KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ CARBON FOOTPRINT REPORT

2022 - ISO 14064:2019
Greenhouse Gas Inventory Report

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Terms	Descriptions
CO_2-equivalent	The international unit derived by expressing the global warming potential (GWP) of six greenhouse gases in terms of the greenhouse gas potential of one unit of carbon dioxide. It is used to establish a common denominator for assessing emissions (or reductions in emissions) of different greenhouse gases.
Direct Emissions	Emissions from sources owned or controlled by the company
Indirect Emissions	Emissions from sources arising from the company's operations but owned or controlled by another company. A company's indirect emissions include emissions associated with the production of the electricity it purchases, etc.
Emission Factor	A factor that allows greenhouse gas emissions to be calculated from a unit of activity data (e.g. fuel consumed in tons, product produced in tons) and final greenhouse gas emissions.
Optimal Techniques	In principle, it is defined as the most effective and advanced stage in the development of activities and their implementation methods that demonstrate the actual suitability of specific techniques that provide emission limit values designed to prevent the effects of emissions on the environment in all aspects and, where this is not possible, to reduce emissions and their effects on the environment as much as possible.
Global Warming Potential	Factor indicating the radiative forcing effect (degree of damage to the atmosphere) of one unit of a greenhouse gas compared to one unit of carbon dioxide.
Scope	The term "Scope" is used in the GHG Protocol to define the boundaries between different types of direct and indirect emissions: Scope I refers to the reporting company's direct greenhouse gas emissions, Scope II refers to the reporting company's greenhouse gas emissions from electricity, heating/cooling or steam purchased for consumption, and Scope III refers to the reporting company's non-Scope II indirect emissions.
Greenhouse gas	Gases that regulate the heat balance because they are permeable to solar radiation and much more permeable to long-wavelength ground radiation. These greenhouse gases are the six gases listed in the Kyoto Protocol: carbon dioxide (CO_2), methane, nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6).
Greenhouse Gas Protocol	It is a standard in corporate greenhouse gas emission accounting and reporting.

1. INTRODUCTION

KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ has prepared a Corporate Carbon Footprint Report to disclose the greenhouse gas emissions from its operations.

As Kafein Teknoloji, whose mobile payment systems, e-commerce and telecommunication projects are now used in Turkey's largest organizations and in other countries, we started our journey in 2005, positioning us among the pioneers of the sector. For seventeen years, we have been meeting the technology software and management needs of national and global customers in the technology, banking, telecom, tourism, service, retail and insurance sectors. In addition to the key solutions we offer for the needs of our customers, we develop technologies in the fields of big data analysis, KVKK, security and mobile applications. In addition, we continue to work to take our innovative solutions to the next level by constantly carrying out R&D projects with our global partners and important institutions such as TÜBİTAK.
We owe our success to our nearly 700 employees, global partners and business partners, and to acting together with our vision of quality service. Within this vision, we continue to take firm steps forward in the sector. While expanding our product range with the services we produce in different fields, we also feed on the areas of our subsidiaries to expand our service capacity.

Our subsidiaries include Intranet Yazılım, which offers solutions that enable companies to manage quality management and occupational health and safety processes from a single point, and Karmasis, which has a successful product portfolio in the field of cyber security.

As Kafein Teknoloji, which continues to contribute to Turkey's software vision by growing 45% between 2017-2020, we are proud to be one of the first software companies to go public.
The reporting period consists of the period between January 2022 and December 2022. In this report, KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ will be referred to as “KAFEİN YAZILIM HİZMETLERİ”
.
Climate change, the biggest natural disaster, has become an important issue with population growth and industrialization. KAFEİN YAZILIM HİZMETLERİ has calculated the corporate carbon footprint of its activities in order to reduce greenhouse gas emissions and to demonstrate its sensitivity to the climate. Carbon footprint reduction efforts continue rapidly with studies on environmental pollution and climate change.

1.1. INFORMATION ABOUT THE STUDY

With the awareness of being a sustainable organization, KAFEİN YAZILIM HİZMETLERİ has prepared the said corporate carbon footprint report with data from 2022.

In order to become a software company with a low carbon footprint, KAFEİN YAZILIM HİZMETLERİ has identified greenhouse gas emission sources, calculated and reported emission amounts.

Table 1. Company Employment Information

KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ	
Number of Employees	660 *people*
No.of Working Days	250 *days*
Workplace Confined Space	2.600 m^2

The corporate carbon footprint calculation study was carried out in line with the data for 2022. For your questions and comments regarding the study, you can contact the authorized persons whose contact information is given in Table 2.

