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Green highway ratings for existing NH& SH in Tamilnadu – a case study

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ABSTRACT

A Green highway rating system is a proposed standard for quantifying sustainable practices associated with the design and construction of roadways. Various techniques and standards can be incorporated within green highways like natural resources, construction methods, operation & maintenance. Such a standard helps improvement and innovation in roadway sustainability, and provide baseline sustainability standards for planning and designing of highways. An attempt is made to rate the existing National highway (NH) & State highway (SH) in Tamil Nadu using Green highway Rating System (GHRS) to implement the sustainability in highways in the future. Recommendations are then made to improve their performance towards green highways from normal highway. Each infrastructure project, before start of the project must undergo the Environmental Impact Assessment (EIA) process to protect our society in economy, environment and technology. This could improve our social value like reduction in pollution, accident reduction, encourage the number of users and improve the environment life and quality. To reduce the impacts in the future, the green highway rating system and green highway construction guidelines should be followed strictly while during construction, operation& maintenance in all phases throughout the lifetime of the highway.

KEY WORDS: Green, standard, existing.

1. INTRODUCTION

Green Highway is the essential object to our country growth. Ratings are an important tool to the decision makers. Nowadays, people are spending their half of the lifetime in travelling. So, the highways are coming one of the most basic important needs to the person's life like buildings. Ratings maybe offer in quantitative, textual reviews or combination of both. People needs offer a review and ratings often, to fulfill their needs within a short time of full quality. The survey shows that reviews and ratings are an important source of information for researchers& road users. This rating will give new insight for future research in the area of the user ratings and reviews. The ratings are additionally given feedback profiles to the researcher. Ratings can be used as an intervention to identify, promote and encourage improved standards and designs and also improve levels of crash protection in vehicles and in the road network. The impartial and objective information provided by rating systems is designed for use by:

• Policymakers, employers, professionals and practitioners in the establishment, implementation and monitoring of targets, strategies and interventions at country or organizational levels;
• Road planners, engineers, operators;
• Transport economists;
• Road users in general who benefit from the use of rating tools.

1.1. Scope of works:

- The main objective is to improve the road performance.
- Upgrading and improvement based on highway design, pavement design, provision of service roads wherever necessary, type of intersections, flyovers/ underpasses.
- Improvement in road safety features.
- It helps to prepare a detailed project report for contact bidding.
- It improves the social value through technical, economic, environmental and financial viability of the project.

1.2. Project corridor: The project under consideration aims at developing the normal highways Chennai- Trichy NH-45& Chennai- Pondichery SH-49, in Tamilnadu state is a part of the National Highway Development Program (NHDP) towards GH. This rating is formed process used to predict the environmental consequence of any development projects. It is intended by identifying the environmental, social and economic impacts of a proposed development using rating system it in asset the suitable environments option and alternative process at an early stage.

Case Study 1: National highway-45 is the one of busiest highway in Tamilnadu with a total length of 474kms. The highways exactly start from Guindy Kathipara Bridge to Theni. The highway has a 4 lane (2 lane from each direction) between Chennai and Madurai. Length of two lane is 16 feet, foot path is 6 feet on both sides in the Towns and villages and center landscaping length is 5 feet.

Case Study 2: State highway 49 also known as east coast road (ERC) is a two lane highway with a length of 160kms in Tamilnadu, India built along the coast of the Bay of Bengal connecting Tamilnadu state capital city Chennai with Cuddalore via Pondicherry. Width of the road is 16 feet and 2 feet foot path on both sides in the towns and villages. It contains no medium barriers and landscaping at all. Rating systems are applied for case studies below in the table shown.

