CII NATIONAL AWARD FOR ENVIRONMENTAL BEST PRACTICES 2026

Large-Scale Native Tree Plantation at Digboi Refinery

Carbon Sequestration and Biodiversity Restoration through the Modified Akira Miyawaki Method

Digboi Refinery (Assam Oil Division) | Indian Oil Corporation Limited

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TRIGGER OF THE PROJECT

- **Indian Oil's NetZero commitment by 2046** - need to move beyond conventional plantation practices towards a scientifically managed, measurable, nature-based solution.
- **Conceived with management commitment** and implementation through collaboration with the APCB for project execution and the District Forest Department for providing suitable forest land.

UNIQUENESS

Known concept, new application:

- **Large-scale Modified Miyawaki plantation** - 6.25 lakh saplings of 30+ species across ~25 hectares,
- **High-density multi-layer plantation** - Integration of carbon sequestration + biodiversity restoration +
- **Geo-tagging + survival monitoring**
- Plantation extended beyond refinery premises to suitable Govt Forest land

DATES — PLANNED vs ACTUAL

Plan [2024-2026]

- **Targeted 6.25 lakh saplings in 25 Ha land**

Actual [2024-26]

- **Commenced:** April 2024 (MoU on 28.04.2024)
- **Completed:** September 2026
- **Planted 6.64 lakh saplings in 26.54 Ha land - 100% of MoU target**

MAJOR MILESTONES

28 Apr 2024

MoU signed between IOCL Digboi Refinery & Assam Pollution Control Board

9 Jun 2024

Phase 1 launch at Golai — 1,11,111 saplings in one day; 1.41 lakh saplings (5.64 Ha) in Phase 1

Site review

Water-logged refinery land replaced with Government Forest land

Jul – Sep 2026

Phase 2 at Kherjan — 5.23 lakh saplings (20.9 Ha) in Phase-2 ; 6.25 lakh target achieved

TANGIBLE BENEFITS

Measurable Environmental Outcomes

Parameter	Project Outcome
Plantation	6.64 lakhs saplings (Target of 6.25 lakh saplings)
Area restored	26.5 hectares (Target of 25.0 hectares)
Native biodiversity	30+ species
Carbon	Long-term biological carbon sink created
Carbon projection	Species-wise scientific modelling up to 2046
Habitat	Multi-layer native habitat creation
Soil	Organic matter / erosion-control potential
Microclimate	Increased vegetative cover
Water	Improved infiltration/recharge potential
Toxicity	Not directly applicable
Energy saving	Not directly applicable

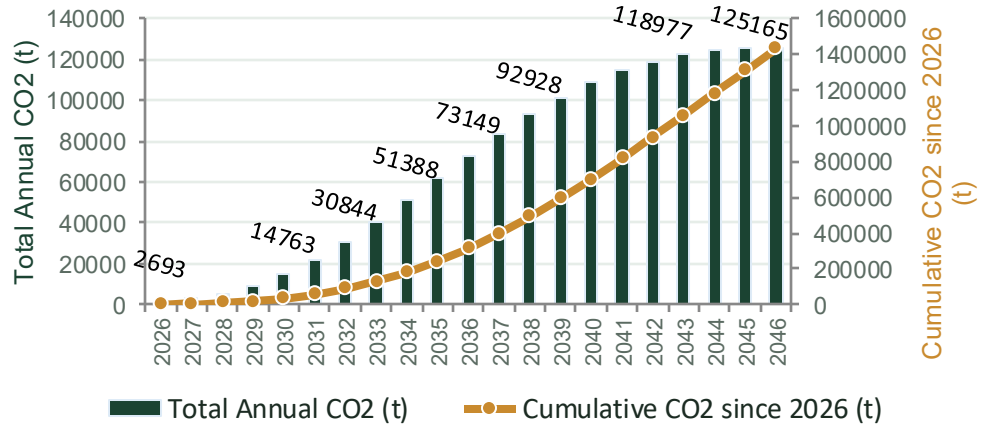




PROJECTED CO_2 SEQUESTRATION

~1,25,165 t/year by FY 2045-46

Cumulative ~14,32,405 t CO_2 from FY 2025-26 onward



Miyawaki plantation cohorts are modelled species-wise using literature-based species parameters and Chapman–Richards growth curves for projected height and DBH. Above-ground biomass (AGB) is estimated using the Chave et al. allometric equation and converted to CO_2 sequestration. The projections represent planning-stage estimates and will be progressively validated and refined using field-measured survival, height and DBH data.