Table 2. Company Employment Information

Company	**Address**	**Person in Charge**	**Contact Information**
KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ	ÇİFTE HAVUZLAR MAH. ESKİ LONDRA ASFALTI CAD. KULUÇKA MRK. A2 BLOK NO:151/1B İÇ KAPI NO: B01 ESENLER / İSTANBUL / TURKEY	KENAN SUBEKÇİ	0212 924 20 30

This report has been prepared for KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ in accordance with ISO 14064-1:2019 Standard and GHG Greenhouse Gases Protocol Calculation and Reporting Standards. Total corporate carbon footprint values resulting from the operations and activities of KAFEİN YAZILIM HİZMETLERİ have been calculated through programs.

KAFEİN YAZILIM HİZMETLERİ Corporate Carbon Footprint Report has been reported in accordance with the requirements of the "7.3. Content of Greenhouse Gas Report" article in TS EN ISO 14064-1:2019 standard.

1.1.1. Purpose and Scope

Institutions and companies determine national and international climate change policies and manage measures to reduce greenhouse gas risks in order to turn current and future risks into opportunities.

This report is prepared for the purposes of;

- calculating the impact of KAFEİN YAZILIM HİZMETLERİ activities on climate change
- reporting in accordance with ISO 14064-1:2019
- contributing to the development of a Carbon Management Plan
- raising awareness and awareness of subcontractor companies within KAFEİN YAZILIM HİZMETLERİ on climate change, energy efficiency and sustainability issues.

KAFEİN YAZILIM HİZMETLERİ uses the operational control approach in its Corporate Carbon Footprint Calculation and Reporting for the said year 2022.

Fixed combustion emissions from natural gas consumption in heating and production processes and company vehicles (Scope I), electricity purchased for operations (Scope II), flight travel and personnel services (Scope III) are included in the calculations.

1.2. CLIMATE CHANGE

The term "Climate Change", which refers to the warming of the atmosphere, is the biggest environmental problem in the history of the world, affecting all nations. Climate change has serious impacts on the ecosystem. The most prominent consequences that have been seen in recent years are the decrease in precipitation and decrease in agricultural production, increase in extreme and sudden weather events (storms, tornadoes, floods, etc.) and seasonal abnormality.

It has been recognized by scientists that emissions from human activities cause the greenhouse effect and many governments have felt the need to take action in this regard. Especially at the 21st UN Climate Change Conference of the Parties (COP21) held in Paris in December 2015, the determination of all countries was demonstrated and joint action was decided.

1.3. GREENHOUSE GASES AND CARBON FOOTPRINT

Carbon footprint is the greenhouse gas measurement and expression of the environmental impacts caused by all kinds of activities of individuals, institutions and organizations in terms of carbon dioxide equivalent (CO_2e). The definition of greenhouse gases set by the Kyoto Protocol includes carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulfur hexafluoride (SF_6). A common unit, the carbon dioxide equivalent (CO_2e), is used to quantify them. The contribution of greenhouse gases to global warming is shown in Figure 1.

