

# Implementation of Green Highway in Indian Context

Jagath Kumari Dungi, Darshit Mehta

**Abstract:** Transportation plays an important role in the economic development of country. India has a total road network of 58.98 lakh kms which is second largest in the world (1). While increase in road highways is linked to the economic development, it comes with a compromise to the ecology in the form of deforestation etc. (2). With the compromise being made, the idea of mitigating the damage in the form of ‘green highway’ comes into picture. Green Highway incorporates both transportation functionality and ecological requirements (3). While the western countries have developed the method for evaluating the green highway, it’s only in September 2015 when the MoRTH (Ministry of Road Transport & Highways) has framed Green Highway policy (4). The objective of this research is to study the existing guidelines for evaluating green highways and to develop the framework for guidelines that is most suitable for Indian Context through literature study and case study approach.

**Keywords:-** Green Highway, MoRTH, Transportation, Green Rating

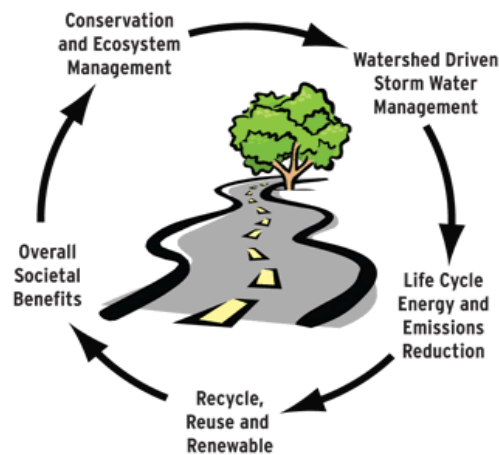


Figure 1 - Five Key Areas for Green Highway

## I. INTRODUCTION

Sustainable development is a key challenge in the present-day scenario. Sustainable development can help to minimize the impact of climate change, GHG emission, air, noise and water pollution, plant and wildlife disturbances. It is been found that nearly 14% of greenhouse gas (GHG) emissions comes from transportation sector (5). According to Arnab Bandyopadhyay, Lead Transport Specialist, World Bank, states, “The green concept includes a suite of measures including tree plantation, bioengineering, use of low energy construction technology and materials, recycling of materials, energy efficient automobiles and traffic management (including solar traffic and street lighting), switching to clean fuels, recharging of groundwater through smart drainage systems and more.”

Sustainable approach towards highway were encouraged from a long time, however, it was in

The year 2007 that a formal rating system for green highway came into the picture by the release of Green road by Washington State researchers (6). Other rating system such as Green Guide, STARS, BE2ST, Green Roads, Green Lites, Green Paves, I-Last, Envision, CEEQUAL and INVEST came into the market from 2009 to 2012 (7). For the purpose of clarity, the definition of Green Highway is adopted from the definition provided by Mr. James Bryce and is governed by five key features.

- 1) Watershed Driven Storm Water Management: - The main objective is to stop as well treat storm water runoff. This can be done by incorporating bio-swales and wetlands alongside highway.
- 2) Life Cycle Energy and Emission Reduction: - Energy in the form of producing of materials used for road construction as well as energy spent in constructing and maintaining of highways is considered. Alternative material to cement like fly ash and slag have proved to be more energy efficient and can be used to reduce total energy.
- 3) Recycle, Reuse and Renewable: - This promotes the idea of using recyclable material in order to stop extraction of virgin material. This helps in sustaining enough resources for the coming generations and also helps in reducing the energy emission. Along with reduction in energy emission, GHG emission i.e. carbon dioxide is also avoided and water is saved.
- 4) Conservation and Ecosystem Management: - A properly designed highway should also consider the importance of its effect on natural environment. Ecosystem management reduces the risk of negative impact of highway construction on the ecosystem. There are many techniques to cater the same for example, by providing animal crossing structure and underpasses, the vehicle wildlife collisions reduce as much as 97 percent.
- 5) Overall Societal Benefits: - A well designed highway will be aesthetically appealing bringing business in the area thus supplying the local communities with jobs and opportunities (6)

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## Implementation of Green Highway in Indian Context

In India, approach towards green highway started lately in September 2015, with the declaration of Green Highways (Plantation, Transplantation, Beautification & Maintenance) Policy 2015. Under this mission, it was required to have 1% of the project cost for the development and maintenance of green canopy. As per the statement given by Shri Vijay Chhibber, Secretary, Ministry of Road Transport and Highways, this policy will help to mitigating the forest cover gap as envisaged by National Forest Policy which should be 33%, while the notified forest is only about 22% (8). The objective of Green Highway Policy is shown in the figure 2.

