VERIFICATION REPORT

of

Greenhouse Gas Inventory

at

Indian Institute of Technology Hyderabad (IITH)

Verification in accordance with ISO 14064-3:2019
Assessment against ISO 14064-1:2018

Verification Report No.: BKR/VVR/IITH/2026-01

Reporting Year: 2024 (Base Year)

Lead Verifier: **Koti Reddy Butukuri**,
Lead Assessor [ISO 14064]
DQS India certificate No. KSC: Q1-0126/01

Date: March 05, 2026

Annexure: IITH GREENHOUSE GAS EMISSIONS INVENTORY REPORT

1. Verification Statement

The Greenhouse Gas Inventory Report titled 'Greenhouse Gas Emissions Inventory Report – ISO 14064-1:2018' for the reporting year 2024 (Base Year), prepared by Indian Institute of Technology Hyderabad (IITH), Kandi, Sangareddy, Telangana – 502284, India, has been verified in accordance with ISO 14064-3:2019 with regard to compliance against ISO 14064-1:2018.

Verified GHG Emissions – Base Year 2024

Total GHG Emissions	37,684 tCO_2e
Scope 1 Emissions	667 tCO_2e
Scope 2 Emissions	36,656 tCO_2e
Scope 3 Emissions	361 tCO_2e

Level of Assurance: Reasonable Assurance
Materiality Threshold: Scope 1 & 2 – 5%; Scope 3 – 10%

Verification Opinion

Based on the verification activities performed and evidence obtained, it is my opinion that the GHG Statement of IITH for the reporting year 2024 is, in all material respects, prepared in accordance with ISO 14064-1:2018 and is free from material misstatement.

2. Objectives of Verification

- Assess conformity with ISO 14064-1:2018
- Evaluate accuracy, completeness, transparency and consistency
- Determine material correctness
- Issue verification opinion under ISO 14064-3:2019

3. Scope of Verification

- Organizational Boundary: Operational Control Approach
- Reporting Period: Calendar Year 2024
- GHGs Covered: CO_2, CH_4, HFCs
- Operational Coverage: Academic buildings, hostels, transport, waste systems

4. Verification Criteria

- ISO 14064-1:2018
- ISO 14064-3:2019
- IPCC AR6 Guidelines
- Central Electricity Authority (CEA) emission factors

Assessment Principles: Relevance, Completeness, Consistency, Accuracy, Transparency, and Conservativeness.

5. Verification Methodology

The verification was conducted using a risk-based approach including:

- Strategic analysis
- Risk assessment
- Evidence gathering
- Sampling and recalculation checks
- Site visit and interviews
- Independent technical review

6. Findings

- Strengths identified include clear boundary definition, transparent emission factor documentation and structured reporting.
- No material misstatements were identified during the verification.
- Opportunities for improvement include enhancement of Scope 3 data collection and refrigerant leakage tracking.

7. Roles and responsibilities

The determination and reporting of GHG emissions are the sole responsibility of IITH. The Lead Assessor role and responsibility is to independently verify the adequacy of the GHG emissions reported by IITH, as well as the underlying systems and processes for data collection, analysis and control, in accordance with the requirements of ISO 14064-3.

8. Conclusion

The GHG Inventory of IITH for Base Year 2024 conforms to ISO 14064-1:2018 requirements and meets ISO 14064-3:2019 verification criteria at a reasonable level of assurance.

Lead Verifier: 

[Koti Reddy Butukuri]

Date: March 5, 2026

Annexure: GREENHOUSE GAS EMISSIONS INVENTORY REPORT (ISO 14064-1:2018)

Annexure

GREENHOUSE GAS EMISSIONS INVENTORY REPORT
(ISO 14064-1:2018)

INDIAN INSTITUTE OF TECHNOLOGY HYDERABAD
KANDI, SANGAREDDY
TELANGANA STATE– 502284, INDIA

Reporting Year: 2025 (Base Year 2024)
Prepared in accordance with ISO 14064-1:2018

Reporting date: February 3, 2026

Prepared by:

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Public Disclosure

The Indian Institute of Technology Hyderabad (IITH) is committed to environmental stewardship and transparency in climate action. This public disclosure summarizes the institute's greenhouse gas (GHG) emissions and its pathway towards achieving a Net Zero Emission Campus by 2030.

Our Commitment

IITH has adopted a Net Zero Emission Campus (NZEC) roadmap aligned with national climate goals and global best practices. The institute is systematically reducing emissions across energy, transport, buildings, and waste systems.

