AMRITA VISHWA VIDYAPEETHAM
DEEMED TO BE UNIVERSITY UNDER SECTION 3 OF UGC ACT, 1956

FCF INDIA

Carbon Footprint Estimation Report for ICSRF Event at Amrita Vishwa Vidyapeetham

Report

Prepared For :
Amrita Vishwa Vidyapeetham

Prepared By :
FCF India

2025

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Executive Summary

This report provides a comprehensive greenhouse gas (GHG) emissions estimation for the ICSRF 2025 event at Amrita Vishwa Vidyapeetham, Kollam, Kerala, scheduled from August 29 to September 1, 2025.
Prepared in accordance with the ISO 14064-1 and ISO 14068-1:2023, the analysis quantifies emissions across Scopes 1, 2, and 3, totaling an estimated **91.28 tCO_2e** based on pre-event data.

Key findings:

- Scope 1 (Direct): **6 tCO_2e** (primarily from diesel generators and wastewater treatment).
- Scope 2 (Electricity): **6.28 tCO_2e**
- Scope 3 (Indirect): **79 tCO_2e** (dominated by participant flights at 49 tCO_2e).

Amrita Vishwa Vidyapeetham commits to emission reductions through energy efficiency, sustainable transport, and waste management, targeting a 10-15% cut from estimates. Residual emissions will be offset using verified carbon credits from Indian projects. Post-event monitoring will enable a verified carbon neutrality declaration, aligning with global net zero goals.

Recommendations: Implement real-time tracking, prioritize local sourcing, and offset via afforestation or renewable energy projects.

Next steps include third-party verification and credit retirement.

1. Introduction and Scope

This report outlines the carbon neutrality management for the **International Conference on Sustainable & Resilient Futures: Bridging Science, Policy, and Practice** (ICSRF 2025) event, hosted by Amrita University from August 29 to September 1, 2025, in accordance with ISO 14068-1:2023 (Carbon neutrality — Part 1: General principles and requirements). The standard provides a framework for organizations to achieve and demonstrate carbon neutrality through GHG quantification, reductions, removals, and offsetting.

Project Overview:

The purpose of this report is to quantify the GHG emissions of the four-day ICSRF event and to define a clear pathway towards achieving carbon neutrality. This endeavor reflects Amrita University's commitment to sustainability by adhering to internationally recognized standards, including the ISO 14064-1 and the principles of ISO 14068-1:2023. This report not only calculates the event's carbon footprint but also integrates an analysis of the proactive sustainable measures implemented on campus.

Top Management Commitment on Carbon Neutrality & Carbon Management Plan (ISO 14068-1:2023, Clauses 6 & 9.1):

Amrita Vishwa Vidyapeetham's top management is fully committed to achieving carbon neutrality for ICSRF 2025, integrating sustainability into the university's strategic vision. A comprehensive Carbon Management Plan has been established, encompassing:

- **Leadership Oversight:** Senior management ensures alignment with ISO 14068-1 principles, overseeing GHG inventory development, reduction initiatives, and offset procurement.
- **Reduction Strategy:** Prioritizing renewable energy (320 kW solar), biofuel, and sustainable practices (e.g., waste and water management) to achieve a 10-15% reduction.

- **Offset Commitment:** Residual emissions will be offset via high-integrity credits (e.g., Khasi Hills REDD+ Project).
- **Continuous Improvement:** Post-event data will inform updates to the plan, ensuring long-term alignment with India's NDCs and global net zero goals. This commitment is supported by dedicated resources, stakeholder engagement, and third-party verification by DNV.

Amrita University's campus incorporates significant environmental initiatives, including:

- **Renewable Energy:** A 320-kW solar power plant partially powers the campus, reducing reliance on grid electricity.
- **Sustainable Waste Management:** Organic waste is efficiently processed using on-site composters and windrow composting systems, with the resulting compost being used for agricultural purposes. Non-biodegradable waste is recycled through a "Punarjani" upcycling campaign.
- **Water Sustainability:** A 600 KLD Sewage Treatment Plant (STP) treats wastewater, which is then reused for non-potable purposes such as toilet flushing and gardening, supporting a zero-discharge policy.
- **Sustainable Mobility:** The event encourages participants to use campus shuttle vehicles and carpools to reduce transportation emissions.
- **Plastic-Free Policy:** Single-use plastics are strictly prohibited. Reusable and biodegradable alternatives are provided.
- **Biofuel Usage:** The kitchen uses 700 kg of biofuel, a renewable energy source, to reduce reliance on fossil fuels for cooking.

