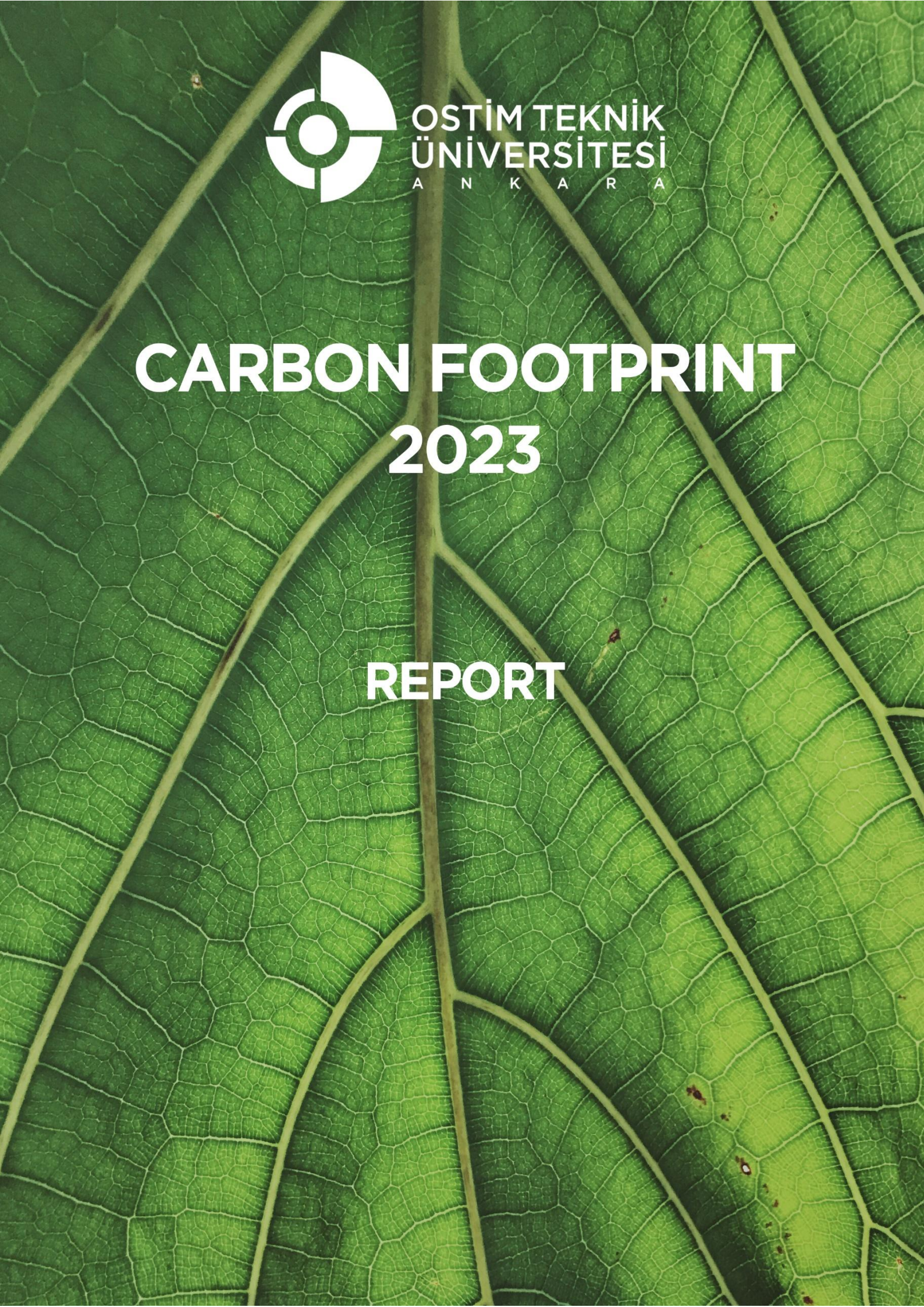

CARBON FOOTPRINT 2023

REPORT

ISO 14064-1 CORPORATE GREENHOUSE GAS

INVENTORY REPORT 2023

TABLE OF CONTENTS

ABBREVIATIONS

Abbreviation	Turkish Explanation
CNG	Compressed Natural Gas (Sıkıştırılmış Doğal Gaz)

Abbreviation	Turkish Explanation
CO2e	Carbon Dioxide Equivalent (Karbondioksit Eşdeğeri)
DEFRA	Department for Environment, Food & Rural Affairs (UK)
dm	Dry Matter (Kuru Madde)
EF	Emission Factor (Emisyon Faktörü)
FV	Activity Data (Faaliyet Verisi)
GHG	Greenhouse Gas (Sera Gazı)
ha	Hectare (Hektar)
HFC	Hydrofluorocarbon (Hidroflorokarbon)
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LPG	Liquefied Petroleum Gas (Sıvılaştırılmış Petrol Gazı)
max	Maximum (Maksimum)
min	Minimum (Minimum)
NCV	Net Calorific Value (Isıl güç)
TUPRAS	Türkiye Petrol Rafinerileri A.Ş.
Ö	Materiality (Önemlilik)
ÖD	Materiality Assessment (Önemlilik Değerlendirmesi)
PFC	Perfluorocarbon (Perflorokarbon)
tCO2e	Tons of CO2 Equivalent (Ton CO2 Eşdeğeri)

SUMMARY

This report is the annual Greenhouse Gas Emission (GHG) inventory report for OSTİM TECHNICAL UNIVERSITY. Throughout this document, the term “emissions” refers to greenhouse gas emissions. Within the specified reporting period and the defined boundary and scope, the inventory provides a complete and accurate measurement of the quantity of GHG emissions directly attributable to the organization's operations.

