

Eco Friendly and Sustainable Transportation

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Abstract

In this paper two aspects of eco-friendly transportation has been discussed. Transportation is a huge consumer of energy and resources and also a major source of environment pollution (basically air pollution). People tend to use motorized vehicle even for the short distances because of inconvenience and unsafe conditions for bicycling. This leads excessive use of fuel. Limiting the motorized transportation to a defined boundary is required to control the fuel usage and also to reduce site air and noise pollution. Green vehicles are very much energy efficient, pollution free and convenient mode for short distance travelling. But because of lack of facilities their use is not preferred. Eco-friendly transportation promotes use of such efficient vehicles by adequate provisions. Eco-friendly transportation is beneficial for the users as it keeps environment free of pollution and posses healthy living conditions. The use of green vehicle is one part of eco-friendly transportation, the other and most important aspect of sustainable transportation is the use of the waste materials such as fly ash, steel industry slag, paper industry waste in the construction of pavements, embankments of roads and rails etc. which are dangerous as far as the environmental pollution is concerned.

Key words: - Green vehicle, Eco-friendly or sustainable transportation, fly ash, Construction of pavements.

1 INTRODUCTION

~~Transportation provides assistance to~~ economic growth by making accessibility to resources and markets. It also improves quality of life linking persons to employment, health, education, recreation and other amenities. Thus, transportation plays a key role in economic and social development. Nevertheless, it has many spill-over effects such as congestion, safety, pollution and non-renewable resource depletion. The concept of sustainable transportation can be derived from the general sustainable development term that embraces all sectors of human activity. Efficacious and sustainable transportation is a key component to well-functioning and civilized societies. Indeed, both developed and developing countries are confronting critical issues in selecting and planning for their future transportation systems when there is a need towards sustainable development that balances accessibility, mobility, protection of human safety and environment. The concept of sustainable transportation is derived from these general terms that imply movement of people and goods in ways that are environmentally,

socially and economically sustainable. ~~Vehicle emissions contribute to~~ the increasing concentration of gases linked to climate change. In order of significance, the principal greenhouse gases associated with road transport are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). Road transport is the third largest source of greenhouse gases emitted in the UK, and accounts for over 20% of total emissions and 33% in the United States. Of the total greenhouse gas emissions from transport, over 85% are due to CO₂ emissions from road vehicles. The transport sector is the fastest growing source of greenhouse gases. Road transport also remains the main source of many local emissions including benzene, 1, 3-butadiene, carbon monoxide (CO), nitrogen oxides (NO_x) and particulates (PMs). Within urban areas, the percentage of contributions due to road transport is particularly high. In London, road transport contributes almost 80% of particulate emissions.

2 METHODOLOGIES

Now we will discuss the various

methodologies to be adopted for eco-friendly transportation. The first methodology in this regard is the use of Green vehicles and other is the utilization of waste materials causing environmental pollution in the construction of embankments for railway tracks and roads

2.1 Green Vehicles

A green vehicle or environment-friendly vehicle is a road motor vehicle that produces less harmful impacts to the environment than comparable conventional internal combustion engine vehicles running on gasoline or diesel. Green vehicles are powered by alternative fuels and advanced vehicle technologies and include hybrid electric vehicles, plug-in hybrid electric vehicles, battery electric vehicles, compressed-air vehicles, hydrogen and fuel-cell vehicles, neat ethanol vehicles, flexible-fuel vehicles, natural gas vehicles, clean diesel vehicles, and some sources also include vehicles using blends of biodiesel and ethanol fuel or gasohol. Several author also include conventional motor vehicles with high fuel economy, as they consider that increasing fuel economy is the most cost-effective way to improve energy efficiency and reduce carbon emissions in the transport sector in the short run. As part of their contribution to sustainable transport, environmentally friendly vehicles reduce air pollution and greenhouse gas emissions, and contribute to energy independence by reducing oil imports.

Table:- Comparison of several types of green car basic characteristics (Wikipedia.....2010)

Type of vehicle / power train	Fuel economy (mpg equivalent)	Production cost for given range	Reduction in CO ₂ compared to conventional	Pay back period
Conven	10-50	Low	n.a.	n.a.

tional ICE				
All-electric	Excluding battery cost: 200 Including battery cost: 10-50	High	55%	–
Hybrid electric	30-50	Medium		5 years