The ICSRF 2025 is a 4-day international conference that is centred on the theme, "Experiential Learning, Inclusiveness, & Sustainable Innovations" to foster dialogue and collaboration among researchers, scientists, policymakers, practitioners, and industry leaders to tackle global sustainability challenges. The event will host approximately 600 participants, including 60 dignitaries from regions like Europe, USA, Asia, Africa, and India. Held at Amrita Vishwa Vidyapeetham, Amritapuri

campus in Kollam, Kerala, the event emphasizes carbon neutrality to align with its sustainability theme.

The GHG inventory follows the principles of ISO 14064-1 for quantification and reporting, aligned with ISO 14064-1. The total estimated GHG emissions for the 4-day event are **91.28 tCO_2e**, based on pre-event data and assumptions. Amrita Vishwa Vidyapeetham commits to monitoring actual emissions during the event, implementing reductions, and offsetting the remainder to declare carbon neutrality post-event.

Reporting Period: August 29 to September 1, 2025 (event duration).

Organizational Approach: Emissions from activities under Amrita Vishwa Vidyapeetham's direct control or influence, including venue operations, travel, catering, and waste management.

Apart from the above we are considering an average travel distance of 120 kms for about 200 participants (not invited dignitaries), which can neither be controlled or significantly influenced by Amrita Vishwa Vidyapeetham. This is done considering the principles of materiality and completeness

Total Estimated Emissions: 91.28 tCO_2e

- Scope 1: 6 tCO_2e;
- Scope 2: 6.28 tCO_2e;
- Scope 3: 79 tCO_2e

Amrita Vishwa Vidyapeetham aims to demonstrate transparency, facilitate verification, and align with global net zero goals.

2. Terms and Definitions

Key terms per ISO 14068-1:2023:

- **Carbon Neutrality:** Net zero GHG emissions achieved through reductions, removals, and offsetting.
- **GHG Inventory:** Quantification of emissions per ISO 14064-1.
- **Offsetting:** Use of carbon credits from verified projects to compensate residuals.
- **Removals:** CO_2 sequestration (e.g., via renewables or biofuels).
- **Scope 1/2/3:** Direct, energy indirect, and value chain emissions (ISO 14064-1).

Additional event-specific: **Dignitaries –** Invited participants; **Biofuel –** Renewable fuel used in kitchen (700 kg for catering).

3. Principles of Carbon Neutrality

Amrita Vishwa Vidyapeetham adheres to ISO 14068-1 principles:

- **Relevance:** Focus on material event sources (e.g., flights >50% of emissions).
- **Completeness:** All scopes including exclusions justified.
- **Consistency:** Standardized factors (IPCC, CEA).
- **Accuracy:** Conservative estimates; uncertainty <10%.
- **Transparency:** Full disclosure of methods and data.
- **Ambition:** Commit to progressive reductions toward net zero.

4. Project Boundary Setting

The GHG inventory for the ICSRF event is based on the **operational control approach**, covering all direct and indirect emissions associated with the four-day event. The boundary for this GHG inventory encompasses all activities associated with ICSRF 2025 at the Amrita Vishwa Vidyapeetham in Amritapuri Campus, Kollam, Kerala. This includes:

- **Organizational Boundary**
  - **Approach:** Operational control – emissions from event activities at Amrita Vishwa Vidyapeetham campus that they directly manage or influences (ex. covering venues, participant travel, accommodations, catering, local transport, and waste management)
  - **Inclusions:** All event-related operations at the Amritapuri campus, including multiple venues (Annapoorneshwari Hall, Acharya Hall, Amriteshwari Hall, Shradha Hall, Classrooms). We have also included the travel emissions for participants (not invited dignitaries) which will be beyond the organizational control.
  - **Exclusions:** Embodied emissions in materials (e.g., conference bags, stationery) due to data gaps, and post-event impacts (e.g., legacy waste). These may be scoped in future if data improves
- **GHG Scopes and Categories:**

  Aligned with ISO 14064-1 and ISO 14068
  - **Scope 1: Direct GHG Emissions -** These include emissions from sources owned or controlled by Amrita Vishwa Vidyapeetham, such as the diesel generator used for on-site power generation, wastewater treatment etc.
  - **Scope 2: Indirect GHG Emissions from Purchased Electricity -** This scope accounts for emissions from the generation of purchased electricity consumed at the event venues. Although the university generates renewable energy, we have excluded this from the calculation to enhance conservativeness of our estimates.

