

# Khalifa University Net Zero Roadmap





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## FOREWORD

At Khalifa University, we recognize climate change as a defining challenge of the 21st century. As a national leader in science, technology, and engineering education, we are committed to advancing the UAE's Net Zero by 2050 strategic initiative. KU is proud to launch this inaugural "Khalifa University Climate Action 2025" report, modeled after international best practices. This roadmap details our phased plan to decarbonize university operations, strengthen education and research for climate solutions, and foster a culture of sustainability across our campuses.

We acknowledge the urgency of the global climate emergency and believe that universities must lead by example through knowledge creation, operational responsibility, and stakeholder engagement. As we implement our Green Transformation (GX) strategy, we are committed to transparency, innovation, and collaboration.



# EXECUTIVE SUMMARY

## Khalifa University Climate Action 2025

Khalifa University's Climate Action 2025 outlines a clear and actionable roadmap to achieve net zero greenhouse gas (GHG) emissions by 2050. This commitment is grounded in the findings of our 2024 GHG emissions baseline assessment, which estimates current annual emissions at 21,185.28 tCO<sub>2</sub>e (covering Scope 1 and Scope 2 emissions).

### Key Components of the Roadmap

Target Year	Reduction (%)	Target Emissions (tCO <sub>2</sub> e)
2024	Baseline	21185.28
2030	30%	14829.7
2035	50%	10592.64
2040	70%	6355.58
2045	90%	2118.53
2050	Net Zero	0

- **Institutional Integration:**  
Embedding sustainability across research, education, campus operations, and stakeholder engagement.
- **Sector-Specific Strategies:**
  - Energy efficiency and decarbonization
  - Green buildings and infrastructure
  - Sustainable mobility solutions
  - Refrigerant management
  - Sustainable procurement practices
  - Behavioral change and awareness initiatives

### Commitment to Continuous Improvement

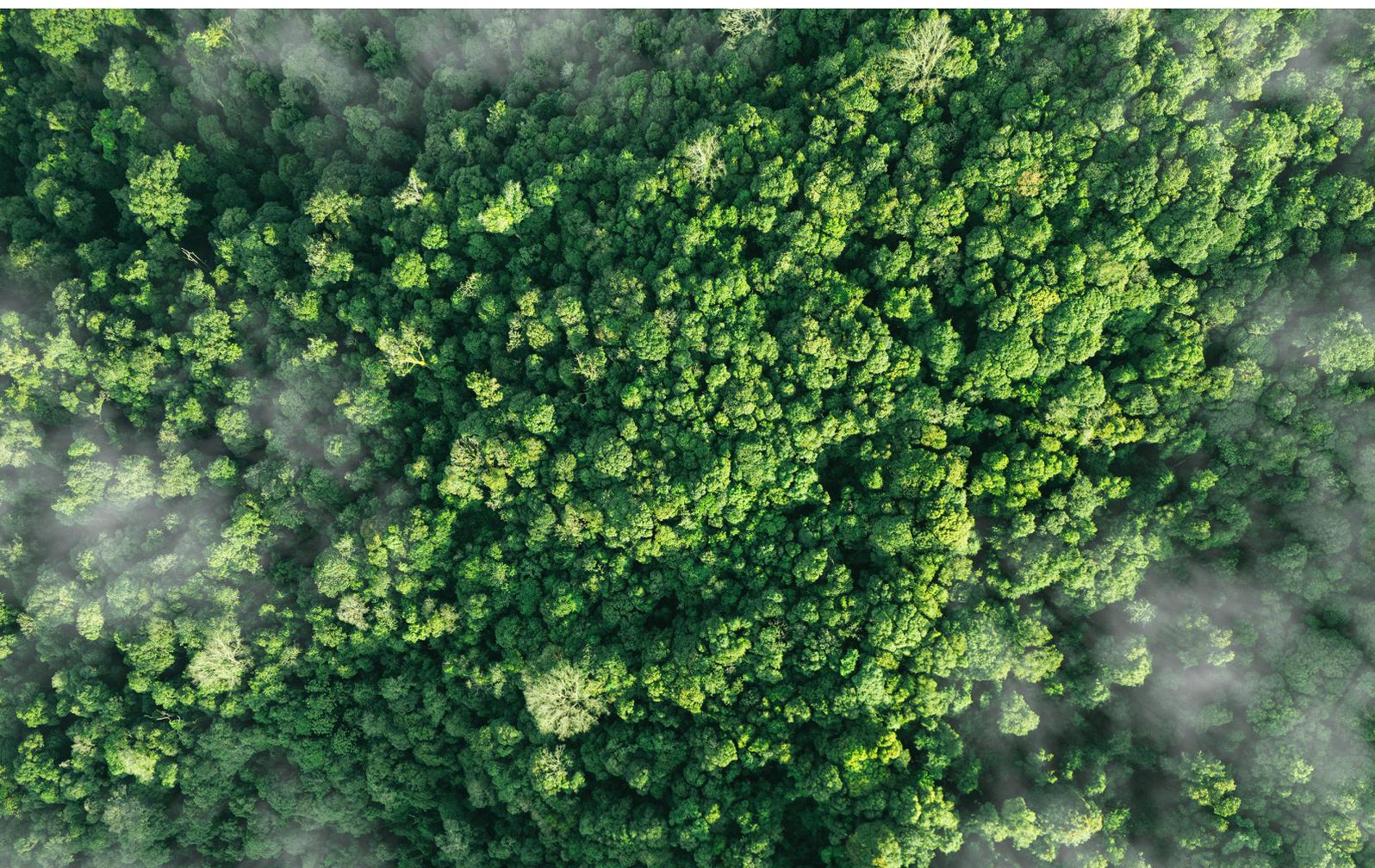
This Net Zero Roadmap aligns with the UAE's national climate commitments and international standards. It will be periodically reviewed and updated to incorporate technological advancements, regulatory changes, and stakeholder feedback—ensuring Khalifa University remains at the forefront of climate leadership in higher education.