Table.1.Site selection& Planning

Site Selection & Planning	Explanation	Possible Points	NH-45	SH-49
Contaminated site remediation [Develop density & community connectivity]	Rehabilitate contaminated sites, where development is complicated by environmental contamination	1	1	1
Access to public places/shuttle services	Channel development to urban areas with existing infrastructures, most of public places, protect green fields and preserve habitat and natural resources	3	3	3
Basic amenities	Enhance the overall quality of life by providing amenities within and closer to the site	2	1	1
Natural topography & landscape 20%, 30%	Minimize disturbances to the highway site. So as to reduce long term environmental effect	2	-	1
Heat island effect on top layer and parking areas	Reduce the heat within the site areas produced by human activities	4	-	-
Non fossil fueling facility for vehicles	Encourage the use of non-fossil fuel vehicles to reduce pollution from automobile use.	1	-	-
Design for differently abled	Ensure that the roadway is user-friendly for differently abled people	2	-	-
Night sky pollution reduction	Reduce light pollution and façade lighting to increase night sky access and enhance the natural environment	1	-	1
Construction activity pollution prevention	Reduce pollution from construction activities by controlling soil erosion, waterway sedimentation and airborne dust generation	1	-	-
Brownfield redevelopment	Rehabilitate damaged sites where development is complicated by environmental contamination and to reduce pressure on undeveloped land	1	-	-
Quality control (e g. Storm water)	Limit disruption and pollution of natural water flows by managing storm water runoff	1	-	-
Tenant design and construction guidelines	Educate tenant about implementing sustainable design and construction features in their tenant improvement build-out	1	-	-
Total points		**20**	**5**	**7**

Table.2.Water conservation

Water Conservation	Explanation	Possible Points	NH-45	SH-49
Limit turf area 20%, 30%, 40%	Limit such landscapes which consume large quantity of water	3	1	-
Drought tolerant species, 30%, 40%	Increase the groundwater table or reduce the usage of water through effective and appropriate rainwater management	2	-	1
Management of irrigation system	Reduce the demand for irrigation water through water-efficient management techniques. Minimize non-process water usage by installing efficient water fixtures	2	-	-
Rainwater harvesting 75%, 95%	Increase the ground water table or to reduce the usage of water through effective and appropriate rainwater management	6	-	-
Non-process waste water treatment, 75%, 95%	Treat non-process waste water either in-situ or in a common effluent treatment plant	4	-	-
Water use reduction 20%, 30%	Reduce the demand for potable water through water efficient management technique	4	-	-
Water efficient landscaping 20%, 30%	To limit or climate the use of portable water or other natural surface or subsurface water resources available on /or the project site for landscape irrigation	1	-	-
Total points		**22**	**1**	**1**

Table.3.Energy conservation

Energy Conservation	Explanation	Possible Points	NH-45	SH-49
Metering	Encourage continuous monitoring and enhance the performance of highway	2	-	-
On-site renewable energy 5%, 75%, 100%	Promote self-sufficiency, energy through renewable technologies for on-site power generation and use within the site.	6	1	-
Green power 50%, 75%, 100%	Encourage investments in of-site renewable energy technologies to be supportive to the grid	6	-	-
Eco-friendly, captive power generation for requirement	Reduce emission levels and their impacts on the environment through use of low emitting fuels or better equipment	2	-	-
Enhanced commissioning	To begin the commissioning the process and execute additional activities after system performance verification is completed	1	-	-
Cool pavement	The temperature is reduced by cool pavement technique	1	-	-
Quiet pavement	Buzzers reduced quiet pavement technique	2	-	-
Environment management system	The environmental management system was prepared for the highway to its individual site conditions	2	-	-
Total points		**22**	**1**	**-**

Table.4.Material conservation

Material Conservation	Explanation	Possible Point	NH-45	SH-49
Waste reduction during construction50%, 75%	Minimize construction waste being sent to landfills	2	-	-
Materials with recycled content 10%, 20%	Encourage the use of products which contains recycled materials to reduce environmental impacts associated with the virgin materials	2	-	-
Local materials 50%, 75%	Increase the use of locally available materials, thereby minimizing the associated environmental impact	4	-	-
Material reuses 5%, 10%	Encourage the use of salvaged building materials and products to reduce the demand for virgin materials, thereby minimizing the impacts associated with extraction and processing of virgin materials	4	-	-
Certified rapidly renewable material 50%, 75%	To minimize the use of virgin materials, thereby encouraging responsible forest management certification	4	-	-
Storage &collection of recyclables	To facilitate the reduction of waste generated by building occupants that are hauled to and disposed of in landfills	1	-	-
Pavement life cycle assessment	The pavement is often assessed it should rectify immediately	3	-	-
Total points		**20**	**-**	**-**