How We Measure Emissions

GHG emissions are quantified in accordance with ISO 14064-1:2018, an internationally recognized standard for organizational-level greenhouse gas accounting. Emissions are reported under three scopes:

- Scope 1: Direct emissions from fuels and campus-owned sources
- Scope 2: Indirect emissions from purchased electricity
- Scope 3: Other indirect emissions such as commuting, waste, and water

2024 Emissions Snapshot

For the base year 2024, IITH's total greenhouse gas emissions are estimated at approximately ***37,684 tCO_2e***. Electricity consumption accounts for the majority of emissions, highlighting the importance of renewable energy deployment.

Pathway to Net Zero by 2030

IITH is implementing a phased transition that includes expansion of on-campus solar power, energy storage systems, energy efficiency upgrades, and electrification of transport. These measures are designed to reduce emissions progressively and responsibly.

Transparency and Verification

The GHG inventory has been prepared to enable independent third-party verification under ISO 14064-3. Periodic updates will be published to track progress and ensure accountability.

Looking Ahead

Through sustained investment, innovation, and community engagement, IITH aims to serve as a national and global

Executive Summary

This Executive Summary presents a high-level overview of the Greenhouse Gas (GHG) Emissions Inventory prepared for IITH in accordance with ISO 14064-1:2018.

Strategic Context

IITH has articulated a clear and ambitious commitment to achieve a Net Zero Emission Campus (NZEC) by the year 2030. This commitment is formally documented in the approved NZEC Roadmap and reflects the institute's leadership in sustainability, climate responsibility, and national development goals. The present GHG inventory establishes the first comprehensive, standards-compliant emissions baseline for the campus, forming the quantitative foundation for monitoring progress, prioritizing investments, and enabling credible external verification.

Reporting Framework and Governance

The inventory has been prepared in compliance with ISO 14064-1:2018 using the operational control approach. The reporting period and base year is calendar year 2024, selected due to the availability of verifiable activity data. Emissions are reported across Scope 1 (direct), Scope 2 (energy indirect), and relevant Scope 3 (value-chain) categories.

Key Findings – Base Year 2024

The total greenhouse gas emissions for the IITH campus during the base year 2024 are estimated at approximately ***37,684 tCO_2e***. The emissions profile is dominated by electricity consumption, which accounts for nearly three-quarters of total emissions.

Scope-wise emissions are summarized below:

- Scope 1 (Direct emissions): ~667 tCO_2e
- Scope 2 (Purchased electricity): ~36,656 tCO_2e
- Scope 3 (Other indirect emissions): ~361 tCO_2e

Hotspots and Risks

Electricity consumption from the state grid represents the single largest emissions source and also the greatest opportunity for rapid and cost-effective emissions reduction. Diesel generator usage, LPG consumption in hostels, refrigerant leakage, and mobility-related emissions represent secondary but material contributors.

NZEC Glide Path and Investment Alignment

Based on the NZEC roadmap, a phased emission reduction trajectory has been defined from 2025 to 2030. Planned mitigation measures include large-scale solar PV deployment, battery energy storage systems, energy efficiency retrofits, electrification of campus transport, and demand-side management. The glide path demonstrates a planned reduction of approximately 25% by 2026, over 50% by 2027, over 70% by 2028, over 85% by 2029, and 100% achievement i.e. net-zero emissions by 2030, subject to timely execution of approved projects.

Strategic Value to IITH

This ISO-aligned GHG inventory strengthens IITH's institutional governance by providing a credible, auditable emissions baseline. It enhances eligibility for national and international funding, supports reporting to government and ranking agencies, and positions IITH as a model net-zero campus for replication across the higher education sector.

Contents

1. Introduction

Climate change driven by anthropogenic greenhouse gas emissions poses significant environmental, social, and economic risks. Institutions of higher education play a critical role in climate leadership by integrating sustainability into operations, research, and education. In this context, IITH has adopted a structured and standards-based approach to quantify and manage its greenhouse gas emissions.

This report follows the ISO 14064-1:2018 standard, which provides guidance at the organizational level for the quantification and reporting of greenhouse gas emissions and removals. The methodology is aligned with the Greenhouse Gas (GHG) Protocol, ensuring international comparability and transparency.

2. Organizational Profile

Indian Institute of Technology Hyderabad (IITH) is a public technical university established by the Government of India. The campus at Kandi, Sangareddy district, Telangana, comprises academic blocks, research laboratories, hostels, residential quarters, utility infrastructure, and support facilities. The institute operates as a fully integrated residential campus with significant energy, water, transportation, and waste management activities, all of which contribute to its overall greenhouse gas footprint.