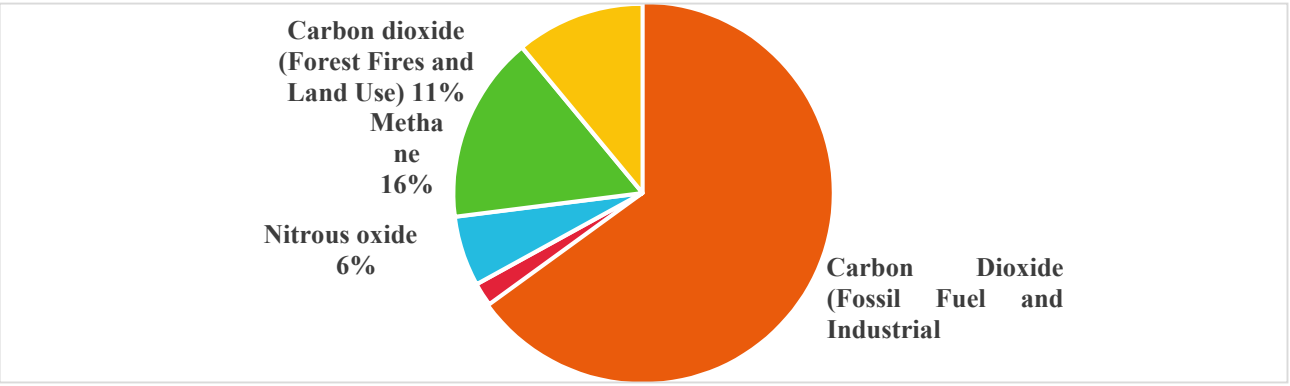

Figure 1. Effects of Different Greenhouse Gases on Global Warming2

Industrial development changes the chemical composition of the atmosphere, leading to the accumulation of greenhouse gases in the atmosphere, especially carbon dioxide, methane and nitrous oxide. If no measures are taken, global warming will lead to an increase in sea level, changes in local climate conditions, and negative impacts on vegetation and water resources. The impact rates of economic activities on greenhouse gas emissions are shown in Figure 2.

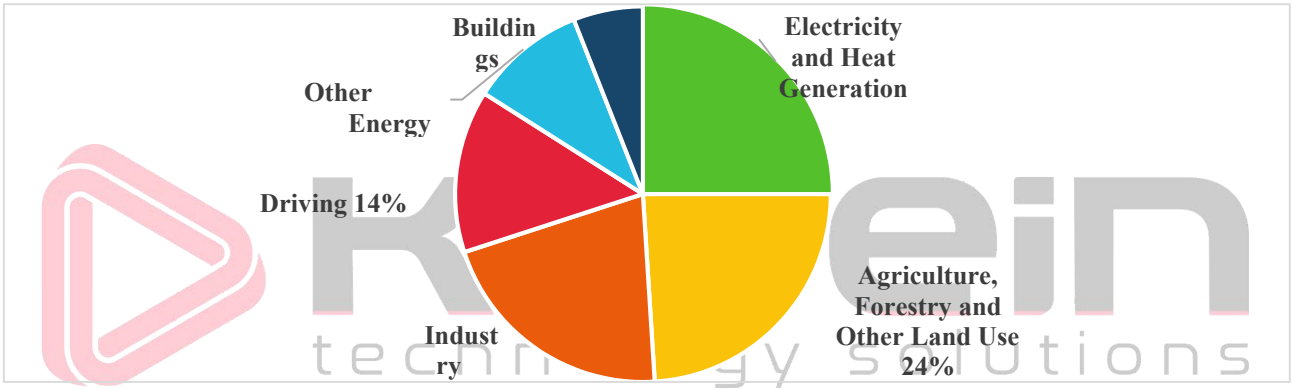

Figure 2. Breakdown of Global Greenhouse Gas Emissions by Economic Sectors[3]

As a result, human health will be affected and many ecosystems will be degraded. This is why individuals, companies, organizations and governments need to unite in a common goal of carbon emission reduction.

1.3.1 Carbon Footprint Calculation Standards

The GHG Protocol and ISO 14064-1:2019 Standard are the most widely used carbon footprint calculation methods
in Turkey. Other standards used in corporate carbon footprint calculations are as follows.

- Carbon Disclosure Project
- Carbon Reduction Commitment & Energy Efficiency Scheme
- EPA Climate Leaders
- US Regional Greenhouse Gas Initiative

1.3.1.1. Greenhouse Gas Protocol

The Greenhouse Gas Protocol is designed to support all aspects of GHG emission accounting and reporting and aims to ensure accurate and fair reporting of organizations' greenhouse gas emissions.

The GHG protocol categorizes emissions into operational scopes for effective GHG management. According to this principle, emissions are basically divided into direct and indirect. Direct emissions are those emitted from sources owned or controlled by the company. Indirect emissions are emissions from the company's activities or activities controlled by the company.

(2 IPCC (2014) Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.)

(3 IPCC (2014); Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change)

To facilitate the calculation of direct and indirect emissions, these are also divided into Scope I, Scope II and Scope III. Comparisons are shown in Figure 3.

Scope I; Direct Emissions (Greenhouse gas emissions generated by the company and emitted directly to the atmosphere. These include stationary combustion emissions from natural gas, diesel fuel or LPG, mobile combustion emissions from company-owned vehicles, refrigerant gas leaks from refrigerators and air conditioners).

Scope II; Indirect Emissions (Includes emissions from electricity, heating and cooling purchased by the company and may vary from country to country).

Scope III; Other Indirect Emissions (purchased goods and services, emissions from vehicles not owned by the company, emissions from waste disposal and other external uses).