INTANGIBLE BENEFITS

People, Society & Organisational Gains

Beyond carbon, the project has created lasting value for the local community, for IndianOil's people and for the wider ecosystem around Digboi.

People & Society

Local workers engaged in community-led planting; cleaner air, soil conservation, groundwater recharge & microclimate improvement

Morale & Motivation

1,11,111 saplings planted in a single day at Golai (9 Jun 2024) — featured in IndianOil newsletters as a flagship Net Zero initiative

Skill Upgradation

Field teams now apply geo-tagging, AR-based spacing verification, survival monitoring & species-wise carbon modelling

Attitude Shift

From routine greenbelt compliance to a scientifically managed, verifiable nature-based climate solution

Others: *habitat for 30+ native species (biodiversity) · improved ESG & BRSR performance · enhanced environmental leadership*

Implemented

PHASE 1





Golai Site – Refinery Land

PHASE 2





Kherjan Site – Forest Land

Where & when implemented

- **Golai-1 & 2, NH-38, Tinsukia —** 2024, Phase 1 (1.41 lakh saplings)
- **Kherjan area, Digboi Range —** 2026, Phase 2 (5.23 lakh saplings)

Assimilation within IndianOil

- Aligned with IndianOil's corporate Net Zero 2046 roadmap; showcased in company newsletters

What next

- Two-year structured maintenance with survival and growth monitoring.
- Timely replacement of dead saplings to maintain plantation density.
- Regular weed removal and site upkeep to ensure healthy and sustained growth.

FIELD DOCUMENTATION

On-Ground Verification of Planting Density

WHY THIS MATTERS

The Modified Akira Miyawaki Method calls for high-density, close-spaced planting of multiple native layers together.

Field teams used on-site AR measurement tools to geo-verify actual inter-sapling spacing at the Kherjan plantation site.

Recorded spacing: approximately 50–82 cm between saplings — consistent with the dense, multi-layer planting prescribed under the method.