- **Scope 3: Other Indirect GHG Emissions -** This encompasses all other indirect emissions that are a consequence of the event but occur from sources not owned or controlled by Amrita Vishwa Vidyapeetham. These sources include invited dignitaries travel (international, domestic, and local), hotel stays, purchased goods catering, and waste. We have also included the travel emissions for participants (not invited dignitaries) which will be beyond organizational control.

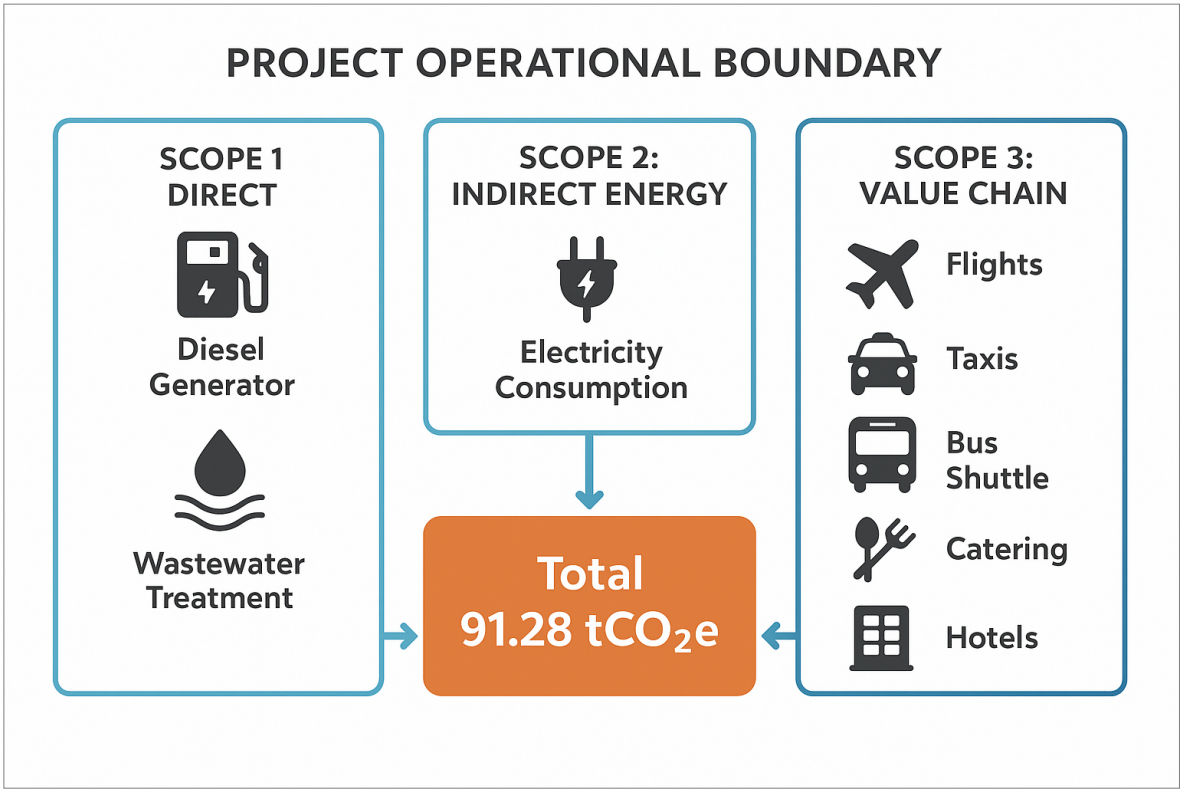

Figure 1 Operational Boundary and Emission Flow

- Prioritization focused on material sources (>1% of total emissions), such as flights (57% of total). The boundary prioritizes completeness while addressing data availability. Assumptions (e.g., flight distances, meal types) are documented in the calculation sheets. Although bio-fuels are used in the kitchen, we have not factored the same in the calculations to enhance conservativeness in our estimate.

- **Exclusions:** Embodied emissions from participant commuting outside organized transport, embodied emissions in procured materials (e.g., bags, stationery) due to data limitations, and post-event legacy impacts. These may be included in future inventories if data becomes available. CH4 and N2O emissions of diesel combustion in DG Use and STP's CH4 emissions were excluded in calculations.

5. Quantifying Methodology

Emissions are calculated using the equation:

Emissions (tCO_2e) = Activity Data × Emission Factor × GWP (where applicable).

Data sources include client-provided estimates (e.g., diesel liters, participant numbers) and standard factors from IPCC-2006, CEA India-2024, UK DEFRA-2025, and ICAO.

