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Green Highway : A Future Requirement

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Abstract-Green Highways constitute transportation functionally and ecological sustainability so that transportation requirements and environmental functions are better than before. The expected contribution of Green Highways include reduced use of virgin materials, reduced energy use, mitigation of environmental burden, promotion of human health and safety, optimization of habitat and land use, improve business and communication and most important is reaffirm our commitment to future generation also.
Keyword- Purpose, policy, characterstics, benefits.

Introduction

The aim is to create a fossil-fuel-free corridor, as well as to demonstrate that investments in green technology boost the economy and contribute to sustainable growth and reduced environmental impact. In extension, this may mean emission-free destinations that are attractive to both residents and tourists.The region produces a significant proportion of renewable energy through wind power and hydropower, there is also production of biogas which means there is great potential for a sustainable transport system.

Designing roads with nature in mind isn't entirely new. Planners of many early highways, like New York's Bronx River Parkway in 1907, intended them to look like naturalized countryside. But the emphasis was on scenic value. Interest in roadsides as habitat for native plants and wildlife began to develop in the 1980s and 90s, particularly in northern Europe. The British government, for instance, designed a section of roadside along the M40 east of Oxford as a travel corridor for invertebrates between two protected woodlands. By 1994, 25 butterfly species had colonized the corridor, notably including the rare black hairstreak. The United States, with about 4 million miles of highways, has generally lagged behind European efforts to naturalize roadsides. Belgium, for instance, now has most of its major highway roadsides planted for conservation, and according to a planner at the Department of Nature, Environment, and Energy, it's one easy way, and sometimes the only way, to put people back in touch with the natural world. Similar efforts in the U.S. have faltered, partly because there's no central agency promoting such programs.

The U.S. Federal Highway Administration (FHWA) provides funds to states for roadside enhancement, but that can mean anything from sound barriers to decorative plantings: "Arizona does a pretty good job, with lots of natural grasses and cactus," said an FHWA spokesman. Iowa has also been a leader in protecting roadside habitat, with a program that times mowing to the natural cycles of ground-nesting birds and other species.

Resistance may also arise because managing roadsides for biodiversity is much more complicated than managing them for safety. In France, for instance, the same stormwater ponds that now harbor amphibians also typically collect heavy metals, petroleum products, salts, pesticides, and other runoff. That means they may function as a biological sink — a death trap, over the long term — for the very species they attract. Amphibians are 80 percent of the roadkill in some European countries, and heavy traffic has made some populations extinct.

Last year, a dozen European nations formed a coalition to develop ways of providing more appropriate freshwater habitat and reducing road mortality.[2]

GOI Guildline –

One more important aspect we have to keep in mind is that the green highway initiative is the voluntary social movement comprising Govt. authorities of highway Dept. Environmental and Ecological department, other concerned Govt. Dept. Social institutions, private contractors, labour unions and parties helpful in implementing the social goals of green highway. The green highway is not any Govt. stipulation of laws but the results of composite efforts rendered by public private associations. There are various Govt. stipulations and laws on minimum environmental requirements but we have to go much beyond these requirements and compliances so as to protect, as far as possible, the environmental and ecological process to its natural form without much impact of highway construction.

The GOI's ministry of environmental and forest has already framed several guidelines and environmental clearances as statutory requirements for highway projects. In this respect the water (Preventions and control of pollution) act 1977 including rules framed in 1978, the air (Preventions and control of pollution) act 1981, the hazardous waste (management and handling) rules 2000, mineral conservation and development rules 1988, the various mines and mineral acts, environmental protection act 1986, Natural wildlife action plan (2002), Nation forest policy (1988), National conservation strategy and policy, National Biodiversity strategy and action plan (2003), Statement on environment and development (1992), environmental legislation for protection of sensitive ecosystems and biodiversity resources etc, can be referred for minimum requirements under each such law related to environment. Environment and ecology are being commonly used terms. The biodiversity is the degree of variation of life forms within a given ecosystem. The some is a measure of the health of ecosystems. Biodiversity boosts ecosystem productivity where each species, no matter how small, have an important role to play. For example, a large number of plant species means a greater variety of crops, greater species diversity ensures natural sustainability for all life forms and healthy ecosystems can better withstand and recover a variety of disasters.

The government launched its Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy 2015, the aim of which is to help the environment, help local communities, and generate employment by planting trees along all the highways in the country. The target for the first year is to plant trees along 6,000 km of highways. India has a total 46.99 lakh kms of road length and out of which over 96214 kms are National Highways, accounting 2% of total road length. The Highways carry about 40% of the traffic load. The Ministry has decided to develop all of existing National Highways and 40,000 kms of additional roads in the next few years as Green Highways.

“The Green Highway Policy will help in making India pollution free. It will also help in curtailing the number of road accidents in India. The vision of the policy is to provide dignified employment to local people and communities,” Nitin Gadkari, Minister of Road Transport and Highways, said during the release of the policy.