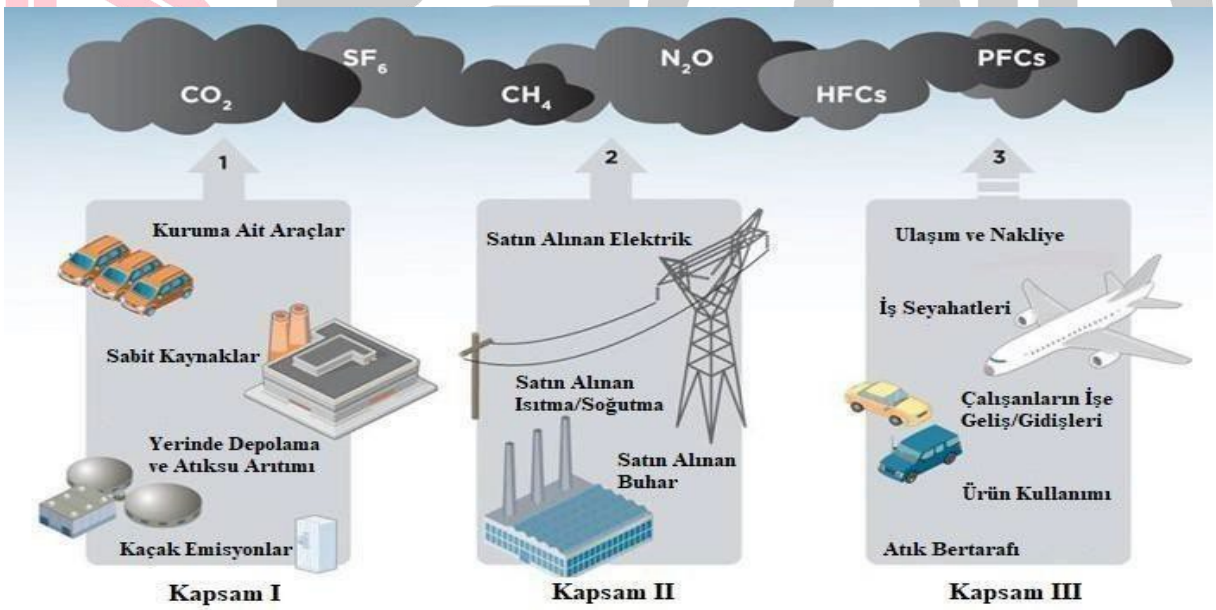

Figure 3. Direct and Indirect Emissions

1.3.1.2 ISO 14064-1:2019 Standard

The International Organisation for Standardization (ISO) is one of the world's largest standards publishing non-governmental organizations. The ISO 14064-1:2019 Standards published by this company provide information on how to calculate and report greenhouse gas emissions. It consists of three parts;

- ISO 14064-1: 2019 Greenhouse Gases - Part I: Guidance and Specifications Standard for Estimating and Reporting Greenhouse Gas Emissions and Removals at the Organization Level: Provides information on the calculation and reporting of greenhouse gas emissions at the organization level.

- ISO 14064-2:2019 Greenhouse Gases - Part II: Guidelines and Specifications Standard for Project-Level Calculation, Monitoring and Reporting of GHG Emission Reductions or Avoidance Improvements: Provides information on the calculation, monitoring and reporting of GHG emissions at the project level.

- ISO 14064-3:2019 Greenhouse Gases - Part III: Guidelines and Specifications Standard for the Verification and Validation of Greenhouse Gas Declarations: Provides information on the principles for the verification and validation of greenhouse gas emission inventories.

2. METHOD OF THE STUDY

The said study is based on the "Greenhouse Gas Protocol Corporate Accounting and Reporting Standard" and ISO 14064-1: 2019 standards prepared by the GHG Protocol for KAFEİN YAZILIM HİZMETLERİ.

According to the GHG Protocol, reporting of Scope I and II emissions is mandatory, while reporting of Scope III emissions is voluntary. The reporting of gases other than the greenhouse gases defined in the Kyoto Protocol is outside the scope and must be reported separately.

2.1 CARBON FOOTPRINT CALCULATION PROCEDURE

The data obtained in the KAFEİN YAZILIM HİZMETLERİ's corporate carbon footprint calculation study were multiplied by the relevant emission factors and emission data by activities were obtained in terms of carbon dioxide equivalent (CO2e).

Carbon dioxide equivalent is the product of the mass of a given greenhouse gas and its global warming potential. The global warming potentials of greenhouse gases determined by the Kyoto Protocol are given in Table 3.