Data Collection

- **Activity Data:** From Amrita Vishwa Vidyapeetham (e.g., 2,165 liters diesel, 600 participants × 3 meals/day, flight origins).
- **Emission Factors:**
  - Diesel: 74,100 kg CO_2/TJ (IPCC); Density 0.81 kg/L; NCV 43 TJ/Gg.
  - Grid Electricity: 0.000727 tCO_2e/kWh (CEA India, 2024-25 weighted average).
  - Flights: ICAO Carbon Calculator (e.g., UK to TRV: 878 kg CO_2/person round-trip).
  - Transport:
    - 0.000173 tCO_2e/passenger-km (taxi);
    - 0.000104 tCO_2e/passenger-km (bus) (UK DEFRA 2025).
  - Catering: Veg meals – Breakfast 0.45 kg CO_2e, Lunch 0.90 kg CO_2e, Dinner 2.16 kg CO_2e (UCL study).

- Hotels: 0.0475 tCO_2e/room-night (Sustainable Travel International).
- Wastewater: 1.5 kWh/KL treatment × grid factor.

Calculation Approach

- **Scope 1:** Fuel consumption × Factor (direct measurement proxy).
- **Scope 2:** KWh consumed × Grid factor (location-based). For Shradha Hall (Large Hall, Aug 30, 4 hours), assumed similar to Acharya Hall (158,921 W total power, including AC).
- **Scope 3:** Passenger-km × Factor for travel; Meals × Factor for catering.
- **QA/QC:** Cross-verification with invoices/logs; conservative assumptions (e.g., economy class flights); uncertainty <10% via sensitivity analysis. Challenges: Pre-event estimates; addressed via post-event actuals.

GWPs from IPCC AR6 (e.g., CO_2=1, CH_4=29.8, N_2O=273).

6. GHG Emissions Quantification

Emissions were quantified using activity data from event planning (e.g., participant numbers, energy usage) and emission factors from credible sources (e.g., IPCC, UK DEFRA, CEA India). Calculations follow the formula: Emissions (tCO_2e) = Activity Data × Emission Factor.

The GHG emissions were calculated by multiplying activity data (e.g., litres of fuel, kWh of electricity) by relevant emission factors.

GHG Emissions Summary

Category	Emissions (tCO_2e)
Total Scope 1	**6.00**
Diesel **Generator**	6.00
Total Scope 2	**6.28**
Electricity Consumption	6.00
Electricity Use for Water Treatment	0.28
Total Scope 3	**79.00**
International and Domestic Flights	49.00
Local Ground Travel	11.00
Catering	9.00
Hotel Stay of Delegates	10.00
Total Estimated Emissions	**91.28**

Scope 1: Direct GHG Emissions: Scope 1 includes emissions from sources owned or controlled by Amrita Vishwa Vidyapeetham.

- **Diesel Generator:** Used for air conditioning in Annapoorneshwari Hall (225 tonnes capacity).

  Total diesel consumed: 2,165 liters (Client Data)
  Emission factor: 74,100 kg CO_2/TJ [1]
  NCV: 43 TJ/Gg [2]
  Density: 0.81 kg/L[3]
  Emissions: 6 tCO_2e.
- **Wastewater Treatment:** On-campus Sewage Treatment Plant (STP).

  Estimated wastewater: 259,200 liters (600 participants × 135 L/day × 4 days × 80%).
  Power consumption: 1.5 kWh/KL.
  Emission factor: 0.000727 tCO_2e/kWh (CEA India[4]).

  Emissions: 0.28 tCO_2e.

Total Scope 1 Emissions: 6.28 tCO_2e.

Scope 2: Electricity Indirect GHG Emissions: Scope 2 covers emissions from purchased grid electricity for venue operations.

- **Emission Factor:** 0.000727 tCO_2e/kWh (CEA India[5])
- **Venue Breakdown (Total: 8,254 kWh across 4 days):**

Date	Venue	Hours	kWh	Emissions (tCO_2e)
Aug 29	Annapoorneshwari	8	113.92	0.08

[1] IPCC – Emission Factor of Diesel
[2] IPCC - NCV of Diesel
[3] IOCL
[4] CEA India
[5] CEA India

