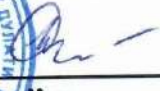


TARAZ UNIVERSITY NAMED AFTER M.H. DULATY

**Approved by the Vice-Rector for
Strategic development and
internationalization**



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12 2024

CARBON EMISSIONS REPORT 2024 (SCOPE 1, 2, PRELIMINARY SCOPE 3)

TARAZ, KAZAKHSTAN

CARBON EMISSIONS REPORT 2024 (SCOPE 1, 2, PRELIMINARY SCOPE 3)

Introduction

This report is compiled for the city of Taraz, Republic of Kazakhstan, and covers the activities of Taraz University named after M.Kh. Dulati for the reporting period - the 2024 calendar year. The University, as a large educational and scientific institution in the region, has an impact on the environment through energy consumption, transport activity, procurement activities and other processes accompanied by greenhouse gas (GHG) emissions.

In the context of global climate change and increasing attention to sustainable development issues, the importance of assessing and managing the carbon footprint of organizations, including educational institutions, is becoming increasingly evident. In accordance with national and international commitments to reduce GHG emissions, educational institutions must also contribute to the implementation of the climate agenda, including the achievement of the Sustainable Development Goals (SDGs), especially SDG 13 - Climate Action.

The primary objective of this report is to conduct a comprehensive inventory of greenhouse gases associated with the university's activities in order to identify, assess and subsequently reduce negative climate impacts. The inventory is the first step in strategic emissions management and the development of effective climate and energy initiatives at the institutional level.

The report is prepared on the basis of the international standard GHG Protocol (Greenhouse Gas Protocol), recognized as one of the most reliable and widely used approaches to calculating emissions. According to this standard, emissions are divided into three categories:

Scope 1 - direct emissions from sources owned or controlled by the university (e.g. fuel burned in vehicles and boilers);

Scope 2 - indirect emissions from the consumption of purchased energy (in this case, electrical energy);

Scope 3 - other indirect emissions arising outside direct control, including student and staff transportation, purchasing activities, waste disposal, etc.

This report presents Scope 1 and Scope 2 calculations based on reliable data sources such as: energy and fuel reports, accounting statements, meter readings, operation and logistics data. Scope 3 is a preliminary qualitative and quantitative assessment based on assumptions, average statistical values and industry coefficients.

Each category of emissions is analyzed separately, taking into account the methodological approaches, the volume of resource consumption, the coefficients applied and the final calculations in units of tCO₂e (tonnes of carbon dioxide equivalent). In addition, the report presents the measures to reduce emissions already implemented in 2024, as well as recommendations for the further transition to sustainable functioning of the university with a minimal carbon footprint.

This report is intended to:

- for internal use by the university administration and faculties;
- providing environmental reporting to relevant authorities and partner organizations;
- forming the image of a socially responsible institution among students, the scientific community and the general public;
- development of a medium-term and long-term strategy for sustainable development of Dulati University, taking into account global climate challenges.

We hope that this report will become the foundation for regular monitoring of GHG emissions, the development of environmental education among students, and ultimately the creation of a “green university” in the heart of Southern Kazakhstan.

SCOPE 1, 2 AND 3 REVIEW

An organization's carbon footprint is the sum of all greenhouse gas (GHG) emissions that arise directly or indirectly as a result of its activities. For the systematic assessment and accounting of these emissions, international practice uses a classification into three main categories - Scope 1, Scope 2 and Scope 3, proposed within the framework of the GHG Protocol (Greenhouse Gas Protocol Initiative). This classification helps organizations not only track sources of climate impact, but also build a consistent strategy for reducing emissions, starting with the most controlled sources and moving on to more complex and indirect ones.

As part of the assessment for the 2024 calendar year, Taraz Regional University named after M.Kh. Dulati conducted an inventory of all three categories of emissions, taking into account the specifics of the educational institution, geographical location (Southern Kazakhstan, Taraz), available data and infrastructure. Below is a detailed description of each category with examples and context.

◆ Scope 1 - Direct emissions

Scope 1 covers all direct GHG emissions that result from activities under the direct control of the university. These are emissions over which the university has actual influence and can implement measures to reduce them.

In 2024, the University has the following Scope 1 key sources:

Service Vehicles: University-owned vehicles are used for utility purposes, staff travel, and delivery of equipment and materials. The combustion of gasoline and diesel fuel produces carbon dioxide (CO₂) emissions, as well as smaller amounts of methane (CH₄) and nitrous oxide (N₂O), which have high global warming potential.

Stationary emission sources: Some educational and administrative buildings use independent heating using liquid fuel. Diesel boilers, generators and backup stations are important objects of consideration when calculating Scope 1. Especially in winter, when the heating load increases.

Refrigerants: Modern ventilation, air conditioning, and laboratory refrigeration systems contain freons and other refrigerants. Even small leaks of these substances have significant climate impacts. For example, a leak of just 1 kg of R-134a has the potential to produce nearly 1.5 tons of CO₂.