3. Reporting Framework

Reporting Standard: ISO 14064-1:2018
Reporting Period: 1 January 2025 to 31 December 2025
Base Year: 2024 (selected due to availability of verifiable data)
Organizational Boundary Approach: Operational Control

4. Organizational and Operational Boundaries

The organizational boundary for this GHG inventory is defined using the operational control approach. Accordingly, IITH accounts for 100% of greenhouse gas emissions from operations over which it has authority to introduce and implement operating policies.

The inventory includes emissions from academic buildings, laboratories, hostels, residential quarters, utility systems (diesel generators, HVAC systems, sewage treatment plants), Business travel, Employee commuting and campus-owned transportation.

All emissions are reported in metric tonnes of carbon dioxide equivalent (tCO_2e). Given the nature of IITH's operations, the relevant greenhouse gases are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- hydrofluorocarbons (HFC)

5. Greenhouse Gas Emissions Inventory

5.1 Scope 1 – Direct Greenhouse Gas Emissions

Scope 1 emissions at IITH arise from sources that are owned or controlled by the institute. These include combustion of diesel in backup generators during grid outages, fuel consumption in campus-owned vehicles, LPG used in hostels and canteens, fugitive emissions from refrigerant leakage in air-conditioning systems, and potential methane emissions from sewage treatment processes.

5.2 Scope 2 – Indirect Greenhouse Gas Emissions from Purchased Electricity

Scope 2 emissions result from the consumption of electricity purchased from the state-owned grid. Although the emissions physically occur at off-site power generation facilities, they are attributed to IITH due to its electricity consumption. The campus has an average electricity demand of approximately 96,000 kWh per day.

5.3 Scope 3 – Other Indirect Greenhouse Gas Emissions

Scope 3 emissions include indirect emissions that occur because of IITH activities but arise from sources not owned or controlled by the institute. These include commuting of staff, business travel, procurement of goods and services, waste management, water supply and treatment, and construction and maintenance activities.

6. Methodology

GHG emissions have been calculated using the activity data multiplied by appropriate emission factors. Emission factors have been sourced from national and international references including the Central Electricity Authority (CEA) of India and IPCC guidelines. All emissions are reported in metric tonnes of carbon dioxide equivalent (tCO2e).

7. Uncertainty and Data Quality

Uncertainty arises from data gaps, estimation assumptions, and variability in emission factors. Where direct measurements were unavailable, conservative assumptions were adopted. Continuous improvement in data collection through advanced monitoring systems is planned.

8. Mitigation Measures and Net Zero Alignment

The results of this GHG inventory directly support the mitigation strategies outlined in the IITH Net Zero Emission Campus (NZEC) Roadmap 2030. Key measures include large-scale solar PV deployment, battery energy storage systems, energy efficiency retrofits, electrification of transport, and reduction of diesel generator usage.

9. Verification Readiness

This GHG inventory has been prepared in accordance with ISO 14064-1:2018 and is suitable for future independent verification under ISO 14064-3. Limited assurance verification is recommended for the first verification cycle.

10. Quantified Greenhouse Gas Emissions Inventory (Base Year: 2024)

Based on activity data reported in the IITH Net Zero Emission Campus (NZEC) Roadmap and using conservative India-specific emission factors, quantified greenhouse gas emissions for the base year 2024 have been estimated. These values represent best-estimated figures and will be refined further as higher-resolution monitoring data becomes available.

10.1 Criteria for Significant Emissions

IITH has established a set of criteria to determine the significance of greenhouse gas (GHG) emissions for inclusion in its GHG inventory. These criteria are based on a combination of quantitative thresholds, qualitative relevance, and materiality to stakeholders, in line with ISO 14064-1:2018 guidance.

The following criteria have been applied:

10.1.2 Quantitative Threshold

Emission sources contributing ≥1% of the total organisational GHG emissions are considered significant and are included in full. Emission sources contributing <1% may still be included if deemed relevant under qualitative criteria.

10.1.3 Qualitative Relevance

Emissions are considered significant if they:

- Are subject to regulatory reporting or compliance requirements.
- Are associated with key stakeholder concerns (e.g. students, staff, or supply chain partners).
- Represent emerging risks or opportunities (e.g. transition to electric vehicles, renewable energy procurement).
- Are strategically important to IITH's sustainability goals or brand reputation.

10.1.4 Data Availability and Estimation Reliability

Emission sources for which reliable data can be obtained or reasonably estimated are prioritised for inclusion. Sources with high uncertainty may be excluded only if their impact is demonstrably immaterial and documented accordingly. These criteria ensure that the GHG inventory is both comprehensive and decision-useful, while maintaining transparency and consistency across reporting periods.