The global warming potential data of the Intergovernmental Panel on Climate Change (IPCC, Intergovernmental Panel on Climate Change) Climate Change
- 5th Assessment Report 4 were used in the study.

Table 3. CO2 equivalents of Greenhouse Gases [5]

Greenhouse gas type	Global Warming Potential (by 100 year, CO2e)
Carbon dioxide (CO2)	1
Methane (CH4)	28
Nitrous oxide (N2O)	265
Sulfur hexafluoride (SF6)	23507
R410 A	1923
R407 A	2000
R407 C	1624

Global Warming Potential (GWP) is expressed in terms of carbon dioxide equivalent and is the unit used to compare the radiative forcing of a greenhouse gas to carbon dioxide. The carbon dioxide equivalent of a greenhouse gas is the mass of the gas multiplied by its carbon dioxide equivalent.

Emission factors presented in the 2006 IPPC Guidelines for National Greenhouse Gas Inventories reports and Ecoinvent v3.3 were used for emission source calculations.

[4] IPCC ClimateChange-5thAssessment Report (2013),

[5] IPCC AR5 (2013), Working Group I (WGI-12) Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Part 1 Chapter 8, Antropogenic and Natural Radiative Forcing Annex 8.A, Table 8.A.1

2.1.1. Scope I

Carbon footprint calculations were calculated in line with the data within the scope of 1 January 2022 - 30 November 2022.

For the calculations, fuel consumption and electricity consumption data used for continuous production purposes arising from all activities within KAFEİN YAZILIM HİZMETLERİ were used. The calculation scope and related activity types are given in Table 4.

Table 4 . KAFEİN YAZILIM HİZMETLERİ Carbon Footprint Calculations Scope Details

Scope	Activity
Scope I (Direct Emissions)	Constant Combustion (Natural Gas, Movable Combustion and Refrigerant Gases)
Scope II (Indirect Emissions)	Industrial Consumption Energy
Scope III (Other Indirect Emissions)	Flight Travel and Staff Shuttles

The consumption amounts from the emission sources shown in the table above are the data recorded within KAFEİN YAZILIM HİZMETLERİ. This data shows that there is no carbon emission from biomass combustion within the company.

3.1. INVENTORY DATA

KAFEİN YAZILIM HİZMETLERİ consumption data have been provided within the scopes to be used in carbon footprint calculations.

Carbon footprint calculation and reporting for 2022 of KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ have been carried out in accordance with international standards and methods, ISO 14064-1:2019 and GHG Protocol standards. These standards are as follows:

- ISO 14064 Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
- The Greenhouse Gas Protocol's 'A Corporate Accounting and Reporting

Standard. General principles within the framework of ISO 14064 standard compliance

are given in Table 5.

Table 5: Carbon Footprint Calculation and Reporting ISO 14064-1 compliance principles

Validity	This Carbon Footprint inventory appropriately reflects greenhouse gas emissions within KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ and serves the decision-making needs of users.
Integrity	This Carbon Footprint Inventory is calculated for all greenhouse gas emission sources within the system boundaries created within KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ.
Consistency	This calculation and report follows a valid methodology that is comparable for future studies.
Accuracy	KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ confirms that calculations are made by minimizing all uncertainties in the carbon footprint study and that no data is ignored within the determined system limits.
Transparency	KAFEİN YAZILIM HİZMETLERİ TİCARET ANONİM ŞİRKETİ transparently discloses the assumptions made about the study in the report within the scope of the study, and provides references to data quality and data sources in the report.

3.1.1. Scope I

Only stationary combustion data was used for Scope I calculations. Annual natural gas consumption for KAFEİN YAZILIM HİZMETLERİ is in Sm^3 . Biomass is not burned in any of the activities of KAFEİN YAZILIM HİZMETLERİ.

Table 6. KAFEİN YAZILIM HİZMETLERİ 2022 Year- Scope I Consumption Amounts

KAFEİN YAZILIM HİZMETLERİ	
Electricity Consumption	210203,622 Kwh
Total fuel consumption of company vehicles, distinguishing between diesel and gasoline, in liters (including service, rental vehicles and generator)	39.572,28 Lt
Movable Combustion (Diesel)	-
Movable Combustion (Gasoline)	-
Refrigerant Gases (R410 A)	-
Refrigerant Gases (R407 A)	-
Refrigerant Gases (R407 C)	-
Fire Tubes (CO_2)	-

3.1.2. Scope II

For the calculation of emissions from electricity from the grid, it is necessary to know the greenhouse gas impact value per kWh of electricity production on a country basis. The amount of emissions from electricity generation in Turkey is 0.59 kg CO2e/kWh. ANNEX I).