2.2 Conversion of conventional vehicles into Green vehicles

The conventional vehicles can be converted to green vehicle. A conventional vehicle can become a greener vehicle by mixing in renewable fuels or using less carbon intensive fossil fuel. Typical gasoline-powered cars can tolerate up to 10% ethanol. Brazil manufactured cars that run on neat ethanol, though there were discontinued. Another available option is a flexible-fuel vehicle which allows any blend of gasoline and ethanol, up to 85% in North America and Europe, and up to 100% in Brazil. Another existing option is to convert a conventional gasoline-powered to allow the alternative use of CNG. Pakistan, Argentina, Brazil, Iran, India, Italy, and China have the largest fleets of natural gas vehicles in the world. Diesel-powered vehicles can often transition completely to biodiesel, though the fuel is a very strong solvent, which can occasionally damage rubber seals in vehicles built before 1994. More commonly, however, biodiesel causes problems simply because it removes the entire built-up residue in an engine, clogging filters, unless care is taken when switching from dirty fossil-fuel derived diesel to bio-diesel. It is very effective at ‘de-coking’ the diesel engines combustion chambers and keeping them clean. Biodiesel is the lowest emission

fuel available for diesel engines. Diesel engines are the most efficient car internal combustion engines. Biodiesel is the only fuel allowed in some North American national parks because spillages will completely bio-degrade within 21 days. Biodiesel and vegetable oil fuelled, diesel engine vehicles are the best amongst the green vehicles.

2.3 Other alternative vehicles

Solar vehicles are electric vehicles powered by solar energy obtained from solar panels on the surface (generally, the roof) of the vehicle. Photovoltaic (PV) cells convert the Sun's energy directly into electrical energy. Solar vehicles are not practical day-to-day transportation devices at present, but are primarily demonstration vehicles and engineering exercises, often sponsored by government agencies. Wind-powered electric vehicles primarily use wind-turbines installed at a strategic point of the vehicle, which are then converted into electric energy which causes the vehicle to propel. Human powered transport includes walking, bicycles, row boats, and other environmentally friendly ways of getting around. In addition to the health benefits of the exercise provided, they are far more environmentally friendly than most other options. The only downside is the speed limitations, and how far one can travel before getting exhausted.

3 USE OF WASTE MATERIALS IN CONSTRUCTION OF ROAD AND RAIL EMBANKMENTS

This is another very efficient and scientific approach towards making the transport environment friendly or in other words to conserve the environment through sustainable transportation. Utilization of Fly Ash in Roads and Embankment Works Around 110 million tones of fly ash get accumulated every year at the thermal power stations in India. Internationally fly ash is considered as a byproduct which can be

used for many applications. Fly Ash Mission was initiated in 1994 to promote gainful and environment friendly utilization of the material. One of the areas identified for its bulk utilization was in construction of roads and embankments. Central Road Research Institute (CRRI), New Delhi, chosen as the 'Nodal Agency' for this activity, has undertaken many demonstration projects. Some of these are jointly with Fly Ash Mission (Presently Fly Ash Utilization Programme). As a result of experience gained through these projects, specifications for construction of road embankments and guidelines for use of fly ash for rural roads were compiled and have since been published by the Indian Roads Congress. Fly ash utilization in the country rose from 3 per cent (of 40 million tons) of fly ash produced annually in 1990s to about 32 per cent (of 110 million tons) of fly ash generated annually now. Out of this total utilization, about 22 percent, amounting to 7.75 million tons, was used in the area of roads and embankments last year. As fly ash is very minute, it tends to remain airborne for a very long period leading to serious health problems as the airborne ash can enter the body. It causes irritation to eyes, skin, and nose, throat, and respiratory tract. Repeated inhalation of fly ash dust containing crystalline silica can cause bronchitis and lung cancer. An industrial by-product that is otherwise waste, fly ash is environmentally friendly because it is recycled and has low embodied energy. Broad objective of Fly Ash Utilization Programme is Confidence Building through "Technology Demonstration Projects for Fly Ash Disposal/Utilization Technologies". The use of these by-products offers environmental advantages by diverting the material from the waste stream, reducing the energy investment in processing virgin materials, conserving virgin materials, and allaying pollution.

Utilisation of fly ash will not only minimize the disposal problem but will also help in utilizing precious land in a better way. Construction of road embankments using fly ash, involves encapsulation of fly ash in earthen core or with RCC facing panels. Since there is no seepage of rain water into the fly ash core, leaching of heavy metals is also prevented. When fly ash is used in concrete, it chemically reacts with cement and reduces any leaching effect. Even when it is used in stabilization work, a similar chemical reaction takes place which binds fly ash particles. Hence chances of pollution due to use of fly ash in road works are negligible.

