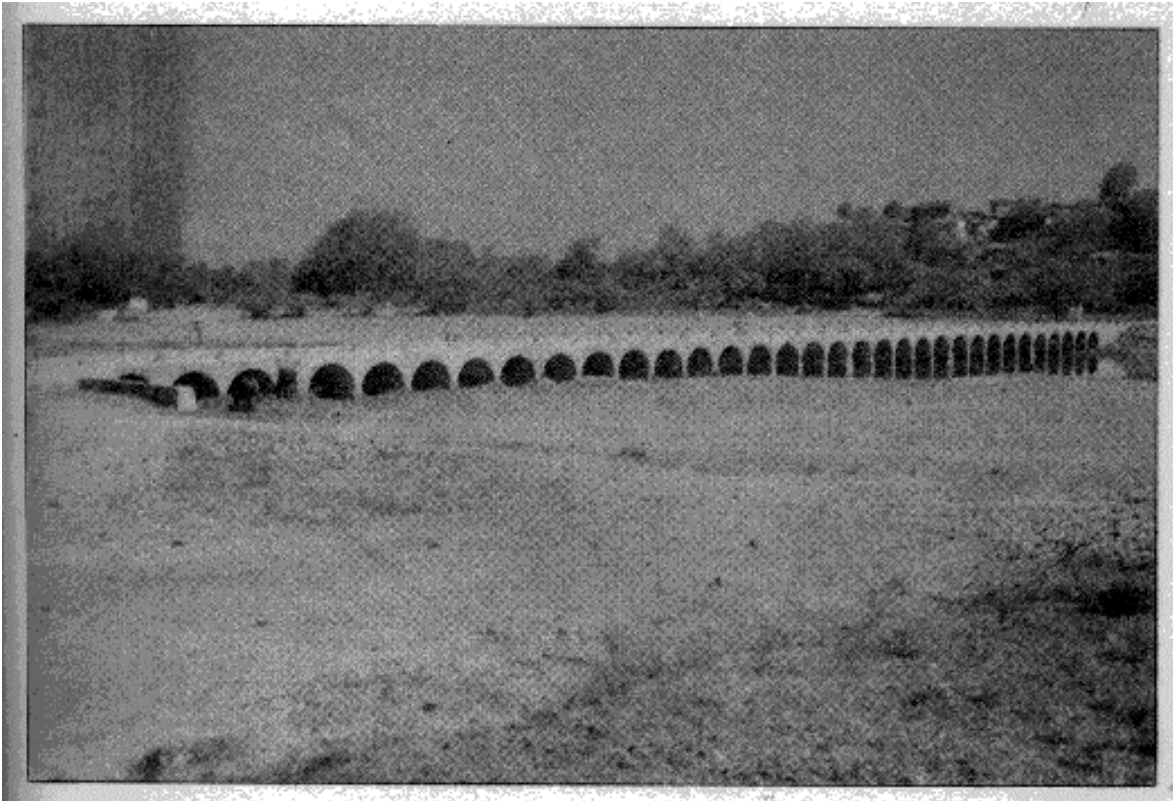


Fig.2 : A Typical Arch Causeway

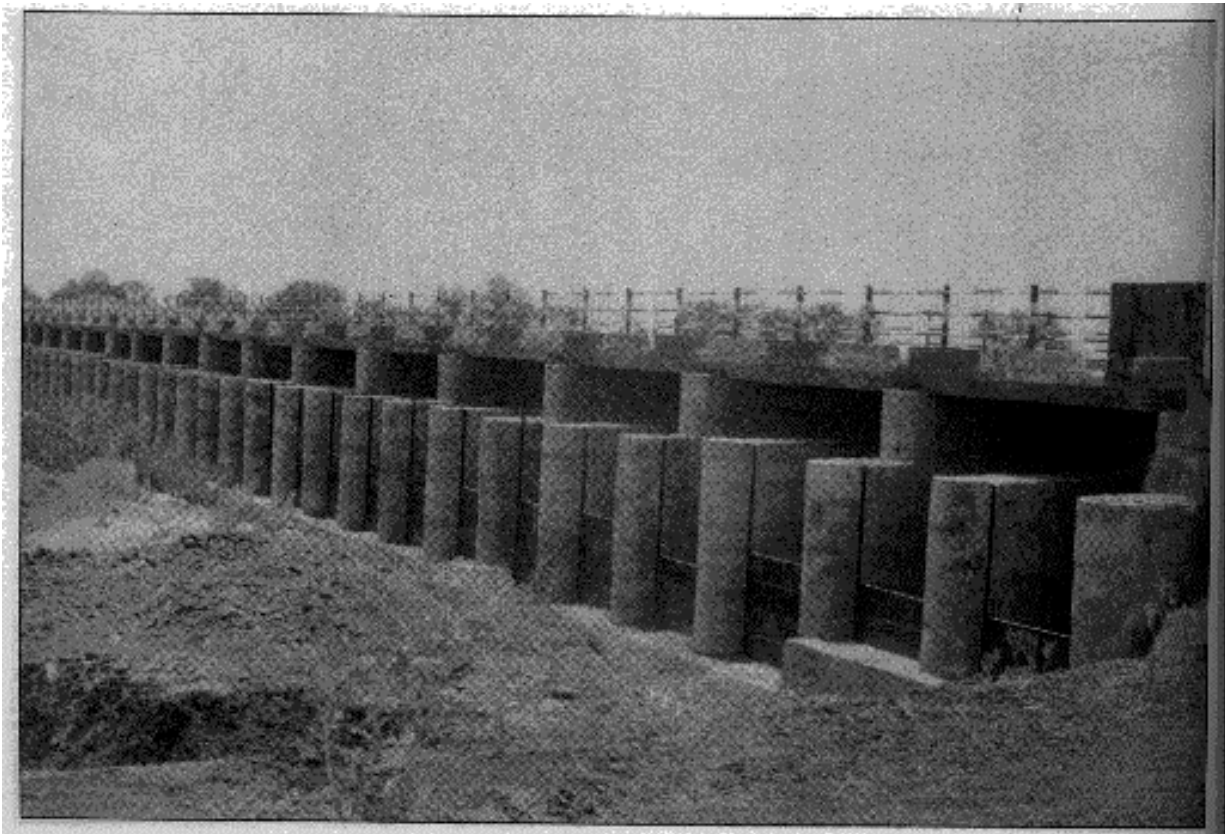


Fig 3,4 : Bridge cum Bandhara