58–65 cm spacing



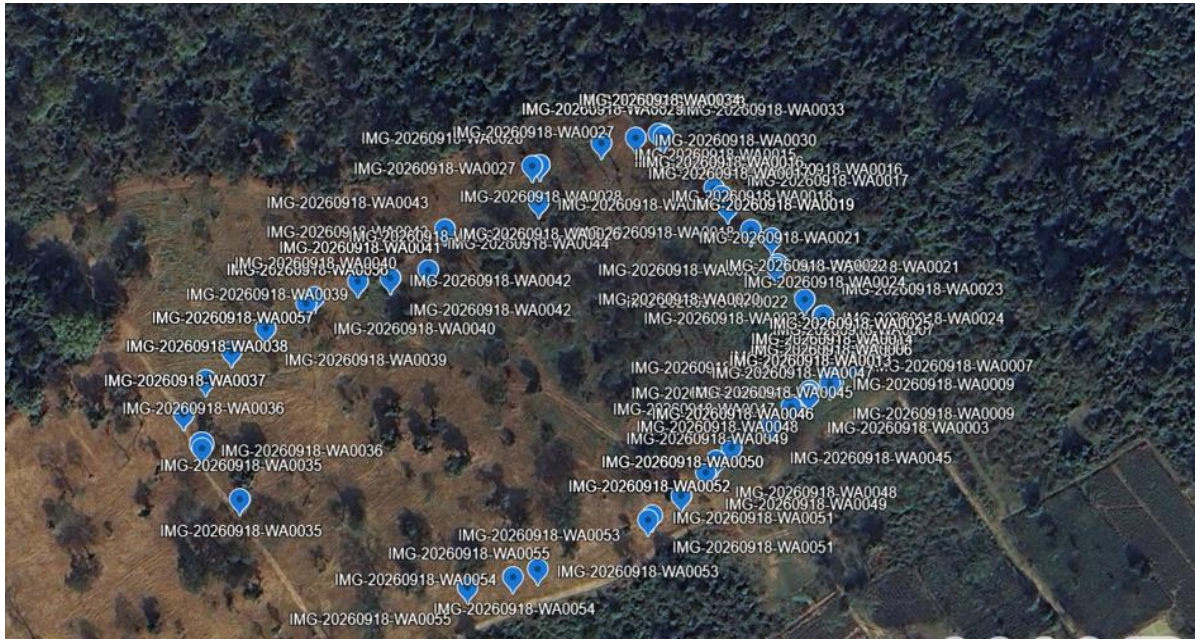
50–82 cm spacing

3 September 2026, Kherjan plantation site, Tinsukia

Plantation Site Boundary & Plot-wise GIS Documentation



GPS-surveyed plantation boundary (~21 ha) subdivided into 10 plantation plots for systematic monitoring and assessment



Sample plantation plot with geo-tagged field photographs linked to their GPS coordinates, demonstrating plot-wise digital field documentation

The ~21 ha plantation area has been mapped and divided into 10 geo-referenced plots, supported by geo-tagged field photographs. This enables plot-wise tracking of survival, growth, biodiversity and carbon sequestration over time.

REPLICATION POTENTIAL WITHIN THE SECTOR

A Replicable Model for Industrial Greenbelts

Applicable Across Sectors

- Oil refineries & petrochemical complexes
- Power, steel & cement plants
- Mining & fertilizer units
- Industrial townships, ports & airports
- Smart cities & urban local bodies

Steps Initiated & Knowledge Sharing

- Featured in IndianOil newsletters “Towards Net Zero” & “Green Frontiers”
- Presented at CII National Award for Environmental Best Practices 2026
- MoU-based partnership model (PCBA & Forest Dept.) ready to replicate
- Geo-tagged documentation & monitoring protocol shareable with peer units

Structured geo-tagged monitoring makes performance transparent, auditable, and easy to report at scale.

Challenges Faced and How They Were Overcome

Top row: Challenge faced · Bottom row: How it was countered

TECHNICAL

Challenge

Low-lying, water-logged refinery land unsuitable for a dense native forest; prescribed close spacing to be achieved at scale

HOW WE COUNTERED IT

Site review shifted planting to suitable Government Forest land; scientific soil preparation & mulching; AR tools verified 50–85 cm spacing

ADMINISTRATIVE

Challenge

Coordinating land, execution and verification across IOCL, APCB and the District Forest Department

HOW WE COUNTERED IT

Formal MoU with PCBA (28 Apr 2024); Forest Dept. provided land; joint field verification and periodic progress reviews

MAINTENANCE

Challenge

Keeping 6.64 lakh high-density saplings alive across dispersed sites until the forest becomes self-sustaining

HOW WE COUNTERED IT

Periodic survival assessment, structured maintenance protocols and geo-tagged photo records for every site

Benchmarking and Alignment with Standards

National Frameworks

National Action Plan on Climate Change (NAPCC): Supports climate mitigation through enhancement of biological carbon sinks.

Green India Mission : Contributes to increased green cover, ecosystem restoration and carbon sequestration.

National Biodiversity Action Plan (NBAP) Promotes native species diversity, habitat restoration and ecosystem resilience.

Biological Diversity Act, 2002 : Supports conservation and sustainable use of biological diversity.

Mission LiFE (Lifestyle for Environment) Demonstrates institutional environmental stewardship and nature-positive action.

ISO 14001:2015 & BRSR Reporting : Supports systematic environmental management and reporting of climate and biodiversity initiatives.

