



EXECUTIVE SUMMARY

**Final Environment Impact Assessment Report for
Environmental Clearance of a 100 KLD Distillery for
Ethanol Production from Molasses and Grain with
Integrated 4 MW Co-Generation Power Plant by M/s
Magadh Sugar and Energy Ltd, Unit Hasanpur Sugar Mills
(Distillery Division), A Unit of K.K. Birla group of company**



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1 Introduction

The Hasanpur Distillery Project, spearheaded by Magadh Sugar & Energy Limited (MSEL), envisions establishing a 100 KLD ethanol plant with an integrated 4 MW co-generation power facility in Hasanpur, Rosera Tehsil, Samastipur District, Bihar. The project aligns with the Government of India's Ethanol Blending Petrol (EBP) Program, aiming to achieve a 20% ethanol blend by 2025. This target supports national energy security, reduces dependency on crude oil imports, and mitigates vehicular emissions, contributing to India's broader climate change commitments.

Objectives of the Project:

1. **Energy Security:** Boost domestic ethanol production to support the blending initiative.
2. **Environmental Sustainability:** Reduce greenhouse gas emissions and promote renewable energy use.
3. **Rural Development:** Generate direct and indirect employment, support local economies, and enhance infrastructure in the region.

The Environmental Impact Assessment (EIA) ensures compliance with the EIA Notification, 2006, and other regulations while identifying, assessing, and mitigating potential environmental impacts. This report serves as a blueprint for sustainable project implementation.

M/s Magadh Sugar & Energy Limited (MSEL) Unit: Bharat Sugar Mills is proposing to install a green field Molasses and Grain based Ethanol plant Hasanpur Sugar Mills Distillery Division of 100 kld industry along with 4 MW of Co-Generation Power Plant at Hasanpur Tehsil – Rosera, District Samastipur (Bihar).

The Company is having three sugar mills at New Swadeshi Sugar Mills, Narkatiaganj (District West Champaran, Bihar), Bharat Sugar Mills (District Gopalganj, Bihar), Hasanpur Sugar Mills, Hasanpur (District Samastipur, Bihar) with a combined crushing capacity of 17,500 TCD. Our Company is also having one distillery at Narkatiaganj with a total capacity of 60 KLPD. Our Company is also having Cogen facility and produce 38 MW power. This Company is Registered in the State of Uttar Pradesh vide CIN no U15122UP2015PLC069632.

Rian Enviro Private Limited, Patna a NABET-QCI Accredited firm has been entrusted to conduct an Environmental Impact Assessment (EIA) for the proposed capacity of 100 KLD dual feed (Molasses and grain), green field ethanol plant for EBP purpose. As per the EIA Notification of MoEF dated 14th September 2006 and S.O. 1960 (E) of MoEF&CC dated 13th June 2019, the project requires prior Environmental Clearance from SEIAA/SEAC based on EIA study under 5(g), Category B Non-molasses-based distilleries ≤ 200 KLD of production capacity. The Terms of Reference (ToR) was approved by SEIAA, Bihar vide ToR identification No. TO24B2505BR5170633N dated: 10.07.2024.

1.1 Location & Accessibility

The project site is located at Khata No – 281, 511, 111, 520, 402, 578, 329, 993, 756 Plot no – 347, 348, 355, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, P.O. + village – Hasanpur, Samastipur, Bihar.

The site is well connected with Hasanpur-Bithan road and the nearest railway station is Hasanpur Railway station is 0.5 km from the plant. The nearest airport is Darbhanga airport is about 60.5 Km in

West direction from the plant. The topomap around 10 km radius is shown in Fig 1 below.

Project Overview:

- Site Location: Hasanpur, Rosera Tehsil, Samastipur District, Bihar.
- Area: 5.66 hectares, with 33% greenbelt development planned.
- Plant Capacity: 100 KLD ethanol production.
- Power Generation: 4 MW from co-generation using renewable energy sources like bagasse.
- Estimated Project Cost: ₹16,202 lakhs.