The vision of the policy is “to develop eco-friendly National Highways with the participation of the community, farmers, NGOs, private sector, institutions, government agencies and the Forest Department for economic growth and development in a sustainable manner”, according to the policy document.[6]

The policy will serve two purposes.

- It will help improve the quality and maintenance of green cover on national highways.
- It will increase employment opportunities for local people by encouraging participation of local communities, NGOs, farmers, and local self-government bodies.

Designs consideration for green highway in highway projects :

The above discussions lead to formulate the designs considerations of green highway in practical form as under : i) Primary action plan shall have to be prepared while designing the green highway project so as to preserve and safeguard natural size, shape, flow of rivers, lakes and streams. Similarly natural beauty of environment i.e. forest, wildlife etc. shall have to be maintained without much disturbances.

ii) The proposal of minimum utilization of natural resources, materials and products shall have to be framed at designs stage only.

iii) The proposal of using Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) is to be considered at designs stage after considering quality of road, economical considerations and life of designed highway.

iv) The survey and provision of using fly ash &/ or other industrial waste products locally available for use in concrete/ asphalt roads shall have to be estimated at design stage of Highway.

v) The estimate of generation of useful milling materials while executing the project and proposal for utilization of the same for different areas viz. internal roads, service roads, on sides of road shoulders etc. shall have to be framed at design stage of the green highway.

vi) The economical aspect and methodology of effective stormwater management along road side shall have to be studied at design stage and appropriate provisions for management of stormwater within ROW shall have to be made in the project after requisite design.

vii) As far as possible planning of the highway shall be such that one time road construction activity can be planned so as to minimize the rework.

viii) While drafting designs proposals for concrete roads, asphalt roads and any other road materials, it is always advantageous to estimate the environmental damages of such proposals during execution so as to compare the same with minimum requirement as per Govt. stipulations for clearance of project.[1]

Green Highway considerations at construction stage :

The designs considerations of green highway shall have to be well studied before the project put to execution and following aspects shall have to be strictly adhere to during execution so as to convert the highway project into green highway.

1. Reduce vehicle/ machinery fuel consumption & lower down fuel demand than estimated in actual construction.
2. Utilization of natural resources & virgin materials to bare minimum extent than estimated.
3. Recycling of byproducts and industrial waste viz.: waste rubber, fly ash, plastic, glass etc. in the locality shall be given priority.
4. Utilization of low electrical equipments viz. CFL, LED, LCD etc. on project site shall have to be ensured.
5. Selection and use of efficient construction equipments and plants which will help to reduce the pollution during construction. Monitor the performance of such plants periodically.
6. Utilization of natural and renewable energy source far camps, offices and execution site areas i.e. solar panels etc.
7. Minimize the waste of every kind. Disposal of hazardous and non-hazardous waste from construction site and reporting its environmental compliances to concerned authorities.
8. Utilization of spill control techniques and recycling techniques wherever possible.
9. Measuring & keeping record of environmental damages during construction phases in terms of air, water, land, flora, fauna & its special impact with sophisticated testing equipments.
10. It is most important to plant large canopy trees along both sides of highway. One should remember that one sqm. of green canopy absorb 0.2 kg of CO2 and other waste gases. Tree plantation interact the stormwater, mitigate the temperature, improve air quality and prohibit soil erosions. Maidan portions between lanes of highway shall also be used for plantation of herbs & shrubs so as to reduce CO2 and help to generate oxygen. Use more local species during the plantation which deliver more severity rate & reduce the rework of plantation.
11. It should be ensured that the compliances of environmental rules & regulations shall be much beyond the stipulated limitations.[1,2]

Green Highway consideration during maintenance of highway :

1) Monitoring of plantation growth & implement techniques to increase the severity of plantations and survival ratio.
2) Monitoring ambient air quality & noise quality after construction.
3) The typical vehicles plying on the highway viz. S.T. buses, trucks, multi-axle vehicles etc. can be assessed for their life maintenance, fuel consumptions, travel life (in kms.) etc. so as to estimate the GHG emission by transportation system as a whole & methodology to reduce down the same and shrinking the related carbon footprints. The goal of sustainable transportation is to protect the environment & conserve natural resources while taking into consideration social need and cost- benefit ratio. The efforts shall have to made in association with transportation sector to reduce the emission of GHG and other detrimental foul gases that affect the environment.
4) Monitoring & minimizing highway accidents.[1,3]

5) Characteristics of Green Highways :

The above data entail to arrive at tentative general characteristics of "Green Highway" initiative covering all the above aspects is general form, which can be made applicable all over the country for time being. These characteristics are not final and may go on changing in days to come depending upon the innovative practices and research on various aspects of "Green Highway" concept. The GHP in USA has also formulated the characteristics for green highways which are also taken into account while finalizing the below mentioned characteristics of Green Highway.