	Hall			
Aug 29	Acharya Hall	4	635.68	0.46
Aug 29	Amriteshwari Hall	4	702.96	0.51
Aug 29	Classrooms	6	6.02	0.004
Aug 30	Annapoorneshwari Hall	6	85.44	0.06
Aug 30	Acharya Hall	6	953.53	0.69
Aug 30	Amriteshwari Hall	6	1,054.43	0.77
Aug 30	Shradha Hall	4	635.68	0.46
Aug 30	Classrooms	8	8.03	0.006
Aug 31	Annapoorneshwari Hall	6	85.44	0.06
Aug 31	Acharya Hall	6	953.53	0.69
Aug 31	Amriteshwari Hall	6	1,054.43	0.77
Aug 31	Classrooms	8	8.03	0.006
Sep 1	Annapoorneshwari Hall	6	85.44	0.06
Sep 1	Acharya Hall	4	635.68	0.46
Sep 1	Amriteshwari Hall	4	702.96	0.51
Sep 1	Classrooms	6	6.02	0.004
Total Estimated Emissions			**7,163.04**	**6.00**

Scope 3: Other Indirect GHG Emissions

- **International and Domestic Flights:** 60 dignitaries

Total: 48,978 kg CO_2e (e.g., Europe: ~1,000 kg CO_2e/person; USA: ~2,500 kg CO_2e/person).

Source: ICAO Calculator[6].

Emissions: 49 tCO_2e.

- **Airport to Hotel Taxi:** 60 dignitaries × 70 km (one-way) + 200 others × 120 km.

  Emission factor: 0.000173 tCO_2e/passenger-km (UK DEFRA[7]).

  Emissions: 10 tCO_2e.

- **Bus Shuttle:** 12 trips × 20 passengers × 10 km.

  Emission factor: 0.000104 tCO_2e/passenger-km. (UK DEFRA[8]).

  Emissions: 1 tCO_2e.

- **Catering:** 600 participants × 3 meals/day × 4 days (veg-focused);

  Factors:

  - Breakfast 0.45 kg CO_2e,
  - Lunch 0.90 kg CO_2e,
  - Dinner 2.16 kg CO_2e

  Source: UCL study [9]

  Emissions: 9 tCO_2e.

- **Hotel Stay:** 70 delegates (Day 1), decreasing to 30 (Day 4); 3-star hotels;

  Factor: 0.0475 tCO_2e/night (Sustainable Travel International).

  Emissions: 10 tCO_2e.

  Total Scope 3 Emissions: 79 tCO_2e

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[6] ICAO Calculator
[7] UK DEFRA
[8] UK DEFRA
[9] UCL Study

7. GHG Emission Reductions and Removals Calculations

Amrita Vishwa Vidyapeetham has various good practices that look to reduce emission through specific measures. Implemented reductions and removals practices include renewable energy for electricity, biofuel for cooking:

Reductions

- **Renewable Energy (320 kW)**: 320 kW solar PV on campus displaces grid electricity (Scope 2).
- Calculation:
  - Annual generation: 526,350 kWh/year
  - Daily generation: 526,350 / 365 ≈ 1,442 kWh/day
  - 4 days: = 1,442 kWh/day × 4 days = 5,768 kWh potential
  - Usage: 20% of Solar electricity (5,768 kWh) = 1,153 kWh
  - Avoided emissions: 1,153 kWh × 0.000727 tCO_2e/kWh[10] = **0.84 tCO_2e**
- **Sustainable Waste Management:** Organic waste processed via on-site composters and windrow composting; compost used for agriculture. Non-biodegradable recycled via "Punarjani" campaign.
  - **Qualitative Reduction:** Reduces methane emissions from landfill (estimated avoidance of ~0.1 tCO_2e/kg organic waste composted; not quantified for event).
- **Water Sustainability:** 600 KLD STP reuses wastewater for gardening/toilet flushing (zero-discharge).
  - **Qualitative Reduction:** Avoids grid energy for water pumping/treatment (estimated ~0.5 kWh/m^3 saved; not quantified).
- **Sustainable Mobility:** Campus shuttles and carpools encouraged.
  - **Qualitative Reduction:** Reduces Scope 3 transport emissions

[10] CEA India

- **Plastic-Free Policy:** No single-use plastics will be used during the event; reusable/biodegradable alternatives will be encouraged.
    - **Qualitative Reduction:** Avoids ~0.5 kg CO_2e per plastic item replaced (not quantified)