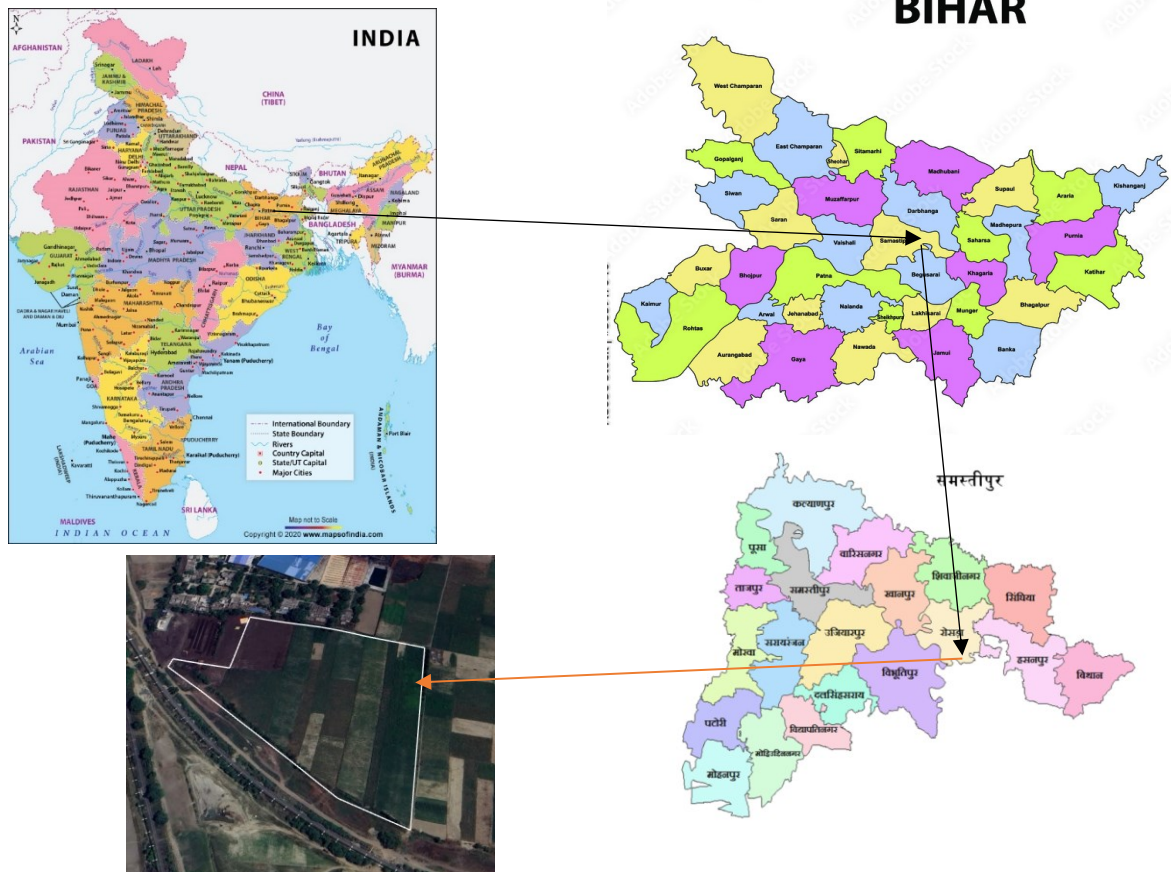


Figure 1-1 : Location of the project

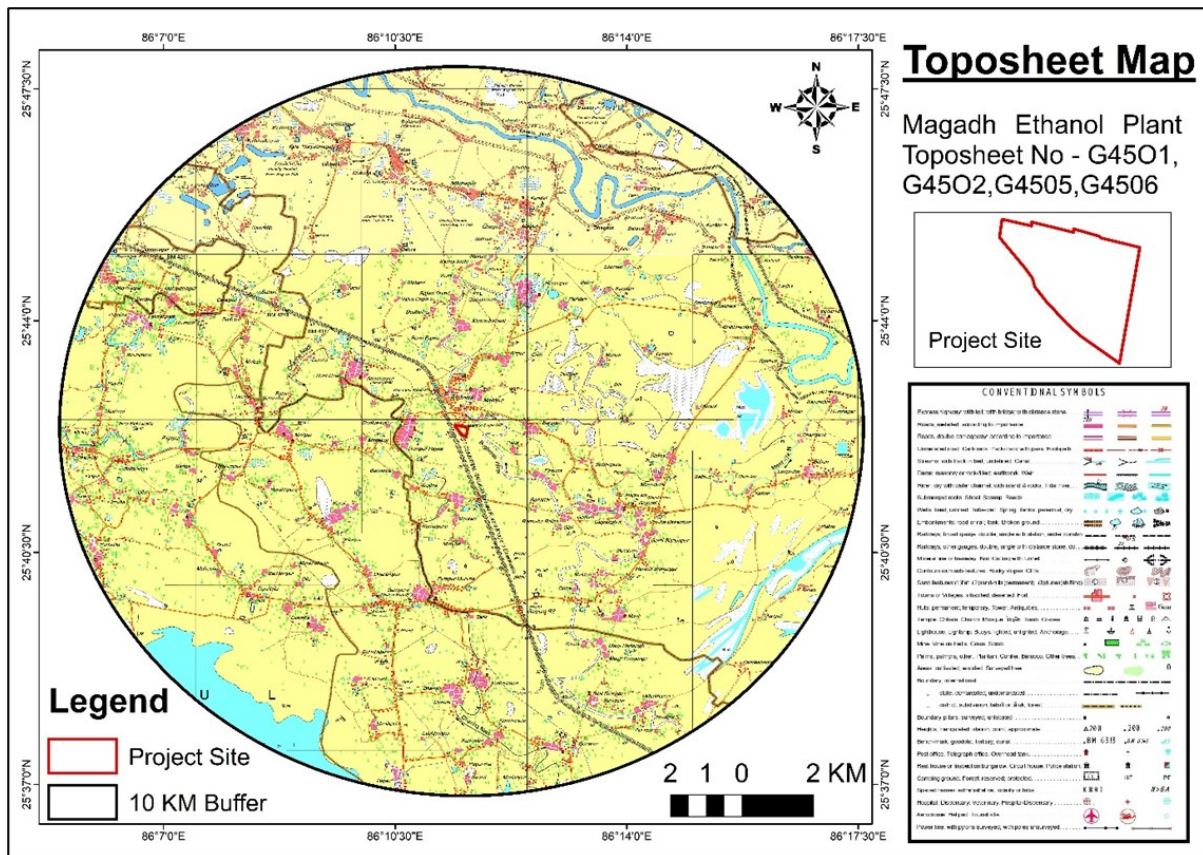


Figure 1-2 : 10 km buffer map of the project site on toposheet

Process Description:

- The plant adopts multi-feed technology for ethanol production, processing:
 - Molasses: Sourced during the sugarcane season, utilized for 160 days annually.
 - Grains: Sourced from local markets during the off-season for 170 days.
- Outputs:
 - Ethanol: 100 KLD.
 - By-products: Carbon dioxide (CO₂) for industrial use and Distillers Dried Grain Solubles (DDGS) for animal feed.