1 The environmental functions as were existing before the construction of Highway in the locality shall improve after the construction of green highway or it shall be better than before.
2 Watershed of the area shall have to be protected by green infrastructure so as to maintain its essential ecosystem role, ecological sustainability & environmental functions. Also to adopt green techniques for stormwater management along highway side and also within watershed so as to cleanse maximum runoff within the watershed of project area.
3 The environmental requirement as per the laws of the land are minimum standards. However the green highway approach goes for achievements beyond the minimum standards of prescribed regulations.
4 Maximize the use of recycled materials and minimize the use of virgin natural materials. Reduce the energy required to build the highway.
5 Plantation of large canopy trees and other plantations in available vacant land alongside the highway with local species.
6 Preservations and safeguarding of natural beauty of environment, rivers, lakes, forest and wildlife. Restore natural drainage paths to rivers, stream channels etc.
7 Reduce disruption to ecological processes and encourage smart growth by integrating and guiding future growth and capacity building with ecological constraints. Promote wildlife corridors and plan for conservation of wildlife.
8 Use of efficient and environmental friendly construction equipments and plants.
9 Calculations of environmental damages during construction phases in terms of air, water, land, flora and fauna & its social impact. Compare targeted environmental outcomes vis-à-vis local environmental needs.[1,4]

6) Benefits of Green Highways:

Green highway is associated with a variety of social environmental, economic & human health benefits. The benefits of green infrastructure are particularly accentuated in urban & suburban areas where green space is limited & environmental damages are more extensive. Green infrastructure benefits include.

i) Social benefits :

Highway has an important impact on local economies. Highway can draw a business into local society & provide local jobs & tax income. Due to decrease of materials in land fill, the land fill space will be decreased ultimately reducing user costs for communities around the land fill. Reduction in noise and reduced pollution from highways can increase the quality of life in the area. Similarly other benefits viz. decreased water use, use

of recycled materials, protection to wildlife, decreased amount of pollutants contained in surface runoff & increase in stream & recreational water quality etc. benefits can also be availed by the society.

ii) Reduced & delayed stormwater runoff volumes :

Green infrastructure techniques increase stormwater infiltration rates, thereby reducing the volume of runoff entering into sewer systems & ultimately at lake, rivers & streams.

iii) Enhanced groundwater recharge :

The natural infiltration capabilities of green infrastructure technologies can improve the rate at which ground water tables are 'recharged' or replenished. Enhanced ground water recharge can also boost the supply of drinking water for private & public uses.

iv) Stormwater pollutant reductions :

Green highway techniques infiltrate runoff close to its source & help to prevent pollutants from being transported to nearby surface waters. Once runoff is infiltrated into soils, plants & microbes can naturally filter & break down many common pollutant found in stormwater.

v) Reduced sewer overflow events :

Utilizing the natural retention & infiltration capabilities of plants & soils, green infrastructure limits the frequency of sewer overflow events by reducing runoff volumes & by delaying stormwater discharges.

vi) Increased carbon sequestration :

The plantation & soils which are the part of green highway approach serve as sources of carbon sequestration. In this process CO2 is captured & removed from the atmosphere via photosynthesis & other natural process.

Vii)Urban heat mitigation & reduced energy demands :

In urban locality natural land cover is replaced by dense concentration of pavement, building and other surfaces that absorb and retain heat. The displacement of trees and vegetation minimizes their natural cooling effects. Additionally tall buildings & narrow streets trap & concentrate waste heat from the vehicles, factories & air conditioners. By providing increased amount of urban green space & vegetation, green infrastructure can help to mitigate the effects of urban heat & reduce energy demands. Trees and other green infrastructure can also lower down the demand for air-conditioning energy, thereby decreasing emissions from power plants.

viii) Improved air quality :

Green infrastructure facilitates the incorporation of trees & vegetations in urban landscape. This can contribute to improved air quality. Trees & vegetation absorb certain pollutants from the air through leaf uptake & contact removal. If widely planted throughout the habited areas, trees & plants can even cool the air & lowering down the temp. dependent reaction that form ground level ozone pollution.

ix) Additional wildlife habitat & recreation space :

Greenways, parks, urban forests, wetlands & vegetated swales (bioretaintion places) are all forms of green infrastructure that provide increased access to recreational space & wildlife habitat.

x) Improved human health :

Vegetations & green space can have a positive impact on human health.

xi) Increased land value :

Clean & green infrastructure can increase the value of surrounding properties.[1,5]

Conclusion

The traditional highway can be converted into green highway right from design process and shall undergo desired changes during construction and maintenance phases. Before the formulation of common characteristics of green highway it is always advantageous to understand the green practices to be followed during process of designs, construction and maintenance of highway.

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