



PLANNING FOR GREEN CORRIDOR (PLANTATION) DEVELOPMENT ALONG HIGHWAYS

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Indian National Highways

- National Highways account for 2 % of Indian road network. (1 lakh km)
- 40 % of automobile traffic moves on NHs.
- It is also responsible for large scale environment degradation.
- Current CO₂ emission is 391 million tons, which is expected to reach 966 million tons by 2030.
- Recognising the imminent threat of global warming and climate change, Ministry of Road Transport & Highways has promulgated Green Highways (Plantations, Transplantation, Beautification & Maintenance) Policy - 2015



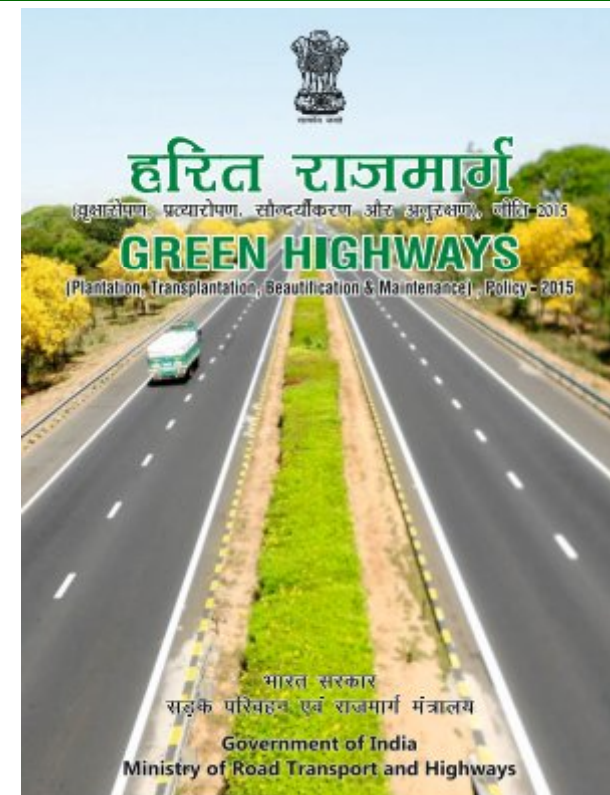
Green Highways Policy – 2015

Ministry of Road Transport & Highways, GoI

Vision: National Highways for Sustainable Environment & Inclusive Growth

Objectives of GHP - 2015

- Develop a systematic framework for Integrated Green Corridor Development along National Highways
- Build resilient ecosystem in the form of "Green Corridors" along National Highways for
 - Combating global warming and climate change effects.
 - Optimum GHG sequestration
 - Ex situ conservation of native RET species of the region
- Develop unique green corridors with aesthetic appeal
- Reduce the impacts of air, noise pollution and dust
- Reduce soil erosion at embankment slopes
- Reduce the effects of wind and incoming UV radiation