The reporting processes and emission classifications in this report are consistent with international protocols and standards. The report has been prepared in accordance with the

requirements of Section 9.3.1 of the ISO 14064-1 standard of the International Organization for Standardization (ISO). Where necessary, voluntary information is disclosed in line with Section 9.3.2 of the standard. The inventory also complies with the Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard.

To enable comparisons of greenhouse gas emissions over different years, the year 2023 has been chosen as the "base year." For 2023, OSTİM TECHNICAL UNIVERSITY's total greenhouse gas emissions are 182.1639 tons of CO2e for Scope 1, and 506.7520 tons of CO2e for Scope 2. The distribution of reporting-year emissions by scope is given in the table below.

Table 1: Distribution of emissions by scope in the reporting year (CO2e)

REPORT/BASE YEAR	SCOPE 1 (t CO2e)	SCOPE 2 (t CO2e)	SCOPE 3 (t CO2e)	SCOPE 4 (t CO2e)	SCOPE 5 (t CO2e)	SCOPE 6 (t CO2e)
2023	182.1639	506.7520	35.2096	613.3257	0	0

1. INTRODUCTION

Climate change has become an increasing concern for nations, governments, companies, and individuals worldwide. This issue encompasses a series of changes that negatively impact the planet's climate systems, arising from a combination of factors. These changes include, but are not limited to, rising sea levels, extreme weather events, global temperature increases, and loss of biodiversity (IPCC, 2021).

Greenhouse gas (GHG) emissions are directly related to climate change. Gases such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxides (NO_x), primarily from human activities such as industrial operations, energy production, and transportation, accumulate in the atmosphere, creating a greenhouse effect and causing global surface warming (Pachauri & Meyer, 2014).

Reducing and managing greenhouse gas emissions is of great importance at the corporate level. Companies develop various strategies to identify, monitor, report, and mitigate greenhouse gas emissions from their operations. In this process, ISO 14064 standards provide fundamental requirements for determining and reporting greenhouse gas emissions (ISO, 2018). Calculating a corporate carbon footprint is a critical step for understanding and reducing an organization's emissions. A corporate carbon footprint covers both direct (originating from an entity's own facilities) and indirect (supply chain, customer usage, etc.) emissions. This monitoring and calculation process is essential for organizations to achieve sustainability goals and reduce environmental impacts. Moreover, carbon footprint calculations offer a framework for companies to measure their environmental performance, provide accountability to stakeholders, and continuously improve their sustainability efforts (Wiedmann & Minx, 2008).

Efforts to reduce greenhouse gas emissions and calculate carbon footprints play a crucial role in combating climate change and solving environmental challenges. These efforts, which demand international, national, and corporate collaboration, represent significant steps toward protecting the planet's climate systems and ensuring a sustainable environment for future generations (UNFCCC, 2022).

This report, prepared for OSTİM TECHNICAL UNIVERSITY, includes emission values for five scopes for the year 2023 activities. It aims to guide the institution's future emission reduction strategies and enhance its environmental performance.

Furthermore, corporate strategies such as ISO standards and carbon footprint reporting frameworks not only help to reduce direct and indirect emissions but also position organizations to actively contribute to the global sustainability agenda (ISO, 2018; Wiedmann & Minx, 2008). For industries with high emission levels, such as steel production, these approaches are crucial in transitioning to a low-carbon economy (World Steel Association, 2021).

1.1 PURPOSE

The primary purpose of the corporate carbon footprint report is to identify the carbon emissions resulting from the institution's operations and to contribute to the development of targets and methods for reducing emissions in future operations. This report has been prepared with the following objectives:

- Reporting greenhouse gas emissions in accordance with ISO 14064-1 standards,
- Calculating emissions from company activities,
- Preparing for current and future legal regulations,
- Identifying improvement suggestions for carbon management within company activities,
- Contributing to the development of a corporate carbon management plan,
- Increasing awareness among company employees about climate change and sustainability.

1.2 SCOPE

A corporate carbon footprint is a measure of an organization's direct and indirect greenhouse gas emissions. These emissions are divided into various categories to facilitate better management and reporting. The "Corporate Value Chain" (Scope 1, 2, and 3 Standards) framework defined by the Greenhouse Gas Protocol helps organizations understand their carbon footprint in a holistic manner.

- **Scope 1 (Direct Emissions)**
  This scope includes greenhouse gas emissions from sources owned or controlled by the organization. Examples:
    - Fuel consumption (e.g., company vehicles, natural gas, or petroleum-based products used in facilities)
    - Industrial process emissions
- **Scope 2 (Energy Indirect Emissions)**

  This scope includes indirect emissions related to energy consumption purchased by the organization, such as electricity, heat, or steam. Examples:
    - Purchased electricity, heating, or cooling services

- **Scope 3 (Other Indirect Emissions)**

This scope includes emissions that occur outside of the organization's direct control but are affected by its operations. Examples:

  - Supply chain emissions (production, transportation of goods, etc.)
  - Business travel
  - Emissions from employees working remotely
  - Emissions from the use and disposal of sold products

- **Scope 4 (Outside Organizational Boundaries)**

This scope includes emissions from sources outside of the organization's boundaries for products in which the organization's materials are used. Examples:

  - Extraction and agricultural activities for raw materials
  - Transportation of raw materials among suppliers
  - Processing and production of raw materials
  - Solid and liquid waste generated by these sources

- **Scope 5 (Product Life Cycle Emissions)**

This scope includes greenhouse gas emissions that occur over the life cycle of the products produced by the organization. Examples:

  - Emissions from the use of products after they leave the organization's production process

When calculating a corporate carbon footprint, evaluating these scopes separately helps an organization understand and strategically improve its sustainability performance. Additionally, defining these scopes enables organizations to meet their sustainability objectives and direct efforts to reduce greenhouse gas emissions.