# 1. ABOUT KHALIFA UNIVERSITY CLIMATE ACTION

## 1.1 Background

Sustainability is a core value embedded across Khalifa University's operations, academics, and research. As a national and global academic leader, KU is committed to supporting the UAE's Net Zero by 2050 Strategy, the UAE Vision 2071, and international frameworks such as the United Nations Sustainable Development Goals (SDGs) and the Paris Agreement. The Sustainability Taskforce, chaired by the President, drives KU's internal alignment with national climate priorities through integrated strategies addressing environmental, economic, and social pillars.

Khalifa University has demonstrated its commitment through various sustainability milestones, including renewable energy research, carbon capture initiatives, climate innovation labs, and campus-wide energy efficiency upgrades. In 2024, KU strengthened collaborations with global partners including Siemens Energy, Masdar, and the UAE Polar Research Program, reinforcing its leadership in climate and sustainability sciences. The development of this Climate Action 2025 roadmap serves to formalize and accelerate KU's climate response across all levels of its operations and mission.



## 1.2 Khalifa University's Sustainability Vision, Mission, Values & Pillars

**Vision Statement:** To be a global leader in sustainability driven education, research, and innovation, creating positive impact for society and future generations

**Mission Statement:** To advance sustainable development through cutting-edge research, transformative education, and innovative solutions that address global challenges while serving the UAE's strategic priorities.



### Strategic Pillars

#### • Sustainable Education

- Embedding Sustainability Across Curricula
- Developing Future Sustainability Leaders
- Promoting Lifelong Learning For Sustainable Development
- Fostering Interdisciplinary Approaches

#### • Impactful Research

- Advancing Sustainability Science
- Developing Innovative Solutions
- Promoting Knowledge Transfer
- Supporting Evidence Based Policymaking

#### • Operational Excellence

- Implementing Sustainable Campus Operations
- Reducing Environmental Footprint
- Promoting Resource Efficiency
- Demonstrating Best Practices

#### • Community Leadership

- Engaging Stakeholders
- Building Partnerships
- Sharing Knowledge
- Creating Social Impact

### 1.3 Purpose and Targets to Achieve

Phase	Scope 1 & 2 Target	Scope 3 Target	Target Year
Phase 1	30% Reduction (Baseline 2024)	25% reduction	2030
Phase 2	70% Reduction	50% reduction	2040
Phase 3	Net Zero (100%)	75% reduction	2050