The total amount of electricity consumed by KAFEİN YAZILIM HİZMETLERİ is provided in kWh.

Table 7. KAFEİN YAZILIM HİZMETLERİ 2022 Year- Scope II Consumption Amounts

KAFEİN YAZILIM HİZMETLERİ	
Electricity Purchased from the Grid	210203,622 *kWh*
Steam Purchased from the Grid	-

3.1.3. Scope III

For the calculation of carbon emissions from Scope III, total kilometers were calculated from personnel routes and number of trips.

Table 8. KAFEİN YAZILIM HİZMETLERİ 2022 Year- Scope III Consumption Amounts

	KAFEİN YAZILIM HİZMETLERİ (İstanbul)
Flight Travels	83.566 *km*
Personnel Shuttles	-

4. KAFEİN YAZILIM HİZMETLERİ CORPORATE CARBON FOOTPRINT

For emission factors, the emission factors presented in the "Greenhouse Gas Calculation Inventory Guide6" published by IPCC in 2006, Ecoinvent V.3.3 and the Regulation on Increasing Efficiency in Energy Use were used. Table 9 shows the emission factors for stationary combustion activities such as heating and on-site electricity generation. Calculations are made according to the Tier 1 calculation method.

Table 9. Emission Factors of Fixed Combustion Activities

	CO_2 (kg/TJ)	CH_4 (kg/TJ)	N_2O (kg/TJ)
Natural gas	56.100	5	0,1

Carbon footprint amount (CO_2e) = Consumption Amount X Emission Factor

To calculate the greenhouse gas emission inventory, direct and indirect emission data were collected from all relevant greenhouse gas emission sources and related services. The corporate carbon footprint of KAFEİN YAZILIM HİZMETLERİ has been calculated in this way.

The data are processed as “kg” or “kWh”. For this reason, the consumption amounts collected in different units are calculated using DEFRA's density coefficients given in the ANNEXES.

Based on the calculations, a total of 203.762 tCO2e for 2022 was found. The results of the study are shown in Table 10.

Table 10. KAFEİN YAZILIM HİZMETLERİ Carbon Footprint Results by Year

	Scope I	Scope II	Scope III	Total Carbon Footprint
KAFEİN YAZILIM HİZMETLERİ	104.539 *tCO2e*	99.216 *tCO2e*	7,24 *tCO2e*	**203.762 *tCO2e***

As a result of the calculations, when the corporate carbon footprint is analyzed, it is observed that Scope I emissions account for 51%, Scope II emissions for 48% and Scope III emissions for 1%.

[6] www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf

5. KAFEİN YAZILIM HİZMETLERİ CORPORATE CARBON FOOTPRINT ANALYSIS

Since energy intensity varies in the software sector, carbon footprint results vary from company to company. In the software sector, comparisons can be made per kg, turnover value and number of people. The most accurate comparison is to compare with their own emission results based on previous years.

KAFEİN YAZILIM HİZMETLERİ Corporate Carbon Footprint is calculated as **203,762 tCO2e** according to 2022 calculations.

According to the IPCC report, the most important reason for the impact of the Software industry on climate change is the consumption of electricity, Vehicle fuels and Flight Travel. Especially in software processes, a lot of energy is consumed.

When the travel issue is examined, 80% of the travel journey in the Software sector is air transportation. It has been proven that the impact of travel on climate change is quite low. Studies have shown that the impact of transportation in the software industry on climate change is calculated to be 3%.

Climate change impacts may vary in different regions due to different energy sources. According to 2016 reports, the carbon emission per capita in the United States is 1,450 kg CO2e, while the carbon emission per capita in Europe is calculated as 1,210 kg CO2e. In İstanbul, the headquarters of KAFEİN YAZILIM HİZMETLERİ, the per capita carbon emission in 2022 is 1026 kg CO2e/person, which is even better than the European average.

[7] **IPCC Climate Change 2013. The Physical Science Basis. Working Group I contribution to the Fifth Assessments Report of the IPCC. http://www.climatechange2013.org)**

The ratio of greenhouse gas emissions in ton equivalents to gross value added from economic activity is expressed as greenhouse gas intensity.

