# TOWARDS SUSTAINABLE AND ENVIRONMENT FRIENDLY ROADS

For quite sometime, India has been promoting the cause of sustainable development of infrastructure for a better tomorrow. After liberalization of the economy, India has become one of the fastest growing nations in the world. The rapid economic growth has also had a significant impact on the social front. However, it is widely felt that the rate of social development needs to escalate further and economic growth needs to be backed by sustainable development of roads. Not only in India but almost everywhere in the world, 'sustainable development of roads' is getting the priority of the Governments. Every international agency – from the World Bank to the UNICEF – and almost every country is talking of it. But what does this sustainable development mean? Sustainable development of roads is, 'the development that meets the needs of the present, without compromising the ability of the future generations to meet their own needs'.

Sustainability can never be absolute. In the beginning of civilization; there was only environment and no worthwhile development. Clean water and fresh air were in abundance. The developmental requirements encroached upon the environment. With faster pace of development, environment also started getting degraded rapidly. Concern for the environment protection is too obvious and a balanced approach is therefore, required. In view of this, the measure of sustainability in a developing country like India should be different from a developed country like USA. Developing countries, however, can be wiser by taking suitable lessons from the experiences of developed world to control environmental degradation. They need not mindlessly ape the developed countries.

Roads are known to be the worst pollutants. All the motorized vehicles emit lot of pollutants like Carbon Dioxide, Carbon Monoxide, Sulphur Dioxide etc. With the increasing use of motorized vehicles, environmental degradation is also taking place at a faster rate. Non-motorized transport including pedestrians, bicycles are the alternatives which must be integrated into our transportation planning process to create a balance between the development and environment. Despite recent growth trend in motorized vehicles, particularly two-wheelers, the fact remains that walking and cycling trips still count for 40-60% of the total trips in several large cities in the Indian sub-continent. In a country like China, it could be even 70% or more. Such human power utility vehicles, which are environment friendly, affordable to the poor, cause less air pollution and provide reasonable mobility are crucial to improve sustainability in urban transportation. The role of non-motorized transport in developing sustainable urban transportation system has also been brought out earlier in Editorial of the June, 2007 issue of Indian Highways.

The process of economic transformation in recent years is seen to have involved a rapid increase in the scale of human pressure on the environment, particularly in terms of urbanization and industrialization. Threats to the environment can be linked directly with these rapid changes in several ways. The growth of urban areas includes creation of road infrastructure facilities keeping an eye on environment, aesthetics, beauty aspects etc. These activities often involve destruction of various species of flora and fauna, thereby adding to environmental degradation. It is worthwhile to note that availability of all natural resources like aggregates, bitumen, cement and even water cannot be assumed till eternity. There is, therefore, an urgent need to conserve them. Infrastructure development will inevitably involve

some amount of land clearing, cutting, filling, river-training etc. However, if handled aptly, economic development and sound environmental management are complementary aspects of the same agenda

In recent times, the importance and use of Fly ash in concrete has grown so much that it has almost become a common ingredient in concrete, particularly for making high strength and high performance concrete. The use of Pozzolanas as concrete admixtures not only adds technical advantages to the properties but, also contributes to the environmental pollution control. The effective utilisation of Fly ash in concrete is, therefore, attracting serious consideration of concrete technologists and Government departments.

The utilization of Fly ash during 1993-94 was one million tonne only, as against a generation of 40 million tonne. Utilization of Fly ash has increased now to the level of 22 million tonne per year. The management of such a large volume of Fly ash and mitigation of its likely impact on environment as well as demand on land for deposition / storage is a mammoth task. To manage the quality level of Fly ash is an important task; because it may create problems if used without ensuring the desired quality level. On the other hand, Fly ash has proved to be a useful material for a number of applications with potential to conserve fertility of the soil, valuable minerals, substitute materials and inter-alia protection of environment. If not utilized, it may add to environmental hazard. Thus, there lies a challenge to convert the threat into an opportunity.

In addition to economic and ecological benefits, the use of Fly ash in concrete improves its workability, reduces segregation, bleeding, heat evolution and permeability, inhibits alkali-aggregate reaction, and enhances sulphate resistance. FHWA has been encouraging the use of Fly ash in concrete. One of the important reasons for using Fly ash in highway construction is to inhibit the expansion resulting from Alkali Silica Reaction. Two classes of fly ash are defined by ASTM on the basis of their chemical composition. Class F fly ash and Class C fly ash. The key difference between these classes is the amount of calcium, silica, alumina, and iron content in the ash. Use of fly ash as a partial replacement for Portland cement is generally limited to Class F fly ashes. Nearly all fly ash used in embankments are Class F fly ashes. Soil Stabilization can be done with both Class C and Class F fly ashes. Both Class F and Class C fly ash can typically be used as a mineral filler to fill the voids and provide contact points between larger aggregate particles in asphalt concrete mixes.

Strong public institutions and environmental protection policies seem to be essential. Policy reforms must focus on changing road construction practices, bridge construction practices, tunnel construction practices and other aesthetics practices so as to reduce drastically the amount of pollution, wastes and other environmental damage per unit of output. Environmental impacts need to be recognized; policies aimed at changing behaviour should rely heavily on economic incentives. Developed countries should assist in the transfer of less-polluting technology to the developing countries. These combined with other technical assistance, would help developing countries to avoid or at least reduce environmental degradation. Further, countries must take the lead in formulating and funding solutions to problems of worldwide concern, as they have been the primary culprits on environment spoilage. But, above all, unless and until the community strives in a concerted way to check population growth, no measure can work effectively.

The agenda for reform is large and comprehensive. Accepting the challenge to accelerate development in an environmentally responsible manner will involve substantial shifts in policies and priorities. It could be that road construction will become little costlier, after accommodating the environmental concerns. This need not be unduly avoided to save cost because, at the end it should become clear to everyone that humanity is not different from nature, but only a part of it.

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