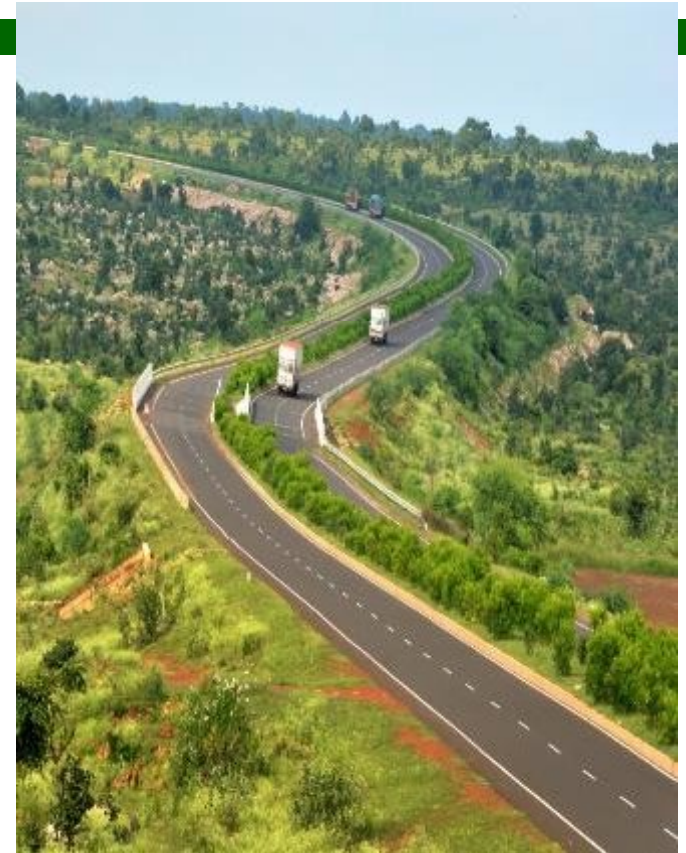
Green Highways Division- NHAI

- Green Highways Division is vertical under National Highway Authority of India (NHAI) responsible for implementation of the Green Highways Policy.
- Earlier functioned as National Green Highways Mission under IHMCL.
- Green Highways Division is responsible for implementing entire Green Highways Program of the Ministry, NHDICL & NHAI



GHD - Vision

Development of ECO – FRIENDLY National Highways with participation of communities, farmers, NGOs, private sector, institutions, government agencies and forest departments for economic growth and development in a sustainable manner



GHD - Mission

- Integrated Green Corridor Development and Management along existing 1 lakh km NHs network and upcoming NHs
- Make Green Highways Program self sustainable in next 10 years.
- Reinforcing India's CoP 21 commitment by developing additional carbon sink outside forest
- Sustained employment for 1 lakh people for next ten years (min 200 days/year)
- Create platform for research and innovation in green pathways sector including roads, rail-sides and waterways.



Convergence of GHPs with SDGs

THE GLOBAL GOALS For Sustainable Development



Convergence of GHPs with SDGs

- Employment Generation: 1 lakh employment generation for semi-skilled and unskilled workers thereby aiding in poverty alleviation and economic growth.
- Climate Change Mitigation: Additional annual carbon sink of 2.13 to 2.46 million tons by 2030 thereby reinforcing CoP 21 (NDC) commitments and aiding climate action.
- Sustainable Linear Infrastructure: Institutionalizing Integrated green corridor development and management approach thereby aiding in sustainable infrastructure development in cities.

UN resolution for transforming world by 2030, through concerted efforts for achieving Sustainable Development Goals, specifically SDG no. 1 (No Poverty), 8 (Decent Work & Economic Growth), 9 (Industry, Innovation & Infrastructure), 11 (Sustainable Cities & Communities) & 13 (Climate Action).

GREEN CORRIDOR (PLANTATIONS) FOR HIGHWAY PROJECTS

- reduce the impact of air pollution and dust as the trees and shrubs are known to be natural sink for air pollutants.
- provide much needed shade on glaring roads during summer / sunny days
- reduce the impact of ever increasing noise pollution caused due to increase in vehicles
- arrest soil erosion at the embankment slopes.
- prevent glare from the headlights of incoming vehicles
- moderate the effect of wind and incoming radiation
- create employment opportunities for local people.