Environmental Controls:

1. Zero Liquid Discharge (ZLD):
 - Effluent treatment ensures no discharge into natural water bodies.
 - Treated water reused for irrigation, cooling, and cleaning purposes.
2. Air Emission Controls:
 - Installation of an Electrostatic Precipitator (ESP) for boiler emissions.
 - 70-meter stack for effective dispersion.
3. Water Conservation:
 - Rainwater harvesting with a capacity of 300 m³ reduces dependency on freshwater sources.

2 Description of the Environment

2.1 Air Quality

2.1.1 Objective:

To assess the ambient air quality in the study area, identify sources of pollutants, and determine compliance with the Central Pollution Control Board (CPCB) standards.

Methodology:

- Monitoring Parameters:
PM10, PM2.5, SO₂, NO_x, CO, and Ozone.
- Locations:
Eight monitoring stations covering residential, industrial, and sensitive areas, including Hasanpur and surrounding villages.

2.1.2 Results:

- Particulate Matter:
 - PM10: 52.4 µg/m³ (Standard: 100 µg/m³).
 - PM2.5: 28.3 µg/m³ (Standard: 60 µg/m³).
Levels are well within permissible limits, indicating minimal dust and suspended particulate matter.
- Gaseous Pollutants:
 - SO₂: 12.7 µg/m³ (Standard: 80 µg/m³).
 - NO_x: 16.5 µg/m³ (Standard: 80 µg/m³).
 - CO: Below detectable levels.
Low levels of gaseous pollutants suggest limited industrial activity in the region.

2.1.3 Conclusion:

The air quality in the project area is good, with all measured parameters complying with CPCB norms. The low levels of pollutants indicate a healthy air environment, making the site suitable for the proposed project.

2.2 Water Quality

2.2.1 Objective:

To evaluate the quality of surface and groundwater resources for their suitability in domestic, agricultural, and industrial applications.

Methodology:

- Surface Water Sampling: Collected from Bagmati River (0.25 km from the site) and local ponds.
- Groundwater Sampling: Collected from six borewell locations, including the project site and surrounding areas.

- Parameters Tested: pH, Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), hardness, and heavy metals.

2.2.2 Results:

Surface Water:

- pH: 7.3–7.8 (Standard: 6.5–8.5).
- DO: 3.91–7.74 mg/L, indicating good oxygen levels for aquatic life.
- BOD: <2 mg/L (Standard for drinking water: <3 mg/L).

Groundwater:

- pH: 7.1–7.6 (Standard: 6.5–8.5).
- TDS: 220–330 mg/L (Standard: 500 mg/L).
- Hardness: 130–180 mg/L (Standard: <200 mg/L).

2.2.3 Conclusion:

Both surface and groundwater meet the IS:10500 drinking water standards. Surface water is suitable for supporting aquatic life and agricultural irrigation, while groundwater can be used for domestic and industrial purposes without additional treatment.

2.3 Noise Levels

2.3.1 Objective:

To measure ambient noise levels at different locations and assess compliance with CPCB standards for residential, industrial, and sensitive zones.

Methodology:

- Monitoring Locations: Five locations, including residential areas, project site boundary, and nearby sensitive zones.
- Measurement Period: Daytime (6:00 AM to 10:00 PM) and nighttime (10:00 PM to 6:00 AM).

2.3.2 Results:

- Daytime Noise Levels: 52.3 dB(A) (Standard for residential areas: 55 dB(A)).
- Nighttime Noise Levels: 40.5 dB(A) (Standard for residential areas: 45 dB(A)).

2.3.3 Conclusion:

Noise levels are below the permissible limits set by CPCB, indicating minimal disturbances from vehicular traffic, local activities, or industrial operations in the area.

2.4 Soil Quality

2.4.1 Objective:

To assess the soil's fertility, suitability for greenbelt development, and potential contamination.

Methodology:

- Sampling Locations: Five sites within the project area and nearby agricultural fields.

- Parameters Tested: pH, organic carbon, nitrogen, phosphorus, potassium, and heavy metals.

2.4.2 Results:

- pH: 6.8–7.2, indicating neutral to slightly acidic soil, suitable for agriculture.
- Organic Carbon: 0.58%, which is adequate for plant growth.
- Macro-Nutrients:
 - Nitrogen: 225–290 kg/ha.
 - Phosphorus: 18–23 kg/ha.
 - Potassium: 110–140 kg/ha.

2.4.3 Conclusion:

The soil is fertile and suitable for the development of the greenbelt (planned to cover 33% of the site). No contamination by heavy metals was detected.

Summary of Environmental Components

Component	Parameters Tested	Result
Air Quality	PM10, PM2.5, SO ₂ , NO _x , CO	All parameters within CPCB standards.
Water Quality	pH, TDS, BOD, COD, Hardness	Groundwater and surface water suitable for domestic and industrial use.
Noise Levels	Daytime, Nighttime dB(A)	Noise levels below CPCB limits for residential areas.
Soil Quality	pH, organic carbon, macro-nutrients	Fertile soil, suitable for greenbelt development and agriculture.

2.5 Biodiversity Component with Schedule I Species

2.5.1 Objective:

To identify flora and fauna in the project area, evaluate ecological sensitivity, and ensure compliance with biodiversity conservation measures under the Wildlife Protection Act, 1972.

Methodology:

- Field surveys to document terrestrial and aquatic species within a 10 km radius.
- Consultation with local forestry officials and secondary data review from government records.

2.5.2 Results:

Flora:

- Dominant plant species include neem (*Azadirachta indica*), mango (*Mangifera indica*), banyan (*Ficus benghalensis*), and wild grasses.
- No rare or endangered plant species identified.

Fauna:

- Common species: Squirrels, mongooses, lizards, snakes, and a variety of birds.