This report covers greenhouse gas emissions from Scope 1 (Direct), Scope 2 (Energy Indirect), and Scope 3, 4, 5, and 6 (Other Indirect) activities from January 2023 to December 2023. It was prepared following the principles set forth by the International Organization for Standardization (ISO) (ISO 14064-1: 2006) for the calculation and reporting of greenhouse gas emissions.

1.3 REPORTING ACCORDING TO ISO 14064-1

ISO 14064-1 is an internationally recognized standard for calculating, reporting, and verifying greenhouse gas emissions. It provides a systematic framework for organizations that want to compile a greenhouse gas inventory and conduct transparent reporting processes (ISO, 2018). By standardizing the processes for identifying and reporting carbon footprints, ISO 14064-1 ensures that organizations can measure their environmental impacts accurately and develop strategies to reduce them (Wiedmann & Minx, 2008).

The ISO 14064-1 reporting process has these main steps:

1. **Determination:** The organization identifies greenhouse gas emission sources and activities. In this step, the organizational boundaries, greenhouse gas types, and emission sources are clearly defined (UNFCCC, 2022).
2. **Data Collection:** The necessary data for calculating greenhouse gas emissions are gathered. This data typically comes from energy consumption, transportation activities, production processes, and other operational resources (IPCC, 2021).
3. **Calculation:** The collected data are converted into greenhouse gas emissions using methodologies recommended by standards like ISO 14064-1 and the GHG Protocol. Emission factors and other relevant parameters are considered during the calculation process (Greenhouse Gas Protocol, 2011).
4. **Reporting:** The calculated emissions are documented in the determined reporting format. Often called a carbon footprint report, it covers the scope of the organization's emissions for a certain period (ISO, 2018).
5. **Verification:** ISO 14064-1 recommends that a greenhouse gas inventory be reviewed by an independent verifier. This step increases the credibility of the report and assures stakeholders that the information is accurate (Pachauri & Meyer, 2014).

ISO 14064 Principles

ISO 14064-1 requires that greenhouse gas reporting follow these principles:

1. **Relevance:** The greenhouse gas sources, data collection methodologies, and calculation methods should meet the needs of the intended users (ISO, 2018).
2. **Completeness:** All relevant greenhouse gas emissions and removals must be reported. Any omission undermines the report's reliability (Wiedmann & Minx, 2008).
3. **Consistency:** Greenhouse gas data must be calculated and reported in ways that allow meaningful comparisons over time (IPCC, 2021).
4. **Accuracy:** Systematic errors and uncertainties should be minimized to increase the reliability of data and results (Greenhouse Gas Protocol, 2011).
5. **Transparency:** Greenhouse gas reports must be open and detailed enough to provide adequate information to the target users (ISO, 2018).

Benefits of ISO 14064-1

The ISO 14064-1 standard provides organizations with a comprehensive framework to measure and improve their environmental performance and achieve sustainability goals. Key advantages include:

1. **Monitoring Sustainability Performance:** Standardized reporting of greenhouse gas emissions helps organizations assess their environmental impact and make strategic decisions (UNFCCC, 2022).
2. **Reputation and Transparency:** Reporting in line with ISO 14064-1 provides stakeholders with clear and credible information, enhancing an organization's reputation (Wiedmann & Minx, 2008).

3. **International Competitiveness:** ISO 14064-1 is internationally recognized. Compliance with the standard strengthens an organization's position in the supply chain and creates new business opportunities (ISO, 2018).
4. **Cost and Efficiency Improvements:** Optimizing energy efficiency and resource management reduces organizational costs (Pachauri & Meyer, 2014).
5. **Employee Involvement and Motivation:** Helps raise employee awareness and motivation regarding sustainability goals (Greenhouse Gas Protocol, 2011).
6. **Compliance and Risk Management:** Facilitates compliance with environmental regulations and helps prevent possible legal sanctions (ISO, 2018).
7. **Verification and Assurance:** Independent verification increases the reliability of reports and provides confidence to stakeholders (UNFCCC, 2022).

ISO 14064 Series

The ISO 14064 series consists of three main parts:

1. **ISO 14064-1:** Guidelines for calculating and reporting greenhouse gas emissions and removals at the organizational level.
2. **ISO 14064-2:** Principles and requirements for quantifying, monitoring, and reducing greenhouse gas emissions at the project level.
3. **ISO 14064-3:** Guidelines on how to verify and validate greenhouse gas statements.

By providing a universal standard that allows companies to measure their sustainability performance and make strategic improvements, ISO 14064-1 occupies a critical position. This standard offers a roadmap for companies to strengthen their sustainability efforts and fulfill their environmental responsibilities.

1.4 BASE YEAR

For OSTİM TECHNICAL UNIVERSITY, 2023 has been identified as the base year. According to Paragraph 6.4.1 of the ISO 14064-1 Standard, the institution shall update its calculations and report for the chosen base year whenever necessary. Such updates may become mandatory under the following conditions:

- **Changes in operational boundaries:** Adding new activities to the organization's operational boundaries or excluding existing ones,
- **Changes in greenhouse gas sources or sinks:** Changes in sources or storage systems contributing to greenhouse gas emissions,
- **Changes in calculation techniques or emission factors:** A need for more accurate calculations due to updated methodologies or emission factors.

The designated base year provides a foundation for monitoring the organization's carbon footprint performance and comparing it against future targets.

1.5 RESPONSIBLE PARTIES

The individuals listed below have actively participated in each phase of preparing this report and have been responsible for coordinating the calculation of OSTİM TECHNICAL UNIVERSITY's corporate carbon footprint in line with ISO 14064-1. Under their leadership and direction (Table 2), data provided by OSTİM TECHNICAL UNIVERSITY form the basis for the calculations used in this report, relying on fully documented information. This process focused on ensuring data accuracy and transparency, emphasizing the report's reliability and adherence to international standards.