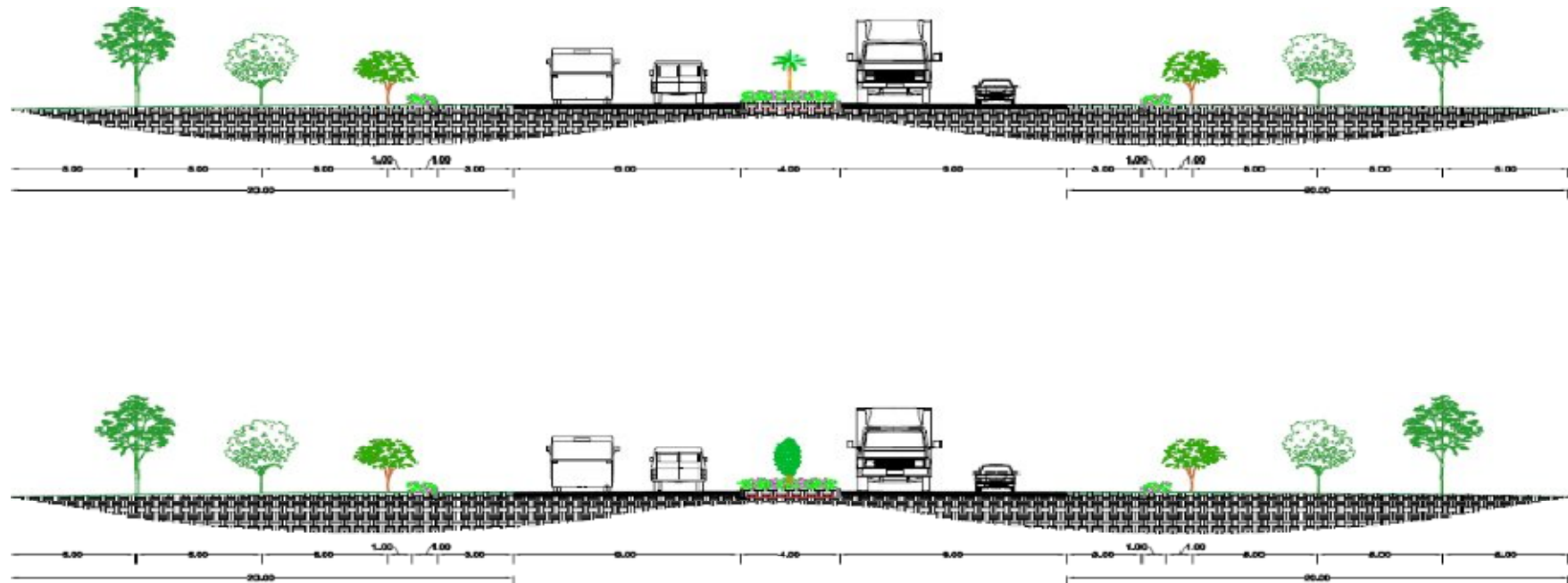
Planning for Green Corridor Development

- ❑ Plantations works are highly site-specific activities and depend on various factors like choice of species, terrain, availability of area (Right of Way), soil type, climatic conditions, etc.
- ❑ IRC:SP-21-2009 provides detailed guidelines on landscaping and tree plantations.
- ❑ Provision for green corridor development will be included in the planning / DPR stage of the project.
- ❑ Standard Chapter on Green Corridor development has been developed by GHD
- ❑ All new highway projects, will have provision for green corridor development

Salient feature of Standard DPR Chapter

- Standard layout of plantation and landscaping has been developed.
- Plantation has been categorized under avenue, median, landscaping and block plantations.
- Provision for minimum five year maintenance has been made.
- Plantation Species Matrix to identify suitable plant species for roadside plantations depending on ecological, economic and aesthetic factors.
- Provision for soil - water conservation and other innovative initiatives such as hydro-seeding, transplantation has been made.

Standard Design for Green Corridor along NHs



Innovations in Green Corridor Planning

Innovative Initiatives

Hydro-seeding

- Hydro-seeding at embankments for biological soil water conservation as compared to mechanical method of stone pitching and gabions.
- Best suitable for hill terrains, landslide prone areas and embankments.
- Standard practice in various developed countries
- Economic and ecologically sound bio – engineering practice for greenery development.
- GHD is developing modalities for undertaking pilot project at Agra bypass and Parwanoo – Solan NH



HYDRO-SEEDING



Transplantation Process – New Technology



Innovative Initiatives

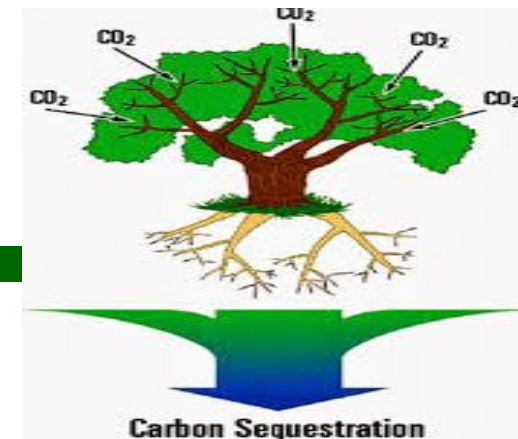
Transplantations Workshop - 27th April, 2016

- Objectives
 - Deliberations on feasibility of transplantations to minimize tree felling during highways development
 - Knowledge dissemination on transplantations
 - ToT for advance transplantation technology
- Outcomes
 - Recommendations and action points emerged during deliberations have been documented in the form knowledge report on Transplantations.
 - Transplantations will be promoted wherever feasible, with focus on survival after transplantation.