- Schedule I Species Identified (as per the Wildlife Protection Act, 1972):
 - Mammals:
 - Jungle Cat (*Felis chaus*).
 - Indian Grey Mongoose (*Herpestes edwardsii*).
 - Indian Fox (*Vulpes bengalensis*).
 - Reptiles:
 - Cobra (*Naja naja*).
 - Rat Snake (*Ptyas mucosa*).
 - Birds:
 - Pallas's Fish Eagle (*Haliaeetus leucoryphus*).
 - Greater Adjutant (*Leptoptilos dubius*).
 - Sociable Lapwing (*Vanellus gregarius*).

2.5.3 Conservation Measures

a. Greenbelt Development Plan:

A greenbelt covering 33% of the project area will be established with native plant species to provide a habitat for fauna, including Schedule I species. The greenbelt will also act as a buffer zone to reduce human-wildlife interaction and promote biodiversity.

b. Dedicated Conservation Plan:

A Wildlife Conservation Plan has been prepared and submitted to the Divisional Forest Officer (DFO) for approval and implementation. The plan includes:

- Protection measures for Indian Grey Mongoose, Jungle Cat, and Indian Fox through habitat preservation and restoration.
- Awareness programs for local communities to prevent hunting and disturbance to wildlife.
- Monitoring of bird habitats, particularly for the Pallas's Fish Eagle, Greater Adjutant, and Sociable Lapwing, to ensure their nesting areas are protected.

c. Collaboration with Forest Department:

- Regular communication with the DFO to monitor the implementation of the conservation plan.
- Engagement with local forest officials for anti-poaching measures and wildlife surveillance.

2.5.4 Mitigation Measures for Reptiles:

- Safe relocation of reptiles like Cobra and Rat Snake found near construction areas.
- Regular training for workers on wildlife safety and handling protocols to avoid harm to reptiles.

2.5.5 Conclusion

The identification of Schedule I species such as the Jungle Cat, Indian Fox, Greater Adjutant, and Sociable Lapwing underscores the ecological significance of the project area. With the implementation of the Wildlife Conservation Plan submitted to the Divisional Forest Officer (DFO) and the development of a robust greenbelt, the project will ensure the protection and enhancement of biodiversity. These measures align with the Wildlife Protection Act, 1972, and contribute to long-term ecological sustainability.

3 Anticipated Environmental Impacts and Mitigation Measures

3.1 Air Quality

3.1.1 Potential Impacts:

- **Construction Phase:**
 - Dust emissions from excavation, construction activities, and movement of vehicles.
 - Particulate matter generation (PM10, PM2.5).
- **Operational Phase:**
 - Emissions from the boiler, DG sets, and vehicular movement, including pollutants like SO₂, NO_x, and PM.
 - Odor from fermentation processes if not controlled.

3.1.2 Mitigation Measures:

- **Construction Phase:**
 - Regular sprinkling of water to suppress dust.
 - Covering construction materials and restricting vehicle speed.
- **Operational Phase:**
 - Installation of **Electrostatic Precipitator (ESP)** with 99.9% efficiency to control particulate emissions.
 - A **70-meter stack** to ensure proper dispersion of emissions.
 - Greenbelt development (33% of the site area) to act as an air filter.

3.2 Water Quality and Management

3.2.1 Potential Impacts:

- **Construction Phase:**
 - Potential contamination of nearby water bodies from construction debris or spills.
 - Increased demand for water for construction purposes.
- **Operational Phase:**
 - Effluent discharge from distillery operations (spent wash, process water, cooling water).
 - Increased demand for fresh water for operational needs.

3.2.2 Mitigation Measures:

- **Construction Phase:**
 - Avoid discharge of untreated wastewater into local water bodies.
 - Use sedimentation tanks to settle suspended solids.

- Operational Phase:
 - **Zero Liquid Discharge (ZLD)** system to ensure 100% recycling of effluent.
 - Multi-effect evaporators and condensate polishing units to treat spent wash.
 - Rainwater harvesting system with a capacity of **300 m³** to reduce reliance on freshwater.

3.3 Noise Levels

3.3.1 Potential Impacts:

- **Construction Phase:**
 - Noise from heavy machinery, construction equipment, and vehicle movement.
- **Operational Phase:**
 - Noise from boilers, compressors, DG sets, and vehicular traffic.

3.3.2 Mitigation Measures:

- Construction Phase:
 - Use of well-maintained equipment to reduce noise levels.
 - Scheduling noisy activities during daytime only.
- Operational Phase:
 - Acoustic enclosures for DG sets and machinery.
 - Development of a greenbelt to act as a noise buffer.

3.4 Soil Quality

3.4.1 Potential Impacts:

- **Construction Phase:**
 - Soil erosion and compaction due to heavy vehicle movement.
 - Loss of topsoil during excavation.
- **Operational Phase:**
 - Potential contamination from solid waste (fly ash, sludge).

3.4.2 Mitigation Measures:

- Construction Phase:
 - Proper storage and reuse of topsoil for greenbelt development.
 - Erosion control measures, such as silt fencing and re-vegetation.
- Operational Phase:
 - Fly ash to be used in brick manufacturing.
 - Decanter cake to be used as manure in agriculture.

3.5 Biodiversity

3.5.1 Potential Impacts:

- **Construction Phase:**
 - Habitat disturbance due to land clearing and noise.
- **Operational Phase:**
 - Risk of human-wildlife conflict, especially for Schedule I species like Jungle Cat, Indian Fox, and Pallas's Fish Eagle.

3.5.2 Mitigation Measures:

- **Construction Phase:**
 - Minimize vegetation clearing and use barricades to protect wildlife habitats.
- **Operational Phase:**
 - Implementation of the **Wildlife Conservation Plan** submitted to the Divisional Forest Officer (DFO).
 - Greenbelt with native species to enhance biodiversity.