Considering the greenhouse gas emissions corresponding to the total turnover in 2022 and calculated in detail above, KAFEİN YAZILIM HİZMETLERİ emits 0.10 kg CO2e carbon emissions for every $1 of added value generated. Based on Euro, these values are calculated as 0.12 kg CO2e for 2022 when calculated at the current exchange rate ($1.2 = €).

KAFEİN YAZILIM HİZMETLERİ has determined a policy that aims to limit the direct and indirect impacts of its products on the environment throughout their life cycle.

The sustainability studies that have been implemented since the day it was founded continue. The environmental strategy is to reduce Scope I, Scope II and Scope III emissions by 30% by 2030.

Personnel training is the main measure to reduce the carbon footprint. All personnel are trained on important issues such as controlling pollution at source, energy saving and water consumption to prevent their consumption.

6. KAFEİN YAZILIM HİZMETLERİ CLIMATE CHANGE ADAPTATION STUDIES

Personnel training is at the forefront of climate change adaptation efforts. All personnel are trained on important issues such as waste reduction, energy saving and water consumption.

The KAFEİN YAZILIM HİZMETLERİ Environmental Policy and KAFEİN YAZILIM HİZMETLERİ Corporate Sustainability Policy, which are presented to all employees by senior management on environmental impacts, have been determined and a commitment has been received from all stakeholders to comply with the KAFEİN YAZILIM HİZMETLERİ Code of Conduct.

Detailed knowledge of process inputs and outputs is also part of good management. It includes inputs of textile raw materials, chemicals, heat, electricity and water, and outputs of products, wastewater, air emissions, wastewater sludge, solid waste and by-products. Monitoring of process inputs and outputs is the starting point for identifying options and priorities for improving environmental and economic performance. In particular, the optimum use of water and energy should start with the control of water, heat and electricity consumption of process sub-units and waste water analysis.

The software industry is directly dependent on electricity consumption and therefore the main source of greenhouse gas emissions is energy consumption. The intensive use of electricity is the most important issue that makes it necessary to work on energy efficiency and reduction.

- According to the results of Scope II, in order to reduce carbon emissions from electricity consumption, it is necessary to turn to or invest in renewable energy sources.
- Especially in electricity consumption where emissions are high, it is necessary to prepare an improvement plan and set a gradual target for emission reduction.
- Emission measurement, recording and monitoring activities should be continued periodically.

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IPCC, Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories

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DEFRA Greenhouse gas reporting: conversion factors 2017 https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2017

TS EN ISO 14064-1:2019 (Eski no: TS ISO 14064-1):: Sera gazları - Bölüm 1: Sera gazı

emisyonlarının ve uzaklaştırmalarının kuruluş seviyesinde hesaplanmasına ve rapor edilmesine dair kılavuz ve özellikler Greenhouse Gas Protocol Corporate Accounting and Reporting Standard https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data

IPCC İklim Değişikliği-5.Değerlendirme Raporu (2013), www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf , sayfa 731,Appendix 8.A / Table 8.A Ecoinvent, https://www.ecoinvent.org/about/organisation/organisation.html

8. ANNEXES

TS EN ISO 14064-1:2019 Greenhouse Gases - Part 1: Prepared according to the guidance and specifications for the calculation and reporting of greenhouse gas emissions and removals at organization level.

Emisyon Faktörleri		
Sabit Yanma	IPCC 2006 Vol 2, Chapter 2 Tablo 2.3	$EF(kWh\ \ olarak) = \frac{Yakıtın\ alt\ ısıl\ değeri\ \frac{kg}{Tj}\ olarak}{277777{,}78\ kWh/TJ}$
Mobil Yanma On Road	IPCC 2006 Vol 2, Chapter 3, Tablo 3.2.1 ve 3.2.2	
Mobil Yanma Off Road	IPCC 2006 Vol 2, Chapter 3, Tablo 3.3.1	$EF(kg\ \ olarak) = \frac{\left(Yakıtın\ alt\ ısıl\ değeri\ EF\ \frac{kg}{Tj}\ olarak\right) \times \left(NCV\ \frac{Tj}{Gg}\ olarak\right)}{1000000\ kg/Gg}$
CO_2 Eşdeğeri	$CO_2e = (CO_2 \times GWP(CO_2)) + (CH_4 \times GWP(CH_4)) + (N_2O \times GWP(N_2O))$	
Elektrik için EF	Elektrik (Türkiye) *0.59 kg CO_2e / kWh*	Firma
Net Klorifik Değer (NCV)	IPCC 2006 Vol 2, Chapter 1 Tablo 1.2	