Innovative Initiatives

Carbon Neutral Green Highways



- GH plantations, being outside forests and outside conventional green cover will be eligible for Carbon credits under CDM.
- Targeted Plantation on approx 4 lakh acre (1.62 lakh ha) land
- Total 10 crore trees can be planted
- Carbon sequestration Capability: 3 - 21 MT per acre/year –
 - (Source Study report on Carbon Sequestered in NHs ROWS - Federal Highway Administration, USA)
 - As per the study conducted by GHD across 10 NHs carbon sequestration potential is 21 MT per acre (15 MT per ha) /year
- Total expected GHG emission - 966 million tons. (CPCB, MoEF report)
- Annual Capacity to sequester Carbon from 4 lakh acre (1.62 lakh ha) land under vegetation: 2.13 to 2.46 Million tons per year
- Current rates in Voluntary Carbon Offset Market is Rs 120 per Metric Ton
- Estimated Annual Income: Rs 576 crore

Innovative Initiatives

Adopt a Green Highway Program

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- Corporate / Institutions can adopt particular stretch of highways for roadside plantations under their CSR program.
- Power Finance Corporation has adopted in 90 km RS plantations in Nagpur with an investment of Rs 12.72 crore
- Coal India Limited has adopted 100 km stretch on NH – 78 with an investment of Rs 19.60 crore.
- ITC has adopted plantation and maintenance along 250 km NH stretch in Andhra Pradesh & Telangana region.
- Yes Bank has adopted 40 km stretch of Mumbai Nashik Expressway.



Innovative Initiatives

Salient Feature of Adopt a Green Highways Program

- ❑ Adopt a Green Highway Program (AGHP) is a unique partnership program benefitting all stakeholders from government to corporate to community at large, in which, organizations and individuals can adopt sections of highways and contribute towards green corridor development.
- ❑ This initiative will help in fulfilling India's commitment at CoP 21 Summit for developing additional carbon sink of 2.5 billion tons annually.
- ❑ Creation of valuable ecological asset by convergence of CSR funds.
- ❑ Participation in the program will help corporate in showcasing their efforts towards environment conservation and livelihood generation.
- ❑ Funding Agencies will also be eligible for earning carbon credits.
- ❑ Branding opportunities along NHs for funding agencies.



Innovative Initiatives

PPP Based Plantation, Maintenance and Sustainable Harvesting

- For Agro-forestry based industries (Pulp, paper, ethanol, floriculture, food processing, plywood etc)
- Concession to utilize large stretches of ROW alongside highways / vacant land parcels for plantation & sustainable harvesting
- Focus on Horticulture, floriculture and other important timber value crops.
- Investment, Management & Sustainable Harvest responsibility of Concessionaire
- Swiss Challenge based Plantation, Maintenance and Sustainable Harvesting
 - Entrepreneurs can submit their innovative proposals for median, avenue or block plantations.
 - Innovative proposals with respect to plantation, maintenance and sustainable harvesting.
 - Tree / shrubs of ecological importance & economic value



Innovative Initiatives

OMC Partnership with Agro-forestry Industries

- Indian Association of Paper Mills (IPMA) (Association of ITC, JK Paper, BILT, International Paper etc) has submitted its intention to take up plantations for agro forestry crops (Melia dubia, Gmelina arborea, Casuarina, Eucalyptus, Bamboo etc) along ROW.
- Plantations, Management and harvesting will be done by IPMA allied industries at their own cost.
- Minimum requirement 100 km contiguous stretch of NH for project feasibility.
- IPMA allied agencies will have user rights only and will have to clear the plantations in case of road widening / extension.
- ITC has signed tripartite agreement with NHAI & REPL (Concessionaire) for undertaking plantations, management and sustainable harvesting activities along 250 km stretch in AP on PPP model.



KNOWLEDGE PARTNERSHIPS SO FAR.....

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- ❑ TERI: Policy Advocacy, Research & Innovations on climate change, forestry & carbon emission reduction
- ❑ INBAR: Role of Bamboos in development of Green Highways
- ❑ CSIR-NEERI: Research, Innovations & Capacity Building for Green Highways with focus on climate change, biodiversity, carbon emission reduction

Partnership on anvil:

- ❑ The World Bank: Support for Centre for Innovation; Joint research & publications; Technical & Financial support for pilot GHPs; and Knowledge Sharing