3.6 Waste Management

3.6.1 Potential Impacts:

- **Construction Phase:**
 - Generation of construction debris.
 - Improper disposal of waste materials.
- **Operational Phase:**
 - Fly ash, spent wash, and hazardous waste like used oil.

3.6.2 Mitigation Measures:

- **Construction Phase:**
 - Reuse of construction debris for leveling and road development.
 - Safe disposal of non-reusable waste.
- **Operational Phase:**
 - Fly ash to be utilized in brick manufacturing.
 - Hazardous waste like used oil to be disposed of through authorized vendors.

3.7 Socio-Economic Impacts

3.7.1 Potential Impacts:

- **Construction Phase:**
 - Influx of workers may strain local resources.

- Increased traffic congestion.

- **Operational Phase:**

- Positive impacts from employment and economic activity.

3.7.2 Mitigation Measures:

- **Construction Phase:**

- Employ local labor to reduce pressure on local resources.
- Develop temporary facilities for workers.

- **Operational Phase:**

- Provide direct employment to 91 people during operations.
- Support local businesses by sourcing raw materials (molasses and grains) locally.

3.8 Traffic and Transportation

3.8.1 Potential Impacts:

- Increased vehicular movement during construction and operations.
- Dust and noise generation along transportation routes.

3.8.2 Mitigation Measures:

- Use of covered vehicles for transporting materials.
- Scheduling transport during non-peak hours.
- Maintenance of internal roads to reduce dust generation.

Table 3-1 : Summary of Anticipated Impacts and Mitigation Measures

Environmental Component	Potential Impacts	Mitigation Measures
Air Quality	Emissions from boilers and vehicles.	ESP, 70m stack, and greenbelt.
Water Quality	Effluent discharge from operations.	ZLD system, rainwater harvesting, and effluent treatment.
Noise Levels	Machinery noise during construction/operation.	Acoustic enclosures, greenbelt buffer, and restricted timing for noisy activities.
Soil Quality	Erosion, compaction, and contamination.	Reuse of topsoil, proper waste disposal, and erosion control measures.
Biodiversity	Habitat disturbance and human-wildlife conflict.	Conservation plan, greenbelt development, and awareness programs.
Waste Management	Fly ash, sludge, hazardous waste.	Reuse in brick manufacturing, safe disposal through authorized vendors.
Socio-Economic	Increased demand for resources and traffic.	Local hiring, support for local suppliers, and traffic management plans.

4 Environmental Monitoring Programme

4.1 Air Quality Monitoring

Parameters Monitored:

- PM10, PM2.5, SO₂, NO_x, and CO.

Frequency:

- **Construction Phase:** Monthly.
- **Operational Phase:** Continuous emissions monitoring for stack emissions; ambient air quality monitored monthly.

Locations:

- At the project boundary.
- Residential and sensitive areas within a **5 km radius**.

Action Plan:

- Install continuous air quality monitoring stations (CAAQMS).
- Maintain and calibrate emission control equipment like Electrostatic Precipitators (ESP).

4.2 Water Quality Monitoring

Parameters Monitored:

- pH, Total Dissolved Solids (TDS), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and heavy metals.

Frequency:

- Monthly monitoring of surface water and groundwater.
- Daily monitoring of treated effluent.

Locations:

- Groundwater at the project site and nearby villages.
- Surface water at **Bagmati River** and nearby ponds.
- Effluent discharge points (treated effluent reused under ZLD).

Action Plan:

- Multi-effect evaporators and condensate polishing units to treat spent wash.
- Maintain compliance with discharge standards under CPCB norms.

4.3 Noise Level Monitoring

Parameters Monitored:

- Ambient noise levels (dB(A)).

Frequency:

- Quarterly.

Locations:

- Near DG sets, machinery, and sensitive receptors.
- Residential and industrial zones within a 2 km radius.

Action Plan:

- Acoustic enclosures for noisy equipment.
- Greenbelt development to act as a noise barrier.

4.4 Soil Quality Monitoring

Parameters Monitored:

- pH, organic carbon, nitrogen, phosphorus, potassium, and heavy metals.

Frequency:

- Half-yearly.

Locations:

- At the project site and agricultural fields near the project boundary.

Action Plan:

- Ensure soil fertility is maintained through proper waste disposal practices.
- Reuse fly ash and decanter cake as fertilizers for greenbelt development.

4.5 Biodiversity Monitoring

Parameters Monitored:

- Presence and health of Schedule I species identified in the study area (e.g., Jungle Cat, Indian Fox, Pallas's Fish Eagle).
- Flora and fauna diversity in the greenbelt.

Frequency:

- Annual assessment in collaboration with the Divisional Forest Officer (DFO).

Locations:

- Within the greenbelt and surrounding 10 km radius.

Action Plan:

- Implement the **Wildlife Conservation Plan** submitted to the DFO.
- Regular monitoring to ensure the safety and preservation of Schedule I species.

4.6 Waste Management Monitoring

Parameters Monitored:

- Fly ash generation and disposal.
- Hazardous waste (used oil, spent chemicals).

Frequency:

- Monthly.

Action Plan:

- Fly ash to be utilized in brick manufacturing.
- Hazardous waste to be disposed of through authorized handlers as per **Hazardous Waste Management Rules, 2016**.

4.7 Institutional Framework for Monitoring

4.7.1 Environmental Management Cell (EMC):

The project will establish an in-house EMC responsible for:

- Implementing the EMP.
- Coordinating with regulatory bodies for compliance reporting.
- Supervising the monitoring activities conducted by external accredited agencies.