Table.5.Environment quality

Environment Quality And User's Health	Explanation	Possible Points	NH-45	SH-49
Low VOC materials	To encourage the use of materials with low emissions so as to reduce the adverse health impact for users	2	2	2
Reduction of user fatigue (post occupancy)	Provide facilities for the user to minimize usage related fatigue	2	-	-
Eco-friendly housekeeping material [chemicals]	Encourage the use eco-friendly housekeeping chemicals which are less toxic, so as to reduce the adverse health impacts for highway users	1	-	-
Aerobic &walking area	To enhance the peoples' health of the highway users	2	-	1
Cycle path	Enhance the person's health and reduce the motor vehicle pollution of the highway	4	-	-
Outdoor air delivery monitoring	Provide capacity for ventilation system monitoring to help promote users comfort	1	-	-
Portable toilets& government shopping centers	Portable toilets and government rented shops should provide certain distance	3	-	1
Accessible views and indicators [sensors]	Provide accessible views and indication should provide wherever is necessary	1	-	-
Signal boards	Provide signal boards and sensors wherever it's necessary	1	-	-
Total points		**17**	**2**	**4**

Table.6.Innovations in design

Innovations In Design	Explanation	Possible Points	NH-45	SH-49
Alignment selection	Alignment selection should cover unwanted areas as well as public densified areas	1	1	1
Context sensitive design	Using the environmental analysis software	1	-	-
Traffic flow improvement	Traffic flow and safety improvement plan should be innovative	1	-	1
Safety improvement		2	-	-
Long life pavement design	Pavement is constructed using new technologies	3	-	-
LEED Accredited professionals	The highway should be rated often using a rating system.	5	-	-
Noise mitigation plan	Provides noise reduction accessories on the highway.	1	-	-
Total points		**14**	**1**	**2**

Total points for NH-45: 10; Total points for SH-49: 14

Recommendations for NH-45 [Vandalur – Chengalpattu]:

Primary:

- Following basic amenities should provide
- Portable toilets
- Water facility
- Daily maintenance
- Hospital signal boards
- Parking area should provide for every 20 Km.
- Separate path should provide for non-fossil fuel vehicles & differently abled people.
- The necessary light facility should provide some of the left places. Where it's necessary.
- Water management system should establish in the highway.

- Drainage facility should provide on both sides of the highway for a full stretch.
- Drought tolerant species and native plants should plant in the highway.
- The rainwater harvesting pit should provide at least 100m once.

Secondary:

- Natural assets are should prevent [e.g. Chengalpattu].
- The heat island effect should provide on both sides of the highway to reduce the mirage formed over on the highway during summer season.
- Light pollution reduction.
- Pollution prevention during construction.
- Brownfield (useless) area should use by the highway.
- Quality control should maintain from construction to maintenance stage.
- Guidance should notice after the construction for user reference.
- Conditions are included in the contract or bond also.
- Water management system should implement for irrigation, waste water treatment and landscaping.
- Metering provided for monitoring the energy consumption and pollutant emission.
- On-site renewable energy generation.
- Commissioning process should establish properly according to the guide.
- Innovative pavements should provide or replace to the highway.
- Waste reduction during construction.
- Encourage the recycled material& local material usage.
- Certified (renewable) materials only use in highway construction.
- Indicators (sensors) provide before the dangerous point.
- Alignment selection should properly do according to the local environment management system.
- After the construction the highway will be kept on maintenance throughout its lifetime and will be ratedoftenly.
- Water treatment plants should provide near to KOLAVAI lake.
- Solar panels should provide to compensate the energy consumption.
- Reduce the wastelands near to the sides of highway throughout the full stretch of the road.
- Waste material storage and collection stores can provide outside of the city area.
- Although the walking area provided. It's not used by the walkable people. The area was fully occupied by the platform shops.
- Cycle path also should provide on the sides of the highway.
- Some of the turnings hasn't signal board and some of the boards are not working properly. It should rectify as soon as possible.
- Safety & noise mitigation plan should provide strictly on the highway.

2. CONCLUSION

According to Green Highway Rating System these two highways should improve their performance on the basis of green highway guidelines, for that highway should remodulate and incorporate some of the green features in the highway. The above prior recommendation commands are improve the highway performance towards green highway.

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