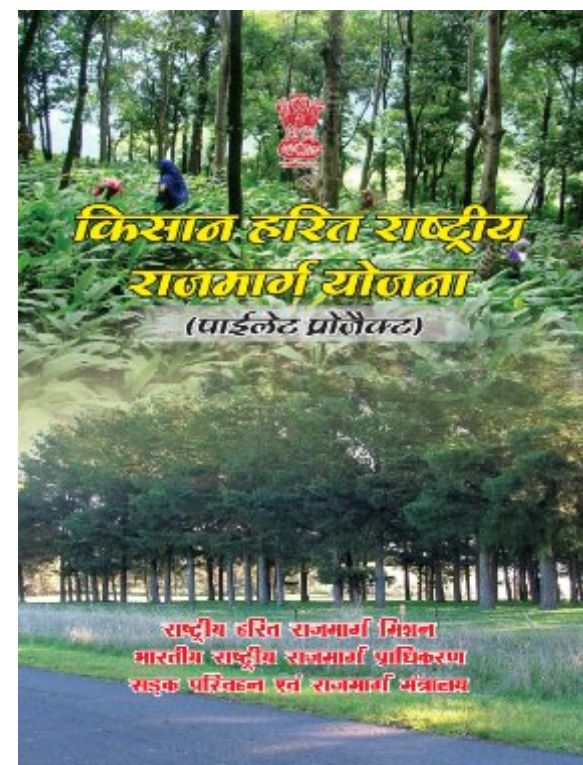
Innovative Initiatives

Extending green belts beyond avenue plantations

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Kisaan Harit Rajmarg Yojna - Pilot

- ~50 m on both side along NHs passing through forest and other rural farmlands can be taken up for plantations by farmers / JFMCs
- NHAI will fund the management of plantations.
- Farmers will be provided the usufruct right on the plantations.
- Tripartite agreement among NHAI, Farmer and Agro-forestry industries for Buy back of sustainable harvest



Innovative Initiatives

HIGHWAY WIND TURBINES

A WORKING PROTOTYPE OF A SERIES OF VERTICAL AXIS WIND TURBINES (5 NUMBERS) ON A HIGHWAY MEDIAN FOR GENERATION OF ELECTRICAL ENERGY FROM THIS MECHANISM

ESTIMATES:

ONE VEHICLE PASSAGE – 20 W

ELECTRICAL

30 VEHICLES PER HR – 15kWhr / 15 UNITS

5 TURBINES – 75 UNITS PER DAY

LED's: 35 W X 2 = 70 W PER POLE

- 4 MONTHS OF LIGHTING OR

- 250 LEDS PER NIGHT

BUDGET: Rs. 20 lacs
(lump sum inclusive of all taxes)



NOTE: TURBINE PHOTO IS INDICATIVE FROM REF. : Mashyal & Anil (2014), Highway windmill, American Journal of Engineering Research, Vol-3, Issue 7, pg 28-32.

Corporate Social Responsibility Summit - Mumbai (27- 28th September)

- ❑ Theme: CSR for Inclusive Growth & Sustainable Environment
- ❑ Participants: Corporate / PSUs / Govt. agencies / Institutions/ Individuals
- ❑ Objectives:
 - Deliberate on the role of CSR in inclusive growth & sustainable environment
 - Explore opportunities for partnering with Corporate/ PSUs for enhancing the scale of Green Highways Program



Innovative Initiatives

National Convention on “Innovations in Green Highways”

New Delhi – (7-9th November, 2016)

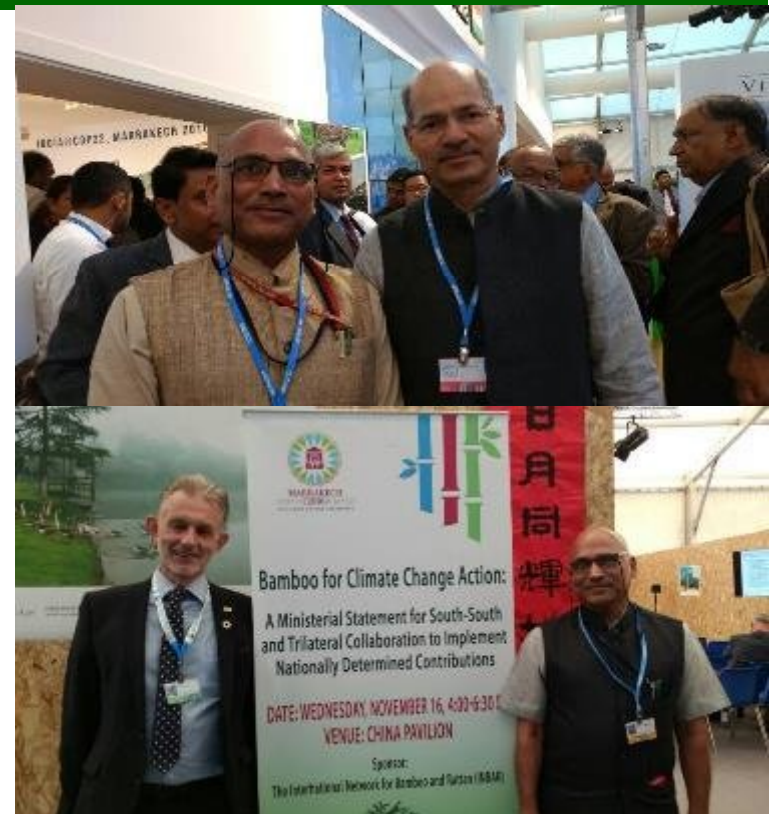
- Promote research, innovations and global best practices in Green Highways
- Establishment of Centre for Innovation in Green Pathways (Waterways, Roadways & Railways)
- Outcomes
 - MoU signing with Corporates, International Institutions.
 - Deliberations on research needs & global trends in greening highways
 - Focus Group Consultation for training need analysis.