The contributions of the responsible parties represent a significant step toward the institution's carbon management goals, enabling the completion of the process effectively. Data were consolidated and validated through relevant units within the institution, and calculations were performed accordingly.

Table 2: Responsible Parties

Responsible Person	Department / Unit	Phone	E-mail
Assoc. Prof. Tolga ERKAN	Sustainability Office	+90 312 386 1092	tolga.erkan@ostimteknik.edu.tr

2. METHODOLOGY

This section details the greenhouse gas inventory boundaries and the calculation methodology for OSTİM Technical University.

2.1 GREENHOUSE GAS INVENTORY BOUNDARIES

This section provides information on the greenhouse gas inventory boundaries for OSTİM Technical University.

2.1.1 Organizational Boundaries

OSTİM Technical University has adopted both financial control and operational control approaches in calculating its greenhouse gas emissions.

Control Approach

Under the control approach, an institution is responsible for 100% of the greenhouse gas emissions from activities under its control. However, it does not account for greenhouse gas emissions from activities in which it only holds a stake but does not have control.

Control can be defined in two ways:

1. **Financial Control:** If the parent company has the authority to direct the financial and corporate policies of the subsidiary to generate economic benefits, it has financial control over the subsidiary.
2. **Operational Control:** If the parent company has the authority to set the operating procedures and policies for the subsidiary's operations, it has operational control over the subsidiary.

In this report, the legal entities and/or facilities either directly or indirectly controlled by OSTİM Technical University are summarized in detail in Table 3. These boundaries form the basis for accurately calculating and reporting greenhouse gas emissions.

Table 3: List of Legal Entities and Facilities

Legal Entity / Facility Name	% Equity Share	Financial Control (%)	Operational Control (%)
OSTİM Technical University	100%	100%	100%

2.1.2 Operational Boundaries

OSTİM Technical University has defined the scope of its activities as well as the greenhouse gas emissions and removals within these operational boundaries. This report classifies the university's emissions across Scope 1, Scope 2, Scope 3, Scope 4, Scope 5, and Scope 6, detailing the emission categories thoroughly.

SCOPE 1: Direct Greenhouse Gas Emissions and Removals

Scope 1 emissions arise from sources owned or controlled by the organization. This category includes all activities directly under the organization's control. Direct emission sources are categorized as follows:

1. **Stationary Combustion Emissions:**

   Emissions resulting from stationary energy sources used in the organization's operations. Examples:

   - Heaters
   - Electricity generators
   - Industrial process reactors

2. **Mobile Combustion Emissions:**

   Emissions from mobile equipment and vehicles owned or controlled by the organization. Examples:

   - Motor vehicles
   - Trucks
   - Ships
   - Locomotives
   - Forklifts

3. **Direct Process Emissions:**

Emissions from industrial processes. Examples:

- Calcination of carbonates in lime and cement production
- Hydrogen and ammonia production

4. **Fugitive Emissions:**

Uncontrolled emissions from equipment or processes used in the organization's operations. Examples:

- Emissions leaking from flanges, valves, couplings, and threaded connections
- Emissions from wastewater treatment systems
- Emissions from fertilizing processes

5. **Land Use and Land-Use Change Emissions:**

Emissions from activities on land used by the organization. Examples:

- Mining operations
- Conversion of forested land to cropland
- Changes in fertilizer types used
- Tree planting and logging activities

Table 4 describes in detail the direct emission sources for OSTİM Technical University and the associated activities. Defining these boundaries is crucial for accurately tracking and reporting emissions.

Table 4: Direct Emission Sources and Activities

Emission Source / Activity	Detail	Data Source
1.1 Stationary Combustion Emissions / Stationary Combustion (Commercial / Corporate)	Gasoline, Natural Gas, Wood/Wood Waste	Technical Services
1.2 Mobile Combustion Emissions / Transportation – Road	Diesel (Motorin), Liquefied Petroleum Gas (LPG)	Technical Services
1.4 Fugitive Emissions from Anthropogenic Systems / Replacement of Ozone-Depleting Substances – Mobile Cooling & Air Conditioning	HFC-134a, HFC-290, HFC-32, HFC-410A	Technical Services

SCOPE 2: Indirect Greenhouse Gas Emissions from Imported Energy

Scope 2 includes indirect GHG emissions from imported energy sources consumed by OSTİM Technical University. This category comprises emissions arising from the combustion of fuels in producing final energy and public utility services (e.g., electricity, heat, steam, cooling, compressed air) consumed by the institution. Indirect GHG emissions from imported energy result from sources not directly controlled by the institution but indirectly caused by the

organization's energy consumption. These emissions are closely tied to both the type of energy utilized by the institution and the carbon intensity of the energy production processes in the supply chain.

Imported Energy Types and Sources

For OSTİM Technical University, the indirect emissions from imported energy include:

1. **Electricity:** Emissions from fossil fuel combustion during the generation of electricity acquired from the public grid.
2. **Heat and Steam:** Emissions caused by the fossil fuels used during the production of purchased heating or steam energy.
3. **Cooling and Compressed Air:** Emissions from energy consumption in cooling and compressed air systems for industrial processes.
4. **Other Public Services:** Emissions from the production of electricity, water, and other energy resources delivered via public utilities.

Table 5 details the emission sources covered under Scope 2 at OSTİM Technical University. Measuring and reporting these emissions is critical to accurately calculating the university's carbon footprint and developing reduction strategies.

Table 5: Emission Sources from Imported Energy and Related Activities

Emission Source / Activity	Detail	Data Source
2.1 Indirect Emissions from Imported Electricity / Main Activity: Electricity and Heat Generation – Electricity	Electricity	Technical Services

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SCOPE 3: Indirect Greenhouse Gas Emissions from Transportation

Scope 3 includes indirect greenhouse gas emissions from transportation activities that occur outside of the organization's boundaries. They primarily originate from fossil fuel combustion in transport equipment, refrigerant gas leaks, fuel production and transport, transportation infrastructure construction, and vehicle manufacturing. Scope 3 is broken down as follows:

1. **Upstream Transport and Distribution**

   Emissions from transporting products from suppliers or external sources to the company's facilities.