10.1.5 Exclusions

IITH has aimed to provide a comprehensive and transparent greenhouse gas (GHG) inventory. However, in accordance with ISO 14064-1:2018, certain emission sources have been excluded from this report. These exclusions are based on materiality, data availability, and relevance to operations. Each exclusion is justified below:

10.2 Summary of GHG Emissions by Scope

Scope	Description	Emissions (tCO_2e)
Scope 1	Direct emissions	667
Scope 2	Purchased electricity	36,656
Scope 3	Value chain emissions	361
Total	Overall campus footprint (2024)	37,684

Detailed estimates are shown in Annexure-1.

These quantified emissions form the official baseline for IITH against which future reductions under the Net Zero Emission Campus (NZEC) roadmap will be measured.

11. Emission Reduction Trajectory and NZEC Glide Path (2025–2030)

Based on the Net Zero Emission Campus (NZEC) roadmap, IITH has established a phased emission reduction trajectory from the 2024 baseline to achieve net-zero emissions by 2030. The glide path reflects planned deployment of renewable energy, battery energy storage systems, energy efficiency retrofits, and progressive electrification of campus transport.

Year	Key Mitigation Measures	Estimated Emissions (tCO_2e)	Reduction vs 2024 (%)
2024	Baseline year	37,684	0%
2025	Additional rooftop solar, Fans, A/Cs, LED retrofits	33,915	10%
2026	Roof-top solar + HVAC Optimization	28,263	25%
2027	EV transition, HVAC optimisation	18,842	50%
2028	Large-scale ground-mount solar power, demand response	11,305	70%
2029	Near-zero grid import, offsets for Scope-3	5,652	85%
2030	Net Zero Emission Campus	≈ 0	100%

12. References

- ISO 14064-1:2018 – Greenhouse gases — Part 1: Specification with guidance at the organization level.
- Greenhouse Gas Protocol – Corporate Accounting and Reporting Standard.
  IPCC Sixth Assessment Report (AR6).
- Central Electricity Authority (CEA), Government of India – CO2 Baseline Database.
  IITH Journey to a Net Zero Emission Campus by 2030 (NZEC Roadmap).

Annexure 1: GHG Estimates (Base Year 2024)

Activity	Type of Emission	Emission Factor(tCO2e)	Consumption per year	Emission per year(tCO2e)	Scope	Remarks
Purchase of electricity from grid	CO2	1.04	35040	36441.60	2	-
Diesel for generation of electricity	CO2	0.67	144	96.48	1	-
R-410A for campus air-conditioners (50% each of HFC-32 = 771 and HFC-125=3740)	HFC	2.26	0.04	0.09	1	200 ACs with 200 g leaks per year
R-410A for residential use	HFC	2.26	0.06	0.14	2	300 ACs with 200 g leaks per year
LPG for hostels and canteens	CO2	2.98	96	286.08	1	4000 Nos with 2 kg/person/month
	CH4	0.00024	96	0.02	1	-
LPG for residential use	CO2	2.98	24	71.52	2	-
	CH4	0.00024	24	0.01	2	
Diesel for campus vehicles	CO2	3.19	5.76	18.37	1	20 Nos, 30kM per day, 240 days @25 kM per Liter
Petrol for campus vehicles	CO2	3.07	48	147.36	1	200 Nos, 20kM per day, 240 days @20 kM per Liter
Aviation Petrol- Staff travel	CO2	3.1	10	31.00	3	20 Nos, 30kM per day, 240 days @3.1 kM per Liter
Outsourced diesel vehicles	CO2	3.1	46	142.60	2	21 Nos, 30kM per day, 240 days @3.1 kM per Liter
Business travel by employees (Diesel bus/Taxi)	CO2	0.00012	929	0.11	2	200 Nos, 60kM per day, 240 days @3.1 kM per Liter
Municipal waste	CO2	0.917	100	91.70	1	-
Municipal waste	CH4	0.003	100	0.30	1	-
Office papers(recycled)	CO2	0.02	10	0.20	1	-
Office papers (land fill)	CO2	1.41	5	7.05	1	-
Textbooks (recycled)	CO2	0.02	5	0.10	1	-
Textbooks (land filled)	CO2	1.41	5	7.05	1	-
Food waste (land filled)	CO2	0.67	10	6.70	1	-
Grass (land filled)	CO2	0.05	10	0.50	1	-
PVC (land filled)	CO2	0.02	5	0.10	1	-
Electronic peripherals (recycled)	CO2	0.05	1	0.05	1	-
Electronic peripherals (land filled)	CO2	0.02	1	0.02	1	-
Fire suppression gas (HFC-134a)	CO2	45.5	0.1	4.55	1	-
Fire suppression gas	CO2	1	0.1	0.10	1	-
LCA- Buildings (0.7% end of life)	CO2	0.00055	600000	330.00	3	6 Lakh Sq. M
			Total	**37684**		