Cop 22 Meeting (7th – 18th Nov 2016)

Marrakesh, Morocco

- Green Corridor development Program of NHAI was acknowledged as a unique & distinctive program : policy, implementation and beneficiary
- Road Transport Department of no other country has followed such a concept of greening
- GHPs were acknowledged as Potential contributors towards India's commitment at CoP 21 for generating additional carbon sink
- Representatives of Green Climate Fund find GHP as a complete project and eligible for receiving funding under it





'Strategically designed greenbelt development along highways and its performance evaluation towards eco-capital build up'



Project Specific Agreement Signed in the presence of Sri Nintin ji Gadkari, Hon'able Minister MoRTH, Go India

Objectives:

Highways – for Environment and Socio-economic development

Develop designed green belt with site specific appropriate vegetation strand for :

- ✚ Mitigate the environmental losses
- ✚ Enhance Sink for GHGs
- ✚ Attenuation of vehicular pollution
- ✚ Renewable resource generation
- ✚ Value addition for safe transportation - Enhance the aesthetics
- ✚ Develop man made linear Ecosystem for
 - ☛ Air-purification (SO_x , NO_x , CO_2 , SPM capture)
 - ☛ Ambient temperature amelioration
 - ☛ Humidity build up during drift
 - ☛ Surface water runoff prevention
 - ☛ Enhanced underground recharge potential
 - ☛ Soil enrichment
 - ☛ Biodiversity buildup
 - ☛ Biomass generation
 - ☛ Noise reduction



MoU NEERI – NGHM Knowledge sharing

Activities:

- ❖ Designed plantation along both sides of 5 kms on NH-7, Jamb to Hinganghat
- ❖ Collected base line data on env. parameters
- ❖ Irrigation source under development
- ❖ Laboratory experimentation for species validation of indigenous site specific appropriate plant species
- ❖ Plantation design
- ❖ Protection plan
- ❖ First phase of plantation before end of August 2017
- ❖ Full plantation before end of this year



MAKE IN INDIA

Green Highways Project Launching

- Projects for 1590 km were awarded in an event organised on 1st July, 2016 in the presence of Shri Nitin Gadkari, Hon Minister, RTH.
- The Green Highways Projects phase I span across 10 States and covers 25 NHs.