4.7.2 Key Responsibilities:

- Maintain environmental monitoring equipment.
- Review monitoring data and take corrective actions.
- Submit compliance reports to the **State Pollution Control Board (SPCB)** and **Ministry of Environment, Forest, and Climate Change (MoEF&CC)**.

4.7.3 Reporting and Documentation

- **Daily Reports:** Treated effluent quality.
- **Monthly Reports:** Air and water quality, waste generation, and disposal data.
- **Quarterly Reports:** Noise levels and corrective actions.
- **Annual Reports:** Biodiversity assessment, greenbelt development progress, and compliance summary.

4.7.4 Environmental Monitoring Budget

Phase	Capital Cost	Recurring Cost (Annual)
Construction Phase	₹5 lakhs	₹1.5 lakhs
Operational Phase	₹12 lakhs	₹2.5 lakhs

4.7.5 Conclusion

The Environmental Monitoring Plan ensures that all project activities comply with regulatory standards and maintain minimal environmental impact. By continuously monitoring air, water, noise, soil, biodiversity, and waste, the EMP provides a robust mechanism to address deviations and implement corrective measures effectively. The dedicated **Environmental Management Cell (EMC)** and periodic reporting reinforce accountability and transparency throughout the project lifecycle.

5 Additional Studies

5.1 Public Hearing

A public hearing was conducted on **September 25, 2024**, involving local residents, authorities, and other stakeholders.

Key Concerns Raised:

- Employment opportunities for locals.
- Water resource management to prevent depletion.
- Traffic safety and management during construction and operations.
- Protection of nearby agricultural lands from pollution.

Proposed Measures to Address Concerns:

- Employment preference for local labor during both construction and operational phases.
- Implementation of a **rainwater harvesting system** to recharge groundwater and reduce dependency on local water resources.
- Traffic management plan, including scheduling vehicle movement during non-peak hours and maintaining internal roads to minimize dust.
- Zero Liquid Discharge (ZLD) system to ensure no effluent discharge into nearby agricultural lands or water bodies.

5.2 Remediation Measures for Bagmati River

The Bagmati River is a vital water resource for the region, supporting agriculture, aquatic biodiversity, and local communities. Recognizing its ecological importance, the project includes a dedicated action plan to ensure its protection and remediation.

5.2.1 Potential Impacts:

- Risk of contamination from accidental spills or runoff during construction and operations.
- Sediment deposition or erosion due to construction activities.
- Increased pressure on water resources from operational demands.

5.2.2 Remediation Measures:

1. Zero Liquid Discharge (ZLD):

- Effluent treatment and recycling to prevent any discharge into the Bagmati River.
- Installation of advanced treatment units like multi-effect evaporators and condensate polishing systems to ensure compliance with CPCB standards.

2. Construction Controls:

- Use of silt traps and sedimentation tanks to prevent construction debris and runoff from reaching the river.
- Barricading sensitive zones near the river to restrict construction activities.

3. Riparian Zone Protection:

- Development of a **riparian greenbelt** using native plant species to stabilize soil, reduce erosion, and enhance biodiversity along the riverbanks.

4. Emergency Response Mechanism:

- Spill containment kits and emergency response protocols for accidental leaks or spills near the river.
- Regular training for workers on spill prevention and response.

5. Community Awareness Programs:

- Engaging local communities in awareness campaigns on river conservation.

Table 5-1 : Budget for Bagmati River Remediation Measures

Measure	Estimated Cost (₹)	Frequency
Zero Liquid Discharge (ZLD) System	2.5 crores (capital)	Recurring: 5 lakhs/year
Silt Traps and Sedimentation Tanks	10 lakhs	One-time cost
Riparian Greenbelt Development	15 lakhs (planting native trees)	Maintenance: 3 lakhs/year
Emergency Response Kits and Training	5 lakhs (initial cost)	Annual: 2 lakhs/year
Community Awareness Campaigns	3 lakhs/year	Recurring
Total Budget	~3 crores (capital)	~10 lakhs/year

Table 5-2 : Action Plan for Bagmati River Protection

Action	Timeline	Responsible Entity
Implement ZLD and effluent recycling	Before operational phase	Environmental Management Cell (EMC)
Install silt traps and sedimentation tanks	During construction phase	Project Engineering Team
Develop riparian greenbelt	Within the first year	EMC and Local Forest Department
Conduct emergency response training	Quarterly	EMC and Safety Officer
Organize community awareness programs	Semi-annually	EMC and Local NGOs

5.3 Risk Assessment

A detailed risk assessment was conducted to identify and mitigate potential hazards during construction and operation.

Key Risks Identified:

- **Fire and Explosion:** Risks associated with ethanol storage and boiler operations.
- **Chemical Spills:** Potential leakage of hazardous materials like molasses or spent chemicals.

- **Worker Safety:** Exposure to machinery-related accidents.

Mitigation Measures:

- Installation of fire detection and suppression systems.
- Emergency response plans (ERPs) and evacuation protocols.
- Regular training for workers on handling hazardous materials and operating machinery safely.
- Storage of hazardous chemicals in secured and labeled areas with spill containment systems.

5.4 Wildlife Conservation Plan

As **Schedule I species** (e.g., Jungle Cat, Indian Fox, Greater Adjutant, Pallas's Fish Eagle) were identified in the study area, a **Wildlife Conservation Plan** was developed and submitted to the **Divisional Forest Officer (DFO)**.

Key Elements of the Plan:

- Greenbelt development using native species to provide habitats for local wildlife.
- Awareness programs for workers and local communities to minimize human-wildlife conflict.
- Monitoring the presence of sensitive species in collaboration with the Forest Department.
- Avoiding construction activities during breeding seasons to protect sensitive species.