Parameter	Digboi Refinery	Tata Steel – Noamundi	JSW – Tarapur	SECL – Gevra	NTPC – Sipat
Scale	**6.64 lakh saplings; ~26 ha**	>6 lakh trees; broad reclamation landscape	~8,500 trees; ~2-acre park	~20,000 saplings; 2 ha	~32,000 plants; ~4 ha
Plantation diversity	**30+ native species**	Native flora	45+ indigenous varieties	Native large/ medium/ small mix	Selected for survival & growth
Method	**Modified Miyawaki; dense, multi-layer**	Miyawaki + mine land reclamation	Miyawaki urban forest	Miyawaki plantation on coal field land	Miyawaki, ~1m×1m spacing
Technology / Measurement	**GPS mapping, geo-tagging, AR spacing check, survival & carbon modelling**	Ecological restoration monitoring	99% survival reported	PSU plantation monitoring	2-yr maintenance & guarding
Primary Outcome	**Carbon sink + biodiversity + ecosystem services**	Restoration of Mine-land	Urban green cover	Coal field green cover	Green-cover development
Replication Value	**Landscape-scale industrial model integrating plantation, monitoring & carbon assessment.**	Mining / disturbed-land restoration	Industrial urban forest	Coal / mining sector	Thermal-power greenbelt model.

Aligned with SDG 13 Climate Action · SDG 15 Life on Land · SDG 17 Partnerships — supporting IndianOil's Net Zero 2046 commitment

PRIORITY PLAN

+1 Year and +2 Years

Priority	+1 Year	+2 Years
Survival	Complete survival census	Stabilise survival & gap filling
Geo-monitoring	Plot-wise GIS/geo-tag database	Digital plantation monitoring system
Growth	Measure DBH & height sample plots	Develop species-wise growth curves
Carbon	Establish field baseline	Field-validated sequestration assessment
Biodiversity	Baseline flora/fauna assessment	Biodiversity improvement assessment
Soil	Baseline soil health	Compare soil-carbon/quality improvement
Replication	Document SOP	Replicate model at suitable locations

Resources required: field monitoring team, GPS/GIS tools, forestry/ecology expertise, periodic soil & biodiversity assessment, and plantation maintenance.

Top Ten Best Practices for +1 & +2 Years

#	Best Practice	+1 Year	+2 Years
1	**Survival Monitoring**	Periodic survival assessment	Establishment/survival trend validation
2	**Mortality Replacement**	Replace dead saplings	Gap filling wherever required
3	**Weed Management**	Regular weed removal and mulching	Need-based site upkeep
4	**Growth Monitoring**	Measure height & DBH	Establish species-wise growth trends
5	**Geo-tagging & GIS**	Maintain geo-tagged records	Develop long-term digital database
6	**Carbon Assessment**	Update model with field data	Field-validated sequestration estimates
7	**Biodiversity Monitoring**	Baseline assessment	Measure biodiversity improvement
8	**Native Species Management**	Monitor species-wise survival	Identify best-performing native species
9	**Soil/Ecosystem Monitoring**	Establish baseline	Assess improvement over baseline
10	**Documentation & Replication**	Develop project SOP	Use learnings for replication

Key Learnings from Project Implementation

1. **Right Site is Fundamental**

   Early assessment of waterlogged land demonstrated that ecological suitability must precede plantation; selecting suitable forest land was critical to successful implementation.

2. **Partnerships Unlock Scale**

   The MoU with APCB and coordination with the Forest Department enabled implementation of a 6.64-lakh-sapling programme across ~26 ha.

3. **Native Diversity Builds Resilience**

   A multi-species, multi-layer and high-density approach using 30+ native species supported ecological resilience, habitat development and faster canopy establishment.

4. **Planting is Only the Beginning**

   Long-term success depends on structured maintenance, survival monitoring, weed removal and timely replacement of mortality, particularly during the two-year establishment period.

5. **Measure, Document & Verify**

   GPS mapping, geo-tagged photographs and field measurements make plantation performance transparent, traceable and verifiable.

6. **Carbon Claims Must be Field-Validated**

   Scientific modelling provides a credible projection pathway, but actual survival, height and DBH measurements are essential to progressively validate and carbon-sequestration estimates.

KEY TAKEAWAY

From planting trees to building a measurable, verifiable and replicable native ecosystem.

Restoring Native Forests.
Securing a Net Zero Future.

Thank you

Digboi Refinery (AOD)
Indian Oil Corporation Limited