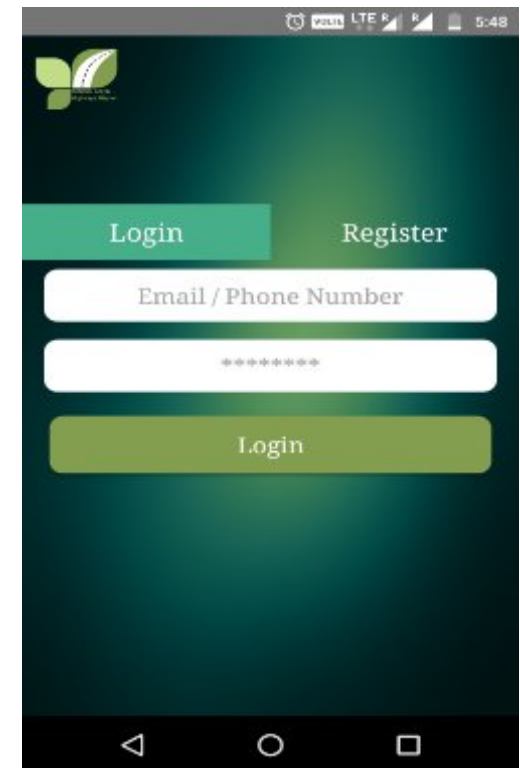


Status of Green Highways Projects at National Level

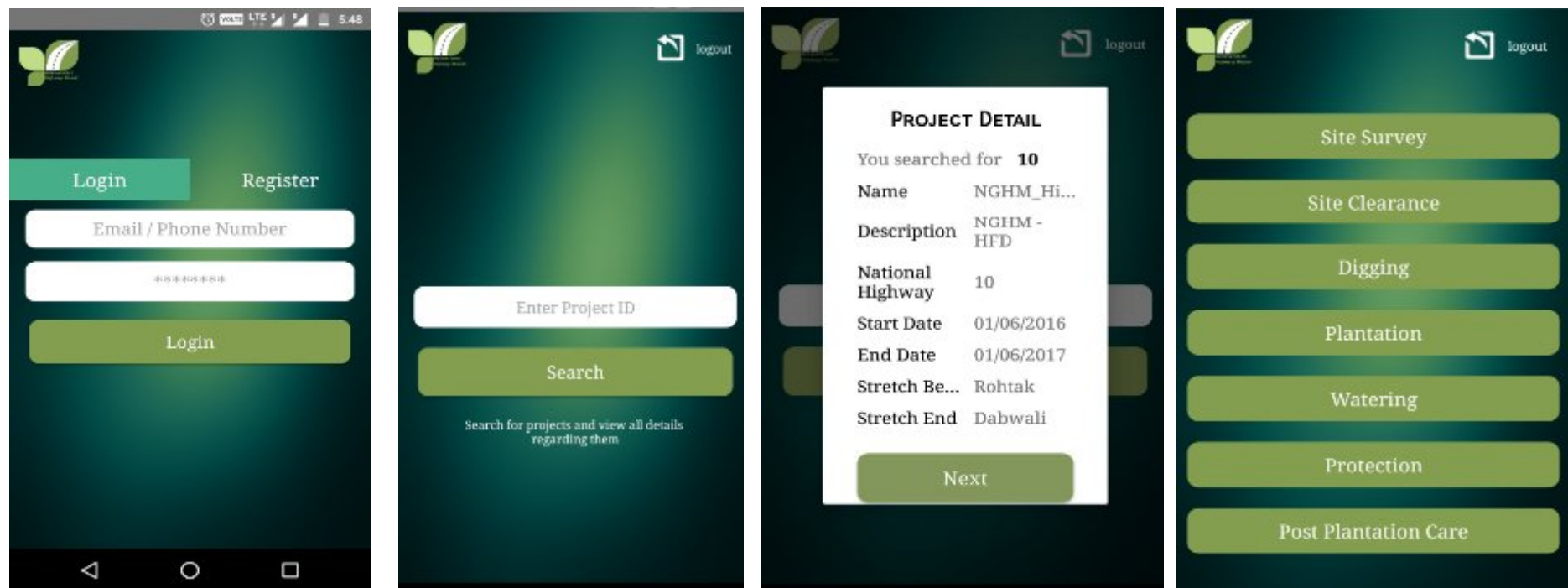
Year	Type of Agency	Length of Project (in Kms)	Estimated Project Cost (In Crores Rs.)	Plantation Progress	
				Target (No of Plants)	Achievement (No of Plants)
2016-17	Government Agency*	933	147.66	8,56,840	2,34,349
	Private Agency	611	121.58	8,00,648	3,51,328
2016-17 Subtotal		1,544	269.24	16,57,488	5,85,677
2017-18	Government Agency*	1,268	157.48	10,61,073	-
	Private Agency	40	3	20,000	-
2017-18 Subtotal		1,308	160.48	10,81,073	0
2018-19	Government Agency	77	13.78	1,11,920	-
	Private Agency	-	-	-	-
2018-19 Subtotal		77	13.78	1,11,920	-
Grand Total		2,929	443.50	28,50,481	5,85,677

MONITORING PLANTATIONS THROUGH GREEN HIGHWAYS MOBILE APP & GIS BASED APPLICATION

- ❑ Mobile app will act as an interface between the plantation agencies , field offices & HQ of NHAI.
- ❑ Plantation agencies will use this app to submit the status of plantation and project activities performed by them.
- ❑ Data generated through this app will help in monitoring of the project
- ❑ Moreover, Geo Spatial technologies and high resolution satellite imagery data will be linked with APP for real time monitoring of plantation activities
- ❑ The App will work in offline mode as well