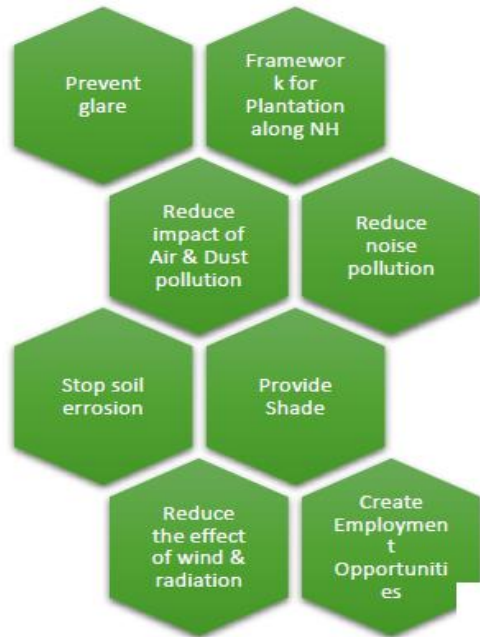


Figure 2: - Objectives of Green Highway Policy, 2015

There are eight major objectives of the policy and this includes reduction of noise, light and air pollution, prevention of soil erosion and reduction of wind and solar effects. This policy is expected to create job opportunities as it requires plantation and maintenance of plants. It is evident the primary objective of the policy is to have plantation along highway, the secondary objectives like reduction in air and noise pollution is by far the after effects of plantation.

Unlike the popular highway rating system in the market, Green Highway Policy considers only plantation as the central idea of the policy, lacking any consideration for wildlife, site selection & planning, water conservation, energy conservation, material conservation and innovation in design. All of the above-mentioned factors are important for considering green highway in Indian Context. State and National Highway cut through at least 26 tiger reserves as per the draft document published by Wildlife Institute of India (WII). A team of scientist from National Centre for Biological Sciences (NCBS) commented that if unplanned development continued, it could lead to a 56% higher average probability for tigers within protected areas. The impact of unplanned highway could be well understood from the example of 9 km stretch of NH-7 that was studied by scientist in the year 2001. The stretch passed through Pench Tiger Reserve in Madhya Pradesh and over 490 snakes were killed in just two years (9). As many as 161 wild animals died in the year 2018 in road and rail accidents as per the data provided by Wildlife Protection Society of India (10). The above information includes data only for

wildlife, the number of stray animals dying due to road accidents is even more alarming. For example, in the city of Nagpur more than 1000 injuries of stray animals over a period of four months from April 2019 to July 2019 were recorded. All these injuries are attributed to road accidents (11).

## II. LITERATURE REVIEW

Singh and Jain developed a framework of rating system that can be applicable in Indian context. This rating system were broadly divided in six categories namely 1) Site Selection and Planning 2) Water Conservation 3) Energy Conservation 4) Material and Resources 5) Environmental quality and 6) Innovation in design (7). This rating system considers a broader approach towards sustainable highway rating. This resulted in a 170-point rating system with distribution as shown in fig 3. It can be observed that Site Selection and Planning along with Water Conservation covers almost 43 % of the total points.

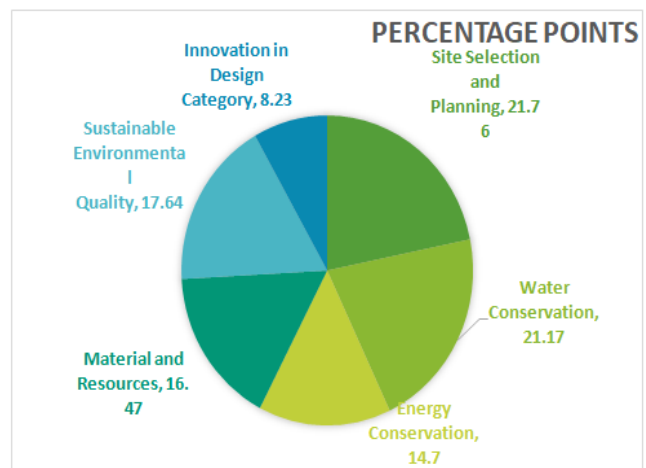


Figure 3: -Percentage Distribution for Rating System by Singh and Jain

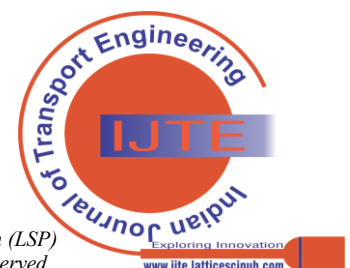
A comparative analysis was done by (12) for various green highway rating system. Six widely known green highway rating systems were compared, these includes Greenroads, Green Lites, I- Last, Invest, STEED and Envision. It is notable to know that all the rating system that are mentioned above are practiced in USA. Site selection and material selection received the highest importance, however unlike the rating suggested by Singh and Jain (7), water efficiency was found to be the least important factor for green highway.

### Case Study

Case Study 1: - Upgrading to Four Lane and Maintenance of Mehsana – Himmatnagar, SH-55 (2)

Length in Km – 60.75

This project included certain green highway interventions which were proposed as a part of proposed widening of the existing two-lane facility to four-lane.



This included the following practices which can be classified as green practices.