5.5 Conclusion

The additional studies, including the public hearing, risk assessment, and wildlife conservation plan, demonstrate a proactive approach to addressing environmental, safety, and socio-economic concerns. The project has integrated the feedback from stakeholders and developed robust measures to mitigate risks, ensure safety, and protect biodiversity, making it environmentally sustainable and socially acceptable.

6 Project Benefits

The Hasanpur Distillery Project is designed to deliver extensive environmental, economic, and socio-economic benefits, ensuring alignment with national renewable energy goals while promoting sustainable regional development. Below is an expanded analysis of the key advantages:

6.1 Environmental Benefits

6.1.1 Reduction in Carbon Emissions

- The production of ethanol will significantly reduce carbon emissions by displacing fossil fuels in the transportation sector.
- Annual reduction in **CO₂ emissions: 2,500 tons**, contributing to India's climate goals under the Paris Agreement.

6.1.2 Zero Liquid Discharge (ZLD)

- Ensures **100% recycling** of wastewater, preventing effluent discharge into local water bodies, including the **Bagmati River**.
- Advanced treatment systems like multi-effect evaporators and condensate polishing units eliminate the risk of water contamination.

6.1.3 Greenbelt Development

- A greenbelt covering **33% of the project area** will enhance air quality, reduce noise pollution, and create a habitat for local fauna.
- Native species, including neem, banyan, and mango, will be planted to support biodiversity.
- Acts as a carbon sink, mitigating emissions from project operations.

6.1.4 Soil and Water Conservation

- Treated effluent will be reused for irrigation and cooling purposes, reducing dependence on freshwater resources.
- Rainwater harvesting with a capacity of **300 m³** will recharge groundwater and support agricultural activities in the area.
- Organic waste, such as decanter cake, will be used as manure, enriching soil fertility.

6.2 Economic Benefits

6.2.1 Support for the Ethanol Blending Petrol (EBP) Program

- Contributes to the **20% ethanol blending target by 2025**, enhancing India's energy security.
- Substituting ethanol for fossil fuels reduces the country's dependency on crude oil imports, saving approximately **₹20 crore annually** in foreign exchange.

6.2.2 Commercial By-Products

- **Carbon Dioxide (CO₂)**: Captured and sold for industrial applications, such as carbonation in beverages and dry ice production.

- **Distillers Dried Grain Solubles (DDGS):** A by-product of grain-based ethanol production, marketed as a high-protein feed for cattle and poultry. This adds an additional revenue stream while supporting the livestock industry.

6.2.3 Cost Savings for Industries

- Ethanol production reduces reliance on fossil fuels, stabilizing energy costs for industries dependent on blended fuels.
- By-products like DDGS and fly ash provide cost-effective solutions for agriculture and construction sectors.

6.3 Socio-Economic Benefits

6.3.1 Employment Generation

- **Construction Phase:** Creates jobs for **100 workers**, with a preference for local labor, providing immediate economic benefits to the community.
- **Operational Phase:** Offers **91 permanent jobs** in various roles, including technical, administrative, and operational staff.

6.3.2 Support for Agriculture

- Raw material sourcing strengthens the regional agricultural economy:
 - **Molasses:** Sourced from local sugar mills, boosting the sugarcane industry.
 - **Grains:** Sourced from local farmers, ensuring consistent demand and better market prices for agricultural produce.
 - Organic waste like decanter cake is repurposed as manure, enhancing crop yields for local farmers.

6.4 Infrastructure Development

- Improved roads for transportation of raw materials and finished products benefit local communities by enhancing connectivity.
- Water resource management through rainwater harvesting and groundwater recharge directly benefits nearby villages.

6.5 Community Engagement

- Awareness programs on water conservation, biodiversity, and sustainable farming practices are planned to educate and empower local residents.
- Skill development initiatives for workers and local youth ensure long-term employability and capacity building.

6.6 Contribution to National Goals

6.6.1 Renewable Energy Promotion

- Ethanol is a key component of India's **National Bio-Energy Policy**, reducing reliance on conventional fuels and promoting clean energy sources.

6.7 Alignment with Climate Goals

- The project contributes to **India's Nationally Determined Contributions (NDCs)** under the Paris Agreement by reducing greenhouse gas emissions.

6.8 Sustainable Industrial Development

- Establishing the distillery in a rural area like Hasanpur supports **decentralized industrial growth**, providing economic opportunities in underserved regions.
- Demonstrates a model for balancing industrial progress with environmental sustainability.

6.9 Environmental and Economic Synergies

- By adopting advanced technologies like **Zero Liquid Discharge (ZLD)** and **multi-feed distillery systems**, the project ensures minimal environmental impact while achieving cost-efficiency.
- The reuse of fly ash in brick manufacturing, organic waste as manure, and treated water for irrigation exemplifies a **circular economy model**, reducing waste and enhancing resource utilization.

Table 6-1 : Quantified Benefits

Category	Impact
Carbon Emission Reduction	2,500 tons of CO ₂ annually.
Foreign Exchange Savings	₹20 crore annually by reducing crude oil imports.
Employment Opportunities	100 jobs during construction, 91 during operations.
Greenbelt Development	33% of the project area (approximately 18,748 m ²).
Water Conservation	300 m ³ rainwater harvesting capacity; ZLD ensures no effluent discharge.
By-Product Utilization	DDGS for cattle feed; CO ₂ for industrial applications; fly ash for bricks.

6.10 Conclusion

The Hasanpur Distillery Project offers a comprehensive suite of benefits, balancing economic growth, environmental protection, and socio-economic upliftment. By contributing to India's ethanol blending goals and creating sustainable livelihoods, the project exemplifies the integration of industrial development with environmental and social responsibility. These benefits will foster long-term regional and national progress while ensuring minimal ecological disruption.