Beta Version of Green Highways Mobile App Launched



Android App

Green Highways Projects –Hisar



Plantations work in progress along National Highway - 10

Green Highways Projects – Guwahati



Plantation Work in Progress along National Highway - 31

Green Highways Project - Nagpur



Plantations under progress along NH -7

Green Highways Projects – Kota (Drip Drop Drizzle)

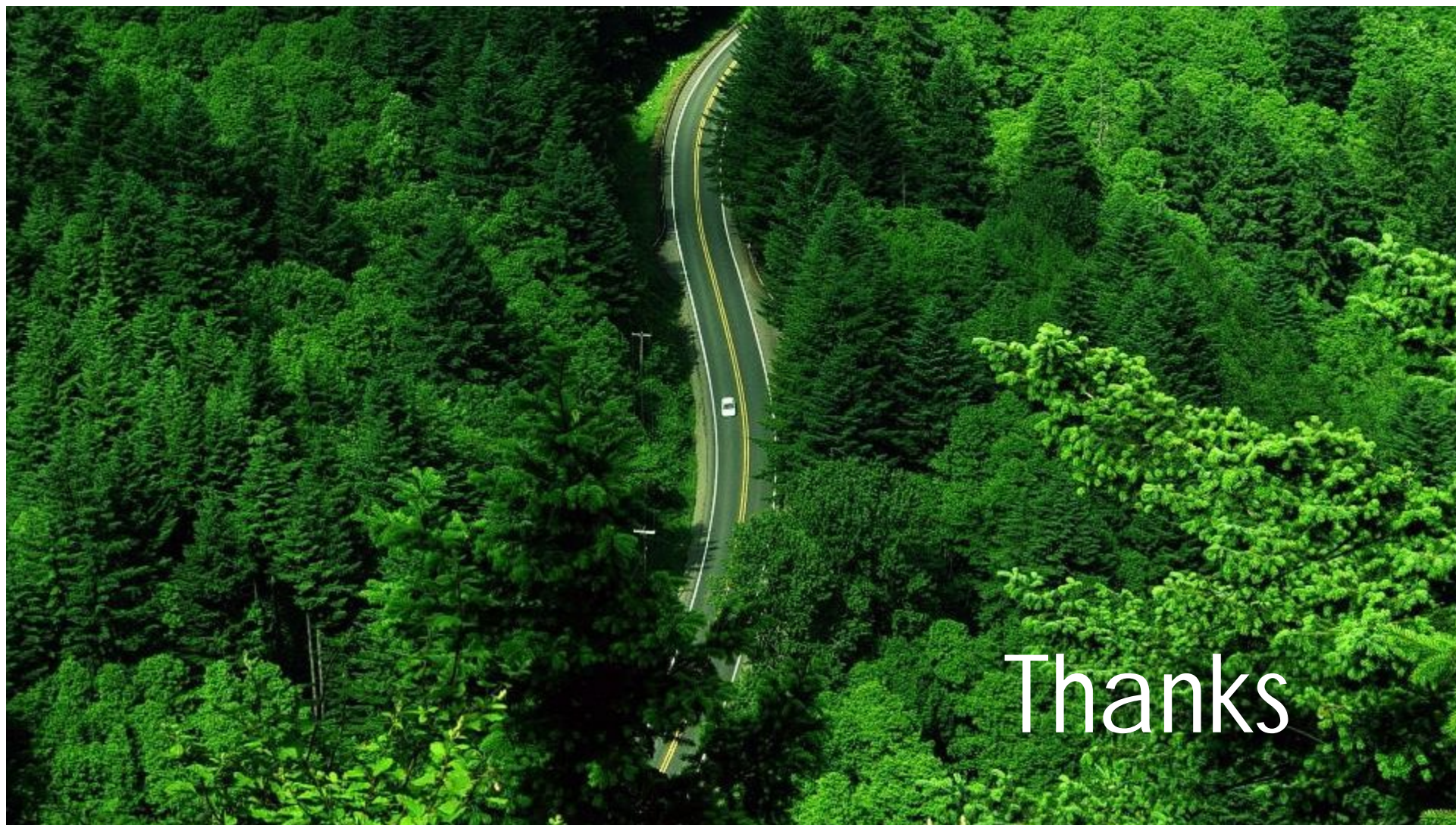


Green Highways Projects – Kota (Drip Drop Drizzle)



Landscaping – Elevated Expressway Nashik - under CSR by L & T





Thanks