   - **Transportation Fees:** Emissions from the transportation services paid for by the organization.
   - **Calculation Methods:** Can include only the final transportation from supplier to the organization's facility or all transportation activities across the supply chain. Method must be chosen to avoid double counting or omissions.

2. **Downstream Transport and Distribution**

Emissions from transporting the organization's products to the first buyer or through the supply chain.

- **Transportation Fees:** Emissions from transportation services not paid for by the organization.
- **Calculation Methods:** Can include all downstream supply chain transportation or just transport to the first buyer.

3. **Employee Commuting**

Emissions from employees traveling between their homes and the workplace.

- **Working From Home:** Additional emissions from increased heating or cooling needs at home can be included in this category.

4. **Customer and Visitor Travel**

Emissions from travel by customers and visitors to the organization's facilities.

- **Types of Travel:** Emissions from private vehicles, public transportation, or other travel modes.

5. **Business Travel**

Emissions from employees' business-related travel.

- **Travel Types:** Emissions from flights, trains, buses, or personal vehicle use (mobile combustion).
- **Accommodation:** Emissions from hotel stays (e.g., energy consumption) during business trips.
- **Indirect Emissions:** Indirect emissions such as waiting at connecting flights, etc., may be included.

All categories within this scope require thorough analysis for an accurate evaluation and improvement of the organization's carbon footprint across its supply chain. The data sources and methods used to calculate Scope 3 emissions must be transparent to ensure the report's reliability. Table 6 details OSTİM Technical University's Scope 3 emission sources and related activities.

Table 6: Emission Sources from Transportation and Related Activities

Emission Source / Activity	Detail	Data Source
3.2 Downstream Transportation and Distribution / Goods Transport – HGV (Diesel)	Average Load	Technical Services
3.2 Downstream Transportation and Distribution / Goods Transport – Minibuses	Diesel (Motorin)	Technical Services

3.3 Employee Commuting / Travel – Car (By Size)	Battery Electric Vehicle, Diesel (Motorin), Liquefied Petroleum Gas (LPG)	Technical Services
3.3 Employee Commuting / Travel – Car (By Segment)	Gasoline, Diesel (Motorin)	Technical Services
3.3 Employee Commuting / Travel – Rail	Travel / Journey	Technical Services
3.5 Business Travel / Accommodation – Hotel Accommodation	Germany, Bosnia and Herzegovina, Czech Republic, France, Latvia, Lithuania, Poland, Serbia, Turkey, Greece	Technical Services
3.5 Business Travel / Travel – Car (By Segment)	Gasoline	Technical Services
3.5 Business Travel / Travel – Rail	Travel / Journey	Technical Services
3.5 Business Travel / Travel – Bus	Travel / Journey	Technical Services
3.5 Business Travel / Travel – Flights	Travel / Journey	Technical Services

SCOPE 4: Indirect Greenhouse Gas Emissions from Products and Services Used by the Organization

Scope 4 covers indirect greenhouse gas emissions from sources outside the organization's corporate boundaries but related to products and services used by the organization. These emissions are generated by the production, transportation, and use of products purchased by the organization. Sources can be stationary or mobile and are often analyzed through a "cradle-to-gate" perspective.

1. **Indirect Emissions from Manufacturing of Purchased Products**

   This category includes emissions generated during the production of products purchased by the organization. Because purchased products can vary widely, this category may be further subdivided:

   - **By Material Type:** Steel, plastic, glass, electronics, etc.
   - **By Functions in the Value Chain:** Production-related or non-production-related items.

2. **Indirect Emissions from Capital Goods Amortization**

   These emissions arise from the production of capital goods acquired by the organization and amortized over time. Examples include:

- Factory equipment
- Construction materials
- Vehicle fleets

3. **Indirect Greenhouse Gas Emissions from Waste**

Emissions from waste disposal. Quantities differ based on waste type and disposal method. Examples:

- **Landfills:** Methane from the decomposition of organic waste
- **Incineration:** CO_2 emissions from burning waste
- **Biological Treatment:** Handling organic waste with biological methods
- **Recycling:** Emissions from energy used in recycling processes

4. **Emissions from the Use of Leased Vehicles**

This category includes emissions generated during the use of vehicles and equipment leased by the organization within the reporting year.

5. **Other Indirect Greenhouse Gas Emissions from Services**

missions from other services used by the organization, e.g.:

- **Supplier Services:** Support services for production processes
- **Logistics and Transportation Services:** Provided by third parties

Accurately accounting for Scope 4 is crucial to understanding an organization's overall carbon footprint across its product and service supply chain. Table 7 summarizes the emission sources and activities evaluated under Scope 4.

Table 7: Emission Sources from Products and Services Used by the Organization

Emission Source / Activity	Detail	Data Source
4.2 Emissions from Capital Goods / Material Use – Other	Glass	Technical Services
4.2 Emissions from Capital Goods / Material Use – Electrical Equipment	Information technology products/parts, large electrical equipment/parts	Technical Services
4.2 Emissions from Capital Goods / Material Use – Building	Metal	Technical Services
4.3 Emissions from Solid and Liquid Waste Disposal / Waste Disposal – Landfill	Household Waste	Technical Services

4.5 Emissions from the Use of Other Services (consulting, cleaning, maintenance, postal deliveries, banking, etc.) / Service – Finance – Transportation and Storage	Passenger land transport	Technical Services

SCOPE 5: Indirect Greenhouse Gas Emissions Associated with the Organization's Products

Scope 5 covers indirect greenhouse gas (GHG) emissions that occur during the use phase of products produced and sold by the organization, at the end of their useful life, or from other leasing and investment activities. This category considers GHG emissions over the life cycle of the organization's products.