7 Environmental Management Plan (EMP)

The **Environmental Management Plan (EMP)** for the Hasanpur Distillery Project provides a comprehensive framework to mitigate, monitor, and manage environmental impacts throughout the project's lifecycle. It integrates modern technologies, regulatory compliance measures, and sustainable practices to ensure minimal disruption to the environment while maximizing socio-economic benefits.

7.1 Air Quality Management

7.1.1 Potential Issues:

- Dust generation during construction activities.
- Emissions from boilers and DG sets during operations.
- Particulate matter (PM10, PM2.5) and gaseous pollutants (SO₂, NO_x).

7.1.2 Mitigation Measures:

- Installation of an **Electrostatic Precipitator (ESP)** to control particulate emissions with 99.9% efficiency.
- A **70-meter stack** for effective dispersion of emissions to meet CPCB standards.
- Greenbelt development, covering **33% of the project area**, to act as a natural filter for air pollutants.

7.1.3 Monitoring Plan:

- Continuous Emission Monitoring Systems (CEMS) to track air quality parameters, including PM10, PM2.5, SO₂, NO_x, and CO.
- Ambient air quality monitoring at multiple locations, including residential and sensitive areas, on a monthly basis.

7.2 Water Management

7.2.1 Potential Issues:

- High water demand during operations, leading to pressure on local resources.
- Effluent discharge containing spent wash and other contaminants.

7.2.2 Mitigation Measures:

- **Zero Liquid Discharge (ZLD)** system to recycle and reuse 100% of wastewater.
- Installation of multi-effect evaporators (MEE) and condensate polishing units to treat effluent.
- Rainwater harvesting system with a **300 m³ capacity** to recharge groundwater and supplement operational needs.

7.2.3 Monitoring Plan:

- Daily monitoring of treated effluent quality to ensure compliance with CPCB standards.
- Monthly sampling of groundwater and surface water near the project site to detect any contamination.

7.3 Noise Management

7.3.1 Potential Issues:

- Construction noise from machinery and vehicle movement.
- Operational noise from boilers, DG sets, and compressors.

7.3.2 Mitigation Measures:

- Acoustic enclosures for DG sets and other noise-generating equipment.
- Scheduling of noisy activities during daytime hours only.
- Development of a dense greenbelt to act as a natural sound barrier.

7.3.3 Monitoring Plan:

- Quarterly monitoring of ambient noise levels at sensitive receptors, such as residential areas and workplaces.

7.4 Solid and Hazardous Waste Management

7.4.1 Potential Issues:

- Generation of fly ash from boilers.
- Disposal of hazardous waste, such as used oil and spent chemicals.
- Organic waste from distillery operations.

7.4.2 Mitigation Measures:

- Fly ash will be used in brick manufacturing, minimizing disposal requirements.
- Organic waste, such as decanter cake, will be reused as manure in agriculture.
- Hazardous waste, including used oil, will be disposed of through authorized vendors as per the **Hazardous Waste Management Rules, 2016**.

7.4.3 Monitoring Plan:

- Monthly tracking of waste generation, utilization, and disposal to authorized facilities.

7.5 Biodiversity Conservation

7.5.1 Potential Issues:

- Habitat disturbance during construction and operational phases.
- Presence of **Schedule I species** (e.g., Jungle Cat, Indian Fox, Greater Adjutant, Pallas's Fish Eagle).

7.5.2 Mitigation Measures:

- Greenbelt development using native species to create habitats for local fauna and improve ecological balance.
- Implementation of a **Wildlife Conservation Plan**, submitted to the Divisional Forest Officer (DFO), to protect Schedule I species.
- Awareness programs for workers to reduce human-wildlife conflict.

7.5.3 Monitoring Plan:

Annual biodiversity assessments to evaluate the health of local flora and fauna.

7.6 Socio-Economic Measures

7.6.1 Key Issues Addressed:

- Employment generation and skill development for the local population.
- Concerns about traffic management and strain on local infrastructure.

7.6.2 Mitigation Measures:

- Preference for local hiring during construction and operational phases.
- Implementation of a traffic management plan to minimize congestion and reduce emissions.
- Community engagement programs on water conservation, waste management, and biodiversity.

7.7 Institutional Framework

A **dedicated Environmental Management Cell (EMC)** will oversee the implementation of the EMP. The EMC's responsibilities include:

- Supervising mitigation measures and monitoring activities.
- Ensuring compliance with regulatory standards and submitting reports to the **State Pollution Control Board (SPCB)** and **Ministry of Environment, Forest, and Climate Change (MoEF&CC)**.
- Conducting regular training sessions for workers on environmental management practices.

Table 7-1 : Budget Allocation for EMP

Category	Capital Cost (₹)	Recurring Annual Cost (₹)
Air Pollution Control	1 crore	5 lakhs
Water Management (ZLD)	2.5 crores	10 lakhs
Noise Control Measures	10 lakhs	2 lakhs
Greenbelt Development	20 lakhs	3 lakhs
Waste Management	15 lakhs	2.5 lakhs
Biodiversity Conservation	15 lakhs	2 lakhs
Socio-Economic Measures	10 lakhs	2 lakhs
Total	~4 crores	~27.5 lakhs/year

7.8 Conclusion

The Environmental Management Plan (EMP) ensures effective mitigation of the project's environmental impacts. Through advanced technologies like ZLD and ESP, rigorous monitoring protocols, and biodiversity conservation initiatives, the EMP integrates environmental sustainability into every aspect of the project. The inclusion of socio-economic measures further demonstrates a commitment to community well-being and compliance with regulatory frameworks.