Removals

- **Biofuel (Kitchen)**: Coconut residues + waste wood (~1,000 kg/day campus-wide) in gasifiers for cooking, displacing LPG (Scope 3). Apportioned to event (600/10,000 people = 6%).
- Calculation:
    - Daily biofuel for event: 1,000 kg/day × 6% = 60 kg/day.
    - 4 days: 60 kg/day × 4 = 240 kg.
    - Energy: 240 kg × 18 MJ/kg[11] = 4,320 MJ.
    - Equivalent LPG: 4,320 MJ ÷ 50 MJ/kg = 86.4 kg.
    - Avoided LPG emissions: 86.4 kg × 3 kg CO_2e/kg[12] = 259.2 kg CO_2e ≈ 0.26 tCO_2e.
    - Biofuel lifecycle emissions: 240 kg × 0.4 kg CO_2e/kg = 96 kg CO_2e ≈ 0.1 tCO_2e.
    - Net removal: 0.26 tCO_2e - 0.1 tCO_2e = **0.16 tCO_2e**
- Biofuel lifecycle: ~0.4 kg CO_2e/kg (conservative estimate for upstream + non-CO_2; general biomass ~0.02 kg CO_2e/MJ or 0.36 kg/kg at 18 MJ/kg).[13]
- Assumption: Biogenic CO_2 = 0 (ISO 14064-1); event proportion based on meal servings.

Total Reduction and Removal

- Solar: 0.84 tCO_2e
- Biofuel: 0.16 tCO_2e
- Total: 0.84 + 0.16 = **1 tCO_2e**

However, these reductions and removal will not be used for insetting the carbon neutral event.

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[11] Calorific Value of Coconut Shell
[12] LPG Emission Factor
[13] Biofuel Lifecycle

8. Carbon Offsetting

To achieve carbon neutrality in line with ISO 14068-1:2023, the total calculated emissions are **91.28 tCO_2e,** which shall be offset.

Carbon neutrality is a state where the net GHG emissions are zero, achieved by reducing emissions where possible and offsetting the remainder with carbon credits.

The Khasi Hills Community REDD+ Project is a viable carbon offsetting option.

- **Location:** Meghalaya's East Khasi Hills, India.
- **Purpose:** The project protects and restores 27,000 hectares of cloud forest, which is a global biodiversity hotspot. It supports local communities by addressing deforestation and providing sustainable livelihoods.
- **Standard:** The project is implemented under the Plan Vivo Standard and has issued over 471,871 carbon credits to date, ensuring a verifiable and credible offsetting mechanism.

By purchasing an equivalent number of carbon credits from this project, Amrita Vishwa Vidyapeetham can directly compensate for the event's GHG emissions, supporting both climate action and community development. This strategic choice aligns with the comprehensive sustainability principles of the ICSRF event and demonstrates a commitment to a net-zero transition.

NOTE:

The assurance of this will be conducted post the conference with the actual data which will come from the conference.

We have made our estimations with a high degree of conservativeness and have not factored some of the emission reductions coming out of the initiatives to provide enough buffer and hence we do not anticipate the actual emissions surpassing the estimated emissions given in this report.

We will update this report to final report including the assurance from DNV post the conference.

9. Reporting and Disclosure

Public disclosure via Amrita Visha Vidyapeetham's website post-event, including inventory, reductions, and offsets.

Annual updates for ongoing neutrality.

10. Verification and Assurance

Third-party verification shall be conducted by DNV as per ISO 14064-3. QA/QC: Conservative estimates; data verified against logs.

11. Carbon Neutrality Declaration

Amrita Visha Vidyapeetham declares intent for carbon neutrality at ICSRF 2025.

Do-No-Significant-Harm Declaration (ISO 14068-1:2023, Clauses 4.1, 10.1):
Based on environmental risk assessments, Amrita Vishwa Vidyapeetham confirms that the ICSRF 2025 event and its carbon neutrality claims adhere to the "do-no-significant-harm" principle. The event's sustainability initiatives (e.g., renewable energy, biofuel, waste management) minimize environmental impacts. Non-GHG emissions from aviation, while significant, are mitigated through conservative emission estimates and high-integrity offsets (Khasi Hills REDD+ Project), which support biodiversity and community benefits, ensuring no net harm to the environment.

The emissions reported in this report are estimations. Assurance will be conducted post-conference with actual data collected during the event. Estimations are made with a high degree of conservativeness, excluding some emission reductions from initiatives to provide a buffer, ensuring actual emissions are unlikely to exceed the estimated 91.28 tCO_2e. This report will be updated post-conference with DNV's assurance to finalize the carbon neutrality claim.

12. Appendices

- **Khasi Hills Project Flyer**

Figure 2 Project Flyer of Khasi Hills Redd+ Project

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Report