## 2. KHALIFA UNIVERSITY GHG INVENTORY

### 2.1 Emission Sources & Calculation Methodology

- Scope 1: 2,906.5 tCO<sub>2</sub>e (13.7%)**
  - Stationary Combustion (LPG): 46.77 tCO<sub>2</sub>e
  - Mobile Combustion (University Fleet and Landscaping): 1,054.73 tCO<sub>2</sub>e + 0.78 tCO<sub>2</sub>e = 1,055.51 tCO<sub>2</sub>e
  - Fugitive Emissions (Refrigerants): 1,805.0 tCO<sub>2</sub>e (sum of R22: 1,259.76; R410: 130.29; R134A: 257.4; R407C: 157.8)
- Scope 2: 18,278.78 tCO<sub>2</sub>e (86.3%)**
  - Purchased Electricity: 16,401.79 tCO<sub>2</sub>e (82,008.956 MWh × 0.2)
  - Purchased Cooling: 1,876.99 tCO<sub>2</sub>e (9,384.97 MWh × 0.2)
- Total GHG Emissions: 21,185.28 tCO<sub>2</sub>e**

### 2.2 Calculation Methodology

Khalifa University's GHG emissions calculations follow the methodologies referenced in the GHG Emissions Inventory Report available at: <https://ku.ac.ae/sustainability/green-housereport>

- Calculations are performed using activity data (fuel, energy consumption, refrigerants, etc.) multiplied by emission factors from:
  - IPCC 2021 GWP factors
  - UAE-specific grid emission factors (TRANSCO, DEWA)
  - ISO 14064-1-compliant protocols
- Scope 1 and 2 are fully accounted. Scope 3 categories are under phased development.
- Emissions per stakeholder (2024): 3.9 tCO<sub>2</sub>e/person (5,426 stakeholders)
- Emissions per built-up area: 0.069 tCO<sub>2</sub>e/m<sup>2</sup> (302,756.81 m<sup>2</sup>)

## 2.3 Global Warming Potential

Gas	GWP (100 - Year)
CO2	1
CH4 (fossil)	29.8
CH4 (biogenic)	27
N2O	273
SF6	24,300

## 2.4 Scope and Boundary

**Reporting Period:** Calendar year 2024 forms the baseline year for the GHG inventory, with annual updates scheduled each subsequent year.

**Organizational Boundary:** The GHG inventory covers all university-owned and operated assets at both the Main Campus and the Sas Al Nakhl (SAN) Campus of Khalifa University, applying the operational control approach.

### Operational Boundary:

- **Scope 1 Includes Direct Emissions from University-Operated Sources Such As:**
  - Stationary Combustion (LPG For Kitchens)
  - Mobile Combustion (KU Fleet Vehicles and Landscaping Equipment)
  - Fugitive Emissions (Refrigerants from HVAC Systems)
- **Scope 2 Includes Indirect Emissions from Purchased Electricity and Purchased Cooling Used Across All Campus Facilities.**
- **Scope 3 (Under Development) Includes Emissions From:**
  - Business Travel
  - Employee And Student Commuting
  - Purchased Goods and Services
  - Water Management
  - Waste Consumption

**Exclusions:** At present, Scope 3 calculations do not include emissions from online learning, remote work, or third-party operated facilities not under direct KU control. These will be considered in future iterations as data becomes available.

## 2.6 Verification

- **Annual Stock Take (2025)**

## 3. REDUCTION OF GHG EMISSIONS AS A BUSINESS ENTITY

### 3.1 Principles and Policy for Emission Reduction Measures

Khalifa University's emission reduction policy is guided by the principles of responsibility, innovation, and data-driven action, benchmarked against international best practices. The following key principles reflect a best-in-class approach inspired by global leaders:

- **Science-Based Target Setting:** All emission targets are set in alignment with the Science- Based Targets initiative (SBTi), ensuring consistency with the 1.5°C climate pathway.
- **Energy Efficiency and Electrification:** KU prioritizes building retrofits, passive design, smart metering, and electrification of heating/cooling systems in line with net-zero building principles.
- **On-Site and Off-Site Renewable Energy Deployment:** The university will deploy rooftop solar PV and explore green power purchase agreements (PPAs), virtual net metering, and grid decarbonization credits.
- **Digital Carbon Governance:** Implementation of IoT-enabled energy management systems, AI-driven optimization of HVAC loads, and Power BI-based real-time carbon dashboards.
- **Internal Carbon Pricing:** KU will develop an internal carbon pricing mechanism to incentivize low-emission practices and integrate carbon cost in financial decision-making.
- **Low-Carbon Mobility:** Best practices from Stanford and TU Delft inspire KU's mobility strategy, which includes a shift to e-buses, EV fleets, bike infrastructure, and hybrid working policies.
- **Green Procurement and Lifecycle Assessment:** Lifecycle carbon assessments will guide purchasing decisions, based on ISO 20400 sustainable procurement principles and LEED v4 standards.
- **Campus as a Living Lab:** Pilot zones for climate-smart innovation in water, waste, cooling, and AI-for-energy initiatives will be co-developed with students and researchers.
- **Faculty and Staff Engagement:** Annual green performance audits, sustainability linked recognition, and professional development on climate literacy will be introduced.
- **Policy Integration:** Alignment with UAE Net Zero 2050 Roadmap, National Climate Adaptation Strategy, and Abu Dhabi's Environmental Vision 2030.

This comprehensive policy ensures that KU's emission reduction strategy is not only ambitious and science-aligned but also embedded into university-wide governance, finance, research, and culture.

### 3.2 Initiatives Related to Scopes 1 and 2

Khalifa University is implementing a robust portfolio of best-practice initiatives to reduce emissions under Scope 1 (direct emissions) and Scope 2 (indirect emissions from purchased energy):

- **Campus Energy Optimization:** Comprehensive retrofitting of buildings with high efficiency HVAC systems, motion-sensor LEDs, and smart thermostats, benchmarked against ASHRAE and LEED v4 standards.
- **Smart Energy Management:** Deployment of AI-based building energy management systems (BEMS) and IoT-enabled sensors to optimize real-time energy consumption.
- **Renewable Energy Deployment:** Target of 10 MW solar photovoltaic (PV) generation by 2030, starting with rooftop installations and solar carports. KU is also exploring virtual PPAs and battery storage pilots.
- **Decarbonizing Cooling:** Phase-out of refrigerants with high global warming potential (GWP) and adoption of district cooling solutions where feasible.
- **EV Fleet Transition:** Electrification of university fleet with phased procurement of electric vehicles and installation of charging infrastructure (100% EV target by 2035).
- **Low-Carbon Building Standards:** All new buildings to meet green construction certifications (e.g., Estidama 3 Pearls or LEED Gold minimum).
- **Renewable-Integrated Microgrids (Future):** Feasibility studies underway for smart campus microgrid integration combining solar, storage, and demand response mechanisms.

### 3.3 Initiatives Related to Scope 3

Scope 3 emissions represent a significant share of Khalifa University's carbon footprint. Best practice initiatives under development and implementation include:

- **Green Procurement and Supply Chain Engagement:** Adoption of ISO 20400-aligned green procurement policy, requiring vendors to disclose carbon footprint and sustainability credentials. Lifecycle assessment (LCA) of major purchases is being piloted.
- **Low-Carbon Commuting:** Introduction of campus-wide mobility strategy encouraging carpooling, public transport subsidies, pedestrian-friendly zones, and cycling infrastructure.
- **Hybrid and Remote Work Models:** Encouraging hybrid work arrangements to reduce emissions from commuting, aligned with digital transformation efforts.
- **Sustainable Travel Policy:** Launch of a travel emissions tracking system and prioritization of rail/virtual alternatives for domestic travel; carbon offsetting will be explored for unavoidable international travel.
- **Sustainable Construction Materials:** For capital projects, materials with Environmental Product Declarations (EPDs) and lower embodied carbon will be prioritized.
- **Waste and Water Minimization:** Comprehensive waste audit and zero-waste policy under development, alongside campus-wide water conservation retrofits.
- **Data Integration and Reporting:** Integration of Scope 3 data into KU's sustainability dashboard (Power BI), enabling tracking, target-setting, and supplier engagement.