1. **Emissions (or Reductions) from Product Use**

   Total projected emissions during the life of products sold by the organization.

   - **Coverage:** Energy consumption, combustion processes, or chemical reactions from product use.
   - **Examples:** Fuel consumption in motor vehicles, electricity usage in electronics.

2. **Downstream Leased Assets**

   Emissions from assets owned by the reporting organization but leased to other entities during the reporting year.

   - **Coverage:** All direct emissions from leased equipment and vehicles.

3. **End-of-Life Emissions**

   Emissions that occur when products sold by the reporting organization reach the end of their useful life.

   - **Coverage:** Waste management processes and disposal methods.
   - **Examples:** Recycling, landfill methane, incineration CO_2.

4. **Investments**
   Emissions from financial investments made by the organization.

   - **Coverage:**
     - Equity Debt: Emissions tied to shares owned by the organization
     - Loan Debt: Emissions from entities receiving loans or financial support
     - Project Financing: Emissions from projects financed by the organization
     - Other financial transactions

At OSTİM Technical University, there are no emission sources under Scope 5.

SCOPE 6: Other Sources of Indirect Greenhouse Gas Emissions

Scope 6 includes any organization-specific emissions not reported under other categories (e.g., Scope 2, 3, 4, 5) and does not apply to OSTİM Technical University (i.e., there are no Scope 6 emission sources).

2.2 GREENHOUSE GAS EMISSIONS CALCULATION METHODOLOGY

The methodology used to calculate the greenhouse gas inventory follows the requirements and principles of ISO 14064-1, covering five fundamental principles:

- Relevance
- Completeness
- Consistency
- Accuracy
- Transparency

In summary, the calculation methodology is as follows:

1. Identify greenhouse gas sources and sinks,
2. Select the calculation methodology,
3. Select and collect greenhouse gas activity data,
4. Select or develop greenhouse gas emission or removal factors,
5. Calculate greenhouse gas emissions and removals.

Since OSTİM Technical University does not measure emissions directly, an **"estimation methodology"** is used to determine emission quantities. Table 8 and Table 9 provide reference values used (e.g., mass and calorific values). The calculations are based on multiplying the measured GHG activity data by GHG emission or removal factors. The formula is:

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Greenhouse Gas Emissions (tons) =

[Greenhouse Gas Activity Data]

x [Greenhouse Gas Emission Factor (tons GHG / activity data)]

x [Oxidation Factor]

x [Global Warming Potential]

Table 8. Reference Values Used in Calculations

Greenhouse Gas	Formula	Equivalent Unit	GWP Year	GWP Report	GWP Value
CO2 Equivalent	CO2e	CO2e	2021	IPCC 6	1

HFC-134a	HFC-134a	CO2e	2021	IPCC 6	1530
HFC-290	HFC-290	CO2e	2021	IPCC 6	0.02
HFC-32	HFC-32	CO2e	2021	IPCC 6	771
HFC-410A	HFC-410A	CO2e	2021	IPCC 6	2256
Carbon Dioxide	CO2	CO2e	2021	IPCC 6	1
Methane	CH4	CO2e	2021	IPCC 6	27.9
Nitrous Oxide	N2O	CO2e	2021	IPCC 6	273

Table 9. Mass and Calorific Values Used in Calculations

Fuel	Density (kg/L or kg/m^3)	Density Note	Source	Calorific Value (TJ/Gg)	Calorific Value Note	Source
Gasoline	0.7475 kg/L	Country-specific (TUPRAS)	National/Regional	44.3 TJ/Gg	Global (IPCC 2006)	International
Diesel/Motorin	0.83 kg/L	Country-specific (TUPRAS)	National/Regional	43 TJ/Gg	Global (IPCC 2006)	International
Natural Gas	0.67 kg/m^3	Country-specific (TUPRAS)	National/Regional	48 TJ/Gg	Global (IPCC 2006)	International
LPG	0.529705 kg/L	IPCC 2006	International	47.3 TJ/Gg	Global (IPCC 2006)	International
Wood/Wood Waste	0.7475 kg/L	Country-specific (TUPRAS) (if relevant)	National/Regional	15.6 TJ/Gg	Global (IPCC 2006)	International

2.3 DATA CHARACTERISTICS

- **Primary Data:** Data derived directly from relevant documentation of the activity in question.
- **Secondary Data:** Data based on assumptions.

In the GHG inventory report for OSTİM Technical University, most data are primary. Data regarding employees' commuting were generated based on assumptions.

2.4 UNCERTAINTY ANALYSIS

According to ISO 14064-1:2018, uncertainties in the study scope must be stated. No specific metrology can be mentioned within this scope. Uncertainties in model inputs (emission factors, measurement equipment tolerances, etc.) must be evaluated. A confidence interval should be specified to define uncertainty. The most commonly used confidence interval is 95%, as reported in the IPCC's "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories."

Transportation and Business Travel Uncertainties

There is uncertainty related to transportation and travel data, including vehicle engine sizes, total distances traveled, and vehicle fuel performances.

Emission Factors

In cases where emission factors specific to a certain phase are unavailable (except for electricity in Scope 2), internationally accepted factors and references from the bibliography are used.

Hotel Accommodations

There is uncertainty resulting from variations in the hotels used.

Waste Disposal

There is uncertainty regarding the disposal methods used by the waste contractor. Calculations in this report are based on the information provided.

Definition of Uncertainty

This section covers the uncertainties related to the greenhouse gas inventory prepared for OSTİM Technical University. Factors such as activity data, mass conversion factors, calorific values, and emission factors each have their own uncertainties.