Type	Location	Counter Uncertainty Tracking Table Calibration Report No.	Uncertainty %
Natural gas	KAFEİN YAZILIM HİZMETLERİ (İstanbul)	Unknown	5%
Water	KAFEİN YAZILIM HİZMETLERİ (İstanbul)	Unknown	5%
Electricity	KAFEİN YAZILIM HİZMETLERİ (İstanbul)	Unknown	5%

Uncertainty Calculations		
Uncertainty Confidence Interval	95%	Reference: IPCC, Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories
Uncertainty Methodology	GHG Uncertanity Tool	
Calculated Uncertainty	4.60	
Confidence Level	Reasonable	

GREENHOUSE GAS EMISSION CALCULATION

The lower heating value for the emission source given for Scope I is determined from the annexes of the "Regulation on Increasing Efficiency in Energy Use "8 .

Natural gas consumption is given in Sm3. The lower heating value is taken as 8,250 kcal/m3 from the mentioned regulation. After unit conversions are applied, the energy value from natural gas consumption is calculated as TJ.

In the study, emission factor and KIP values were determined from the Intergovernmental Panel on Climate Change (IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2- Energy) National Greenhouse Gas Inventory Guidelines, Volume 2- Energy (2006)9 .

8 Regulation on Increasing Efficiency in Energy Use

Annex - 2: Lower Heating Values of Energy Sources and Conversion Coefficients to Oil Equivalent Ref: http://www.resmigazete.gov.tr/eskiler/2011/10/20111027-5.htm

Direct Greenhouse Gas Emissions		
Emission Scope	**Emission Source**	**Emission Factor**
Constant Combustion	Natural Gas= 1 m^3 nat.gas× 0,75 kg/m^3	2.83 $kgCO_2e$ / kWh
Movable Combustion Onroad	Diesel= 1 Liter Diesel: 0,85 kg	3.24 $kgCO_2e$ / kWh
Energy Indirect Greenhouse Gas Emissions		
Emission Scope	**Emission Source**	**Emission Factor**
Electricity	Electricity (Turkey)	0.59 $kgCO_2e$ / kWh
Heat and Steam	1 ton = 3023,95 $kcal$ × 0,01163 kwh / $kcal$	0.20 $kgCO_2e$ / kWh

UNCERTAINTY CALCULATION

According to ISO 14064-1:2019, uncertainties within the scope of the study should be specified. It does not mention a specific methodology in this context.

Uncertainties in the model inputs (emission factors, measurement equipment tolerances, etc.) will be assessed.

A confidence interval should be specified to describe the uncertainty. The most commonly used confidence interval is 95%, as stated in IPCC, Good Practice Guidance and Uncertainty Management's National Greenhouse Gas Inventories.

Electricity, Natural Gas and Diesel Uncertainties

All electricity is purchased. Electricity consumption is monitored through electricity meters and monthly consumption invoices.

Transport Uncertainties

There are many uncertainty analyses for transport and transportation data.

Uncertainties in Electricity and Natural Gas Meters

Reading errors in natural gas meters were determined as +/- 0.3%.

Reading errors in electricity meters are determined as +/- 0.5%.

Total Uncertainties

Uncertainty calculations were made by taking into account the uncertainties of emission factors and the uncertainties in the calculation of consumption data within the scope of activities.

In 2006 IPCC Guidelines for National Greenhouse Gas Inventories, the confidence interval for emission factors is given as 95%. Uncertainties of all facilities were calculated according to the formula defined in GHG Uncertanity Tool.

FUEL DENSITY UNIT CONVERSION

General Use Fossil Fuels	Density kg/^{m3}	Density liters/ton
Aviation Fuel	710,23	1.408
Aircraft Turbine Fuel	798,08	1.253
Coal (Domestic)	850,00	1.176
Diesel	837,52	1.194
Diesel (average biodiesel blended)	839,00	1.192
Fuel-oil	982,32	1.018
Kerosene	851,06	1.175
LPG	512,87	1.950
Natural Gas	0,75	1.342.097
Other Petroleum Gases	366,30	2.730
Gasoline	730,46	1.369
Gasoline (biogasoline blend)	733,54	1.341
Other Fuels		
Biodiesel	890,00	1.124
Biogas	1,15	869.565
Biomethane	0,73	1.376.922
CNG	175,00	5.714
Landfill Gas	1,30	769.231
LNG	452,49	2.210
Gases		
Methane (CH_4)	0,72	1.394.700
Carbon Dioxide (CO_2)	1,9770	505.817