## 4. SOCIAL CONTRIBUTION TO SOLVING CLIMATE CHANGE

### 4.1 Contribution through Initiatives and Research

Khalifa University is actively contributing to climate change mitigation and adaptation through its research, innovation, and institutional initiatives. These efforts are integrated into national and international sustainability agendas and are advancing climate-positive technologies, practices, and partnerships.

- **Net Zero Labs:** KU to launch specialized Net Zero Labs focused on hydrogen technologies, carbon capture and storage (CCUS), green materials, sustainable desalination, and renewable energy integration.
- **AI for Climate Innovation:** Leveraging AI and machine learning, KU is developing predictive tools for energy optimization, carbon accounting, water stress modeling, and climate risk analytics.
- **Flagship Research Centers:**
  - **Center for Membranes and Advanced Water Technology (CMAT):** Developing low-energy desalination and water reuse solutions.
  - **Advanced Power and Energy Center (APEC):** Investigating solar-to-hydrogen conversion, battery storage, and microgrid modeling.
  - **Emirates ICT Innovation Center (EBTIC):** Working on digital twins for building energy management and city-level climate planning
  - **RICH (Research and Innovation Center on CO2 and Hydrogen)**
- **Innovation Ecosystem:** Through its research and innovation park and startup incubators, KU supports clean tech entrepreneurs addressing climate challenges in mobility, energy and materials.
- **Applied Pilot Projects:** Implementation of climate innovation pilots on campus, including smart irrigation, waste valorization, carbon-negative construction materials, and energy retrofitting demonstrations.
- **Research Funding Alignment:** KU prioritizes research funding proposals aligned with the UAE Net Zero 2050 Roadmap, UN SDGs, and the Abu Dhabi Research and Development Strategy.
- **International Research Collaboration:** KU partners with global institutions and consortia, including the UAE Polar Research Program, Masdar Institute, Siemens Energy, and international academic networks, to accelerate climate technology development and policy-relevant research.

Through these initiatives, Khalifa University demonstrates leadership in creating a low-carbon innovation ecosystem that not only reduces its own footprint but also drives transformation across society and industry.

KU is committed to building the next generation of climate-conscious leaders by embedding sustainability in all levels of education, from undergraduate exposure to specialized professional learning. Our human capital development approach includes formal curriculum, hands-on learning, interdisciplinary training, and global exchange.

#### 4.2.1 Education for Freshmen and UG Students

- Mandatory sustainability and climate change literacy modules through the “GENS 101: Grand Challenges” course.
- Launch of undergraduate minors and electives in Renewable Energy, Environmental Engineering, Energy Transition and Sustainability Science.
- Problem-based learning projects tied to campus sustainability challenges (e.g., solar retrofits, zero-waste plans).
- Peer-to-peer engagement through the Green Ambassadors Program.

#### 4.2.2 Graduate-Level Education and Research Training

- Research assistantships and fellowships in Net Zero Labs.
- Graduate programs with climate-focused specializations (e.g., MSc in Sustainable Critical Infrastructure, PhD in Engineering with a sustainability track; MSc (Energy Transitions and Sustainability for Global Market)).
- Integration of climate change components in thesis research across domains.

#### 4.2.3 Advanced Climate Talent Programs

- Creation of the “KU Climate Leadership Fellowship” for exceptional postgraduates and early-career researchers.
- Participation in national and international challenge labs
- Incubation support for student startups focused on green innovation and clean tech solutions.

#### 4.2.4 Global Education Exchange

- Joint courses and dual-degree opportunities with leading global sustainability programs (e.g., ASU, TUM, NTU, Tsinghua University).
- Participation in international networks such as the Sustainable Development Solutions Network (SDSN) and UI GreenMetric.
- Exchange programs focused on experiential learning in climate-vulnerable geographies.

#### 4.2.5 Recurrent Learning for Professionals

- Executive education in Sustainability Management and Carbon Accounting.
- Online micro-credentials for public and private sector professionals (e.g., Sustainable Procurement, ESG Reporting).
- Custom training modules for industry partners in collaboration with Masdar and BEEAH.