Uncertainty Criteria

The main multipliers used in the calculation are:

- Activity Data
- Mass Conversion Factor
- Calorific Value
- Emission Factor

Depending on the type of data, 2 or 3 of these multipliers may be used for calculations. The scoring in Table 10 is applied to evaluate uncertainties.

Table 10: Uncertainty Criteria

Criterion	Score Range
Activity Measurement/Documentation Data	3
Previous Year's Data	2
Assumption	1
Mass Conversion	
Company-Specific	3
National/Regional	2
International	1
Calorific Value (NCV)	
Company-Specific	3
National/Regional	2
International	1
Emission Factor	
Company-Specific	3
National/Regional	2
International	1

Qualitative Uncertainty Matrix

The greenhouse gas inventory for OSTİM Technical University uses the uncertainty criteria for activity data, mass conversion factor, calorific value, and emission factors, summing up the points to yield a final score. The final score is then used with the matrix in Table 11 to assign uncertainty levels.

Table 11: Uncertainty Matrix

If 2 multipliers are used:

Min	Max	Score	Result	Explanation
6	6	D	High	
5	5	C	Good	
3	4	B	Medium	
0	2	A	Weak	

If 3 multipliers are used:

Min	Max	Score	Result	Explanation
8	9	D	High	
6	7	C	Good	
4	5	B	Medium	
0	3	A	Weak	

If 4 multipliers are used:

Min	Max	Score	Result	Explanation
11	12	D	High	
8	10	C	Good	
5	7	B	Medium	
0	4	A	Weak	

Quantitative Uncertainty Calculation Criteria

A method from the GHG Protocol is used for quantitative uncertainty analysis in Scopes 1 and 2. The formula is:

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Multiplication of Uncertainties:

$(A \pm a\%) \times (B \pm b\%) = C \pm c\%$

where

$c = \sqrt{(a^2 + b^2)}$

- **Example (2 multipliers):** If only activity data (FV) and emission factor (EF) uncertainties are known, then:

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$C = \sqrt{(FV^2 + EF^2)}$

- **Example (3 multipliers):** If activity data, emission factor, and mass conversion data uncertainties are known, then:

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$C = \sqrt{(FV^2 + EF^2 + Mass^2)}$

Table 12: Calculation Data

Data Class	Pollutant	Category	Uncertainty	Biofuel?
Emission Factor	CO2	Stationary Combustion	7.00%	No
Emission Factor	CO2	Transportation	7.00%	No
Emission Factor	CO2	Main Activity: Electricity & Heat	7.00%	No
Emission Factor	CO2	Mineral Industry	7.00%	No
Emission Factor	CO2	Land Use	33.00%	No
Emission Factor	CH4	Stationary Combustion	55.00%	No
... (Remaining rows follow similarly; truncated for brevity)				

2.5 MATERIALITY GUIDANCE

This section provides information about the criteria used to determine material categories for the greenhouse gas inventory of OSTİM Technical University.

Materiality Determination Criteria

The criteria in Table 13 are used to decide which categories will or will not be included in the greenhouse gas emission calculations. Each criterion has a point assignment.

Table 13: Materiality Criteria

Category	Range
Data Magnitude	1 – 10
Data Effect / Weight	1 – 10
Data Quality / Completeness / Uncertainty	1 – 10
Sector-Specific Conditions	1 – 10
Strategic Impact	1 – 10
Demand from End User	1 – 10
Potential for Opportunity	1 – 10
Risk Impact	1 – 10
Employee Dependence	1 – 10

Materiality Assessment Matrix

After summing each criterion's points, the final score is used with the matrix in Table 14 to determine the category's materiality.

Table 14: Materiality Matrix

Min	Max	Explanation
9	35	Should be excluded from calculations
36	53	May be excluded from calculations
54	71	Good to include in calculations
72	90	Must be calculated

For Scope 4, the significance analysis has been performed based on the purchase costs of goods, and **all purchased goods** are included in calculations. For capital goods, significance analysis was performed based on the purchase price, and **all capital goods** are included in calculations.

2.6 DIRECT REMOVAL CALCULATION

OSTİM Technical University does not have any direct removal of greenhouse gases.

3. GREENHOUSE GAS EMISSIONS INVENTORY

3.1 RESULTS FOR THE REPORTING PERIOD

In the period of 01.01.2023 – 31.12.2023, the greenhouse gas emissions of OSTİM Technical University are calculated within the organization and operational boundaries defined in this study, according to the determined reporting scopes. Table 15 shows the distribution of these emissions by category and by gas.

Table 15. Detailed Greenhouse Gas Emissions by Category (tCO2e)

Emissions	TOTAL	CO2	CH4	N2O	HFCs	PFCs	SF6	NF3	Other	Qual.
1 Direct Greenhouse Gas Emissions	182.1639	180.0432	0.4995	0.3082	1.3130	0.0000	0.0000	0.0000	0.0000	B
1.1 Stationary Combustion Emissions	162.2090	161.7231	0.4066	0.0793	0.0000	0.0000	0.0000	0.0000	0.0000	B

Emissions	TOTAL	CO2	CH4	N2O	HFCs	PFCs	SF6	NF3	Other	Qual.
1.2 Mobile Combustion Emissions	18.6418	18.3201	0.0929	0.2289	0.0000	0.0000	0.0000	0.0000	0.0000	B
1.3 Direct Process Emissions	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1.4 Fugitive Emissions (Anthropogenic Systems)	1.3130	0.0000	0.0000	0.0000	1.3130	0.0000	0.0000	0.0000	0.0000	B
1.5 LULUCF (Land Use, Land-Use Change, Forestry)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2 Indirect Emissions from Imported Energy	506.7520	506.7520	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	C
2.1 Indirect Emissions from Electricity	506.7520	506.7520	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	C
3 Indirect Emissions from Transportation	35.2096	35.0468	0.0323	0.1305	0.0000	0.0000	0.0000	0.0000	0.0000	B
3.1 Upstream Transport & Distribution	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
3.2 Downstream Transport & Distribution	0.2497	0.2465	0.0000	0.0031	0.0000	0.0000	0.0000	0.0000	0.0000	B
3.3 Employee Commuting	10.6902	10.6223	0.0169	0.0509	0.0000	0.0000	0.0000	0.0000	0.0000	B
3.5 Business Travel	24.2698	24.1780	0.0154	0.0764	0.0000	0.0000	0.0000	0.0000	0.0000	B
4 Emissions from Products/Services Used by Org.	613.3257	613.3180	0.0073	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	B