4 THE USE OF PAPER MILL SLUDGE FOR STABILIZATION OF SAND ROADS

A Method of Stabilizing Loose-Sand Road surfaces with paper mill sludge in aggregate-deficient areas has been developed. Roads in the Chequamegon National Forest have been treated with paper mill sludge from the James River Corporation (formerly American Can Company) since 1977. These roads were constructed in vast areas of glacial outwash sands that consisted mostly of one-sized particles. Aggregate is greatly needed in these large areas and must be imported at a high cost. The sludge is a waste product of a paper recycling process, is available free of charge, and is an effective stabilizing agent. The clays and wood fibers in the sludge give the sand cohesive properties and fill the voids that result from the sand's uniform gradation. The characteristics of the sand-sludge mixture, its application and incorporation, the performance of roads treated, and its use in conjunction with gravel are discussed in this paper. When the sludge is mixed with sand, it forms a stable all-weather road, reduces substantial erosion problems, and

lessens the amount of sludge that needs to be land filled. (Transportation research record vol.-1)

5 ECO-FRIENDLY CONSTRUCTION CATCHES ON IN INDIA BUT HAS A LONG WAY TO GO

Eco-friendly construction catches on in India but has a long way to go



The ITC Centre in Gurgaon has got a platinum ranking from the US Green Building Council. The council rates buildings as silver, gold or platinum based on certain parameters such as water and energy.

New Delhi: Imagine working in an office that uses sunlight instead of artificial lights for illumination and that has in place central air conditioning instead of the split or window air conditioners.

In an increasing revolt against over-urbanization, companies are opting for eco-friendly options.

The concept of environment-friendly buildings, or green buildings as they are popularly known, is catching on in India. While the green building movement has been around globally since the 1970s, it has picked up momentum in India only in the last couple of years.



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A green building essentially uses better design and construction material to minimize the consumption of power and water within the building. Such buildings are eco-friendly and energy-efficient. But in most case, the external appearance of green buildings does not differ very much from that of normal buildings.

Green buildings are steadily increasing their footprint in India with an increase from 6,000 sq. m of green space in 2003 to 304,800 sq. m expected by the end of 2008, according to the Indian Green Building Council, which is promoting the green building movement in India.

The first green building in India was the CII-Sohrabji Godrej Green Business Centre in Hyderabad. Kolkata's Techno polis lays claim to be the country's first green building for information technology.

A mix of green building projects is coming up in the country, which includes residential, commercial and hotel properties. As cities get hemmed in by concrete buildings and green spaces rapidly disappear, companies are looking at green buildings to do their bit for the environment. In turn, some of them can earn carbon credits for the clean buildings.

“Corporates feel that they are fulfilling corporate social responsibility by opting to make their buildings eco-friendly,” says Varun Pahwa, assistant vice-president of Desiccant Rotors International Pvt. Ltd, which supplies green building materials.

“Also, as green buildings use less power and water, the cost of running the building is less.”

There are other ways in which such buildings pay off.

Techno polis, for example, makes money through trading carbon credits—about Rs75 lakh a year. Techno polis is also the first green building in the world to be registered under the United Nations Framework Convention on Climate Change as a clean development mechanism project. The clean development mechanism allows companies to obtain carbon credits for initiating projects that reduce carbon dioxide emissions while enhancing sustainable development in countries.

The concept of carbon credit trading seeks to encourage countries to reduce their greenhouse gas emissions, as it rewards those countries which meet their targets and provides financial incentives to others to do so as quickly as possible. Surplus credits (collected by overshooting the emission reduction target) can be sold in the global market. One credit is equivalent to one tonne of carbon dioxide emission reduced.

There are also other benefits to be had. For instance, real estate developers also find it advantageous to construct green buildings as they can then charge a higher rate for such buildings. “Green buildings cost between 4% and 10% more than the normal buildings,” says Pahwa.

Spectral has designed energy and lighting systems for Wipro Technologies’

development Centre and the ITC Centre, both in the New Delhi suburb of Gurgaon. However, the bulk of the commercial and residential buildings in India are still non-green.

In fact, some of the sprawling suburbs of New Delhi and Mumbai have come in for sharp criticism for the hundreds of ordinary glass-fronted structures, which let in heat and consequently use up more energy in cooling the interiors. This, despite the fact that summer is the country's dominant season.

6 CONTRIBUTION TO SUSTAINABILITY

Deconstruction has strong ties to environmental sustainability. In addition to giving materials a new life cycle, deconstructing buildings helps to lower the need for virgin resources. This in turn leads to energy and emission reductions from the refining and manufacture of new materials. As deconstruction is often done on a local level, many times on-site, energy and emissions are also saved in the transportation of materials. Deconstruction can potentially support communities by providing local jobs and renovated structures. Deconstruction work typically employs 3-6 workers for every one employed in a comparable demolition job. In addition, solid_waste from conventional demolition is diverted from landfills. This is a major benefit because construction_and demolition___waste accounts for approximately 20% of the solid waste stream.

7 CONCLUSION

From the above study we have little acquaintance with the refuse and waste and there uses in different fields and by using them we can make control on some pollutions of atmosphere and our surrounding. We have to healthy and make other healthy by mentally as well as somatically.

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