These educational pathways equip KU students, researchers, and partners with the knowledge, tools, and leadership skills needed to drive the Green Transformation in the UAE and beyond.

#### 4.3 Co-creation and Collaboration with Stakeholders

- KU Student Sustainability Club
- BEEAH, Siemens, AGWA, Masdar collaborations

## 4. COMMUNICATION AND ENGAGEMENT

### 5.1 Communication with Internal Stakeholders

Khalifa University maintains an active internal communication strategy to engage faculty, staff, and students in the university's climate action initiatives:

- Annual Sustainability Report presented by the Office of the President and Sustainability Taskforce.
- Annual Stock Take highlighting progress on GHG emissions against committed targets.
- Power BI Dashboards on real time emission across KU campuses.
- Sustainability Recognition Program to celebrate individual and departmental contributions to emissions reduction.

Through consistent and transparent internal communications, KU ensures its community is informed, empowered, and aligned with the Climate Action 2025 roadmap.

### 5.2 Outreach to Local and Global Communities

Khalifa University engages actively with the broader community to amplify the impact of its climate leadership through the following outreach initiatives:

- Public Disclosure of GHG Reports and Roadmaps via KU's website and the Sustainability Portal.
- Participation in COP, presenting university-led net zero innovation and student-led climate projects.
- Collaborative Events with local and international authorities.
- Youth-Led Climate Dialogues hosted by KU Student Sustainability Club to foster local awareness and activism.
- Partnerships with International Platforms.

These initiatives ensure that Khalifa University's climate actions resonate beyond the campus, positioning KU as a hub of sustainable leadership and innovation in the UAE and globally.

## TIMELINE AND MILESTONES

Year	Milestone
2024	Baseline GHG emissions inventory established: 21,185.28 tCO <sub>2</sub> e; Green Procurement Policy implemented
2025	Net Zero Roadmap launched; KU carbon dashboard pilot; Net Zero Lab launches; Green Grants and Green Certification Program launched; Sustainability training mandated university-wide, baseline GHG emissions for scope 3
2026	Curriculum-wide climate literacy integration complete; Scope 1 and 2 live dashboards go public
2027	Full LED retrofit and HVAC optimization
2030	<ul style="list-style-type: none"> <li>30% reduction (target: 14,829.7 tCO<sub>2</sub>e); Solar PV capacity target achieved (10 MW); 25% Scope 3 reduction achieved</li> <li>10% of energy consumed will be sourced from renewable energy sources</li> <li>10% reduction in waste generated throughout campuses by 2030 against the 2024 baseline</li> </ul>
2035	50% reduction (target: 10,592.64 tCO <sub>2</sub> e)
2040	70% reduction (target: 6,355.58 tCO <sub>2</sub> e); 50% Scope 3 reduction achieved; fleet is 100% electric
2045	90% reduction (target: 2,118.53 tCO <sub>2</sub> e)
2050	Net Zero (target: 0 tCO <sub>2</sub> e); KU recognized as a regional climate innovation hub

### Appendix: GHG Emission Categories, GWP Factors, Tools Used

Scope	Source	Emissions (tCO <sub>2</sub> e)	% of Total
Scope 1	Stationary, Mobile, Fugitive	2,906.5	13.7%
Scope 2	Electricity, Cooling	18,278.78	86.3%
<b>Total</b>		21,185.28	100%

### Emission Factors Used:

Source	Emission Factor	Reference
Grid Electricity	0.2 tCO <sub>2</sub> e/MWh	TAQA 2023 Sustainability Report
Vehicle Fuel (Gasoline)	2.3 kg CO <sub>2</sub> e/L	GHG Protocol Guidance
Equipment Fuel (Diesel)	2.6 kg CO <sub>2</sub> e/L	GHG Protocol Guidance
Liquefied Petroleum Gas	1.47 kg CO <sub>2</sub> e/L	GHG Protocol Guidance

Refrigerant Type	GWP (100 - year)	Reference
R22	1,810	US EPA GHG Factors Hub
R410	2,088	
R134A	1,430	
R407C	1,774	

### Tools Used:

- Data from KU Facilities and Procurement
- Emission Factors from IPCC and UAE utilities
- Dashboarding via Power BI (internal rollout in 2025)