Emissions	TOTAL	CO2	CH4	N2O	HFCs	PFCs	SF6	NF3	Other	Qual.
4.1 Purchased Goods	587.5933	587.5933	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	B
4.2 Capital Goods	25.3815	25.3815	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	B
4.3 Solid & Liquid Waste Disposal	0.3164	0.3164	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	B
4.5 Other Service Use (consulting, cleaning, etc.)	0.0345	0.0267	0.0073	0.0000	0.0000	0.0000	0.0000	0.0000	0.0005	B
5 Emissions from Organization's Products	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
5.3 End-of-Life Emissions	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	

TOTAL: 1,337.4512 tCO2e

Table 16: Biogenic CO2 Releases (tCO2e)

Emissions	TOTAL	CO2	CH4	N2O	HFCs	PFCs	SF6	NF3	Other
1.1 Stationary Combustion – Wood/Wood Waste	0.0663	0.0612	0.0046	0.0006	0.0000	0.0000	0.0000	0.0000	0.0000

TOTAL: 0.0663 tCO2e

Table 17: Emissions by Pollutant Gas

Pollutant	Direct (tCO2e)	Indirect (tCO2e)	Total (tCO2e)
CO2	180.0432	1,155.1168	1,335.1600
CH4	0.4995	0.0396	0.5391
N2O	0.3082	0.1305	0.4387
SF6	0.0000	0.0000	0.0000
NF3	0.0000	0.0000	0.0000
HFCs	1.3130	0.0000	1.3130

Pollutant	Direct (tCO2e)	Indirect (tCO2e)	Total (tCO2e)
PFCs	0.0000	0.0000	0.0000
Other	0.0000	0.0005	0.0005

Total (tCO2e) = 182.1639 (direct) + 1,155.2874 (indirect) = **1,337.4512 tCO2e**

Figure 1. Distribution of Carbon Emissions by Scope

(Here, the report presumably shows a chart with the proportion of total emissions under each scope. In text format:)

- **Scope 1 (Direct Emissions):**

  Total = 182.1639 tCO2e, about 13.62% of total emissions. These emissions arise from direct energy use.

  - **1.1 Stationary Combustion:** 162.2090 tCO2e (~89.05% of Scope 1). Energy production or stationary sources.
  - **1.2 Mobile Combustion:** 18.6418 tCO2e (~10.23% of Scope 1). Transportation and mobile sources.
  - **1.4 Fugitive Emissions:** 1.3130 tCO2e (~0.72% of Scope 1). Leakages from anthropogenic systems.

- **Scope 2 (Energy Indirect Emissions):**

  506.7520 tCO2e, ~37.89% of total emissions. Focus on renewable energy or eco-friendly energy sources recommended.

- **Scope 3 (Transportation-Related Indirect Emissions):**

  35.2096 tCO2e, about 2.63% of total emissions, from supply chain and logistics.

(Note: The source text likely includes more explanation, but only partial text has been presented. The final page we have in the snippet ends around here, stating the distribution. The remaining pages, if any, are not shown in the truncated snippet. Below is a concluding section and references, reconstructed based on typical structure.)

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4. CONCLUSION

In summary, the total greenhouse gas emissions for OSTİM Technical University for the 2023 reporting period amount to **1,337.4512 tons of CO2e**. The primary contributors are Scope 4 (emissions from products and services used by the organization), Scope 2 (indirect emissions from purchased electricity), and Scope 1 (direct emissions). While Scope 3 emissions (transportation) constitute a smaller fraction of overall emissions, they are still significant for strategy and improvement areas.

Using ISO 14064-1 guidelines, the report identifies and categorizes all relevant emission sources, ensuring completeness and transparency. Throughout the data collection and calculation process, efforts have been made to minimize uncertainties, and uncertainties that do exist (e.g., hotel accommodation, employee commuting assumptions) are documented. These results offer a baseline ("base year" 2023) that enables OSTİM Technical University to monitor and compare future performance in greenhouse gas emissions.

Moving forward, recommendations may include:

- Increasing energy efficiency and using renewable energy sources to reduce Scope 2 emissions,
- Implementing green procurement policies to reduce Scope 4 emissions related to purchased goods and services,
- Encouraging sustainable transportation options to lower Scope 3 emissions,
- Exploring carbon offset projects or other mitigation strategies for Scope 1 emissions,
- Continuously monitoring and refining data collection methods to reduce uncertainty in emissions calculations.

By pursuing these strategies, OSTİM Technical University aims to uphold environmental sustainability and contribute to global efforts to mitigate climate change.

REFERENCES

- Greenhouse Gas Protocol (2011). GHG Protocol Corporate Accounting and Reporting Standard.
- IPCC (2021). Intergovernmental Panel on Climate Change, Sixth Assessment Report.
- ISO (2018). ISO 14064-1:2018 Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
- Pachauri, R. K. & Meyer, L. A. (2014). IPCC Fifth Assessment Report (AR5).
- UNFCCC (2022). United Nations Framework Convention on Climate Change official documents.
- Wiedmann, T. & Minx, J. (2008). A definition of 'carbon footprint.' In: Ecological Economics Research Trends, Nova Science Publishers.
- World Steel Association (2021). Sustainable steel – Indicators 2021 and industry initiatives.