- 1) Warm Mix Asphalt
- 2) Recycling of Pavement
- 3) Monitoring environmental Footprint GHG measurement
- 4) Use of Renewable Energy
- 5) Cattle Crossing
- 6) Landscaping
- 7) Solid Waste Management
- 8) Introduction of Noise Barriers

By the use of Warm Mix Asphalt a reduction of 30% energy consumption is being achieved. Recycling of pavement was a part of construction contract document and it compelled the contractor to reuse a minimum of 20% of the excavated pavement. In order to move to renewable source of energy, street light along corridors including lighting at junctions, truck lay bay and bus stops are proposed to be battery mounted solar street lights. Landscape included plantation of trees along the highway in government land to increase the existing green cover. Another requirement of landscape was to preserve the existing trees within 30 to 90 cm girth size of trees. Solid Waste Management required the contractor to provide with dust bins in order to discourage open disposal of waste.

**Case Study 2:** - State Highway 49, this highway is two lane highway connecting Chennai to Cuddalore (13).

Length in Km – 160

This project had certain elements which can be classified as green practices, this includes

- 1) Contaminated Site Development
- 2) Landscape
- 3) Night Sky Pollution
- 4) Drought Tolerant Species
- 5) Use of low VOC materials
- 6) Design Innovation

Contaminated Site Development included use of those land areas where development is complicated by environmental contamination. Landscape includes covering 20% of total area as green cover by tree plantation. Night Sky pollution is reduced by reducing light pollution in order to increase night sky access. By plantation of Drought Tolerant Species, the idea is to increase the ground water table through effective rainwater management. Use of low VOC materials encourages the use of material with low emissions. Design innovation is achieved by proper alignment selection such that maximum unwanted land as well as public densified areas are the part of final alignment plan.

### III. CONCLUSION

The following conclusions are made from this study

- 1) There is a need for India to develop or adopt Green Highway rating system in order to promote sustainable practices for road construction.
- 2) There are shortcomings in the Green Highway Policy adopted by the Government of India. While the policy considers tree plantation and at possible places tree transplantation, however, it overlooks many

other heads like Water, Energy, Materials and Innovation.

- 3) The Green Highway (Plantation, Transplantation, Beautification & Maintenance), Policy assumes reduction in noise, light and air pollution due to avenue plantation, it fails to advocate any measure to assess such reduction.
- 4) It is seen from the case studies that green practices beyond the scope of what is defined in 'The Green Highway Policy, 2015' is achievable. From the case study green practices apart from avenue plantation included use of low energy consuming equipment, recycling of pavement, use of renewable energy, solid waste management, environmental monitoring, use of low VOC materials and proper alignment selection were achievable (2) (13).
- 5) Over years only a few researches on development of a rating system in Indian Context is available. Over that these rating does not suggest any form of Certification like minimum points for Silver, Gold or Platinum rating. There is a need of a detailed research which needs to be done establishing the criteria and code of practice for Green Highway.

### REFERENCES

1. **Ministry of road transport & highways.** *Annual report 2018-2019.* New delhi : government of india, 2019. P. 7, annual report.
2. **Sharda, suraj.** Implementation of green highway in an indian context. Ahmedabad, gujarat, india : s.n., may 2018.
3. **Sustainable waste management for green highway initiatives. Husin, nur illiana, et al.** S.I.: edp sciences, 2016. Matec web of conferences. Pp. 3-8.
4. National informatics centre (nic). *Press information bureau, government of india.* [online] august 28, 2015. <https://pib.gov.in/newsite/mberel.aspx?Relid=126427>.
5. **Environmental protection agency.** Global greenhouse gas emissions data. *United states environmental protection agency.* [online] april 13, 2017. <https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data>.
6. **Bryce, james m.** Exploring green highways. *Astm international .* [online] october 2008. [https://www.astm.org/snews/so\\_2008/bryce\\_so08.html](https://www.astm.org/snews/so_2008/bryce_so08.html).
7. *Development of framework for rating system for indian green highways. Singh, juhita and jain, dr. A.k.* 2019, american journal of engineering research (ajer), pp. 250-259.
8. **Ministry of road transport and highways.** Green highways. *National informatics centre (nic).* [online] november 11, 2019. <https://morth.gov.in/green-highways>.
9. **Perincheri, aathira.** Fatal crossings: tigers in 26 reserves under threat. *The hindu.* [online] january 07, 2018. <https://www.thehindu.com/sci-tech/energy-and-environment/fatal-crossings-tigers-in-26-reserves-under-threat/article22388295.ece>.
10. **Pandey, kiran and sengupta, ranjit.** 161 wild animals died in road, rail accidents in 2018. *Downtoearth.* [online] june 13, 2019. <https://www.downtoearth.org.in/factsheet/161-wild-animals-died-in-road-rail-accidents-in-2018-65065>.
11. **Chakraborty, proshun.** Over 1k stray animals injured in road accidents in 4 months. *The times of india.* [online] september 4, 2019. <https://timesofindia.indiatimes.com/city/nagpur/over-1k-stray-animals-injured-in-road-accidents-in-4-months/articleshow/70965326.cms>.
12. *A review paper - study of green highway rating systeme. Kaushal p nikumbh and pritesh d aher.* 2017, international research journal of engineering and technology, pp. 2104-2108.
13. *Green highway ratings for existing nh& sh in tamilnadu – a case study. Suresh, r.* 2015, journal of chemical and pharmaceutical sciences, pp. 734-738.