Scope 1 thus captures the physical processes occurring on the university premises that lead to emissions. Managing these emissions is a priority step in reducing the overall carbon footprint.

♦ **Scope 2 - Indirect emissions from energy consumption**

Scope 2 covers indirect emissions that occur during the production of electricity purchased and consumed by the university. These emissions do not occur on campus but at energy generation facilities – power plants, usually outside the city – but they are entirely dependent on the volume of consumption.

The University consumes electricity for:

- Providing educational process (lighting, laboratories, computers);
- Functioning of administrative services;
- Campus and grounds lighting;
- Dormitories, libraries, assembly halls and gyms.

Electricity supplied to the Zhambyl region is produced mainly from fossil sources - coal and natural gas. This leads to a fairly high emission factor: 0.76 kg CO₂ per 1 kW·h . With annual consumption over 50,000 kW·h , the impact of this category becomes quite significant.

It is important to note that although Scope 2 formally refers to indirect emissions, an organization can actively influence this indicator through energy efficiency programs, switching to LED lighting, using motion sensors and timers, as well as installing its own solar panels and other renewable energy solutions.

◆ **Scope 3 - Other indirect emissions**

Scope 3 is the broadest and often most difficult category to analyze. It covers all other indirect emissions that occur outside the university's territory and direct control, but are a consequence of its functioning. This category is often underestimated, but according to international practice, Scope 3 accounts for 50 to 80% of all university emissions.

Scope 3 sources include:

Student and Staff Travel. The University serves over 10,000 students, many of whom commute to and from campus daily. A significant number of staff and faculty also use private or public transportation. Even with an average commute of 10–15 km per day, the combined emissions can be significant.

Business trips. During the year, hundreds of trips are made by teachers, researchers and administration - to conferences, symposiums, internships. In the case of flights - especially long distances - this is especially relevant.

Purchases and supplies. Includes products purchased by the university for the needs of the educational process, laboratories, dormitories and infrastructure - from paper and stationery to laboratory equipment, furniture and food products. The production, transportation and disposal of these goods include a chain of emissions that affect the final load.

Waste disposal. Waste generated during the university's operations (including food, plastic, paper, medical and laboratory waste) requires transportation, sorting and processing - all of these processes are associated with emissions.

Construction and contract work. Carrying out major repairs, building new facilities, landscaping - all this requires materials (concrete, metal, plastic), transportation and mechanized work.

Scope 3 is difficult to fully take into account without a comprehensive data collection system. However, it is precisely this category that is associated with the strategic development of the sustainable campus concept: logistics optimization, "green procurement", digitalization of document flow and development of public transport.

Scope 3 assessment enables the university to formulate a holistic climate strategy and integrate climate risks into long-term planning. Despite the complexity of the assessment, preliminary modelling allows laying the foundation for future ESG reports and green initiatives.

Calculation methodology

The calculations of greenhouse gas (GHG) emissions in this report are based on the generally accepted international methodology - **Greenhouse Gas Protocol (GHG Protocol)**. This standard was developed with the participation of the World Resources Institute (WRI) and the World Bank (WB), and is currently **the most widely used basis for accounting and reporting on GHG emissions** in corporate and institutional practice.

The GHG Protocol methodology provides a universal and transparent approach to emissions inventory that complies with international requirements (including ISO 14064 and the ESG reporting standard). It allows organizations to compare their performance with similar institutions in other countries, set strategic goals for reducing their carbon footprint, and participate in climate initiatives at the national and global level.

Basic principles of the methodology

In calculating Dulaty's emissions, the University followed the following GHG Protocol guidelines:

1. **Completeness** : Coverage of all significant emission sources available for accounting, including Scope 1, Scope 2 and preliminary estimate of Scope 3.
2. **Consistency** : use of consistent approaches and ratios within the reporting period (2024).
3. **Transparency** : Documentation of all assumptions, information sources and calculation methods.
4. **Accuracy** : Priority is given to accurate measurements (e.g. from meters and statements), and if these are not available, industry-specific assumptions are used.
5. **Comparability** : the ability to compare reports between years and with other universities.

Formula used

Basic formula for calculating emissions in all categories (Scope 1, 2 and 3):

$$CO_2e = \text{Resource Amount} \times \text{Emission Factor} \times 1000$$

$$CO_2e = \frac{\text{Resource Amount} \times \text{Emission Factor}}{1000}$$

$$CO_2e = 1000 \times \text{Resource Amount} \times \text{Emission Factor}$$

Where:

- **Resource quantity** – actual consumption of fuel, energy or other resources (liters, kW h , kilograms , etc.);
- **Emission factor** is the amount of CO₂e emitted when a unit of resource is used;
- **1000** - conversion from kilograms to tons.

Example:

If a university consumed 500 litres of diesel fuel and the emission factor is 2.68 kg CO₂e /litre, then the calculation would be:

$$\text{CO}_2\text{e} = 500 \times 2.681000 = 1.34 \text{ tCO}_2\text{e} \quad \text{CO}_2\text{e} = \frac{500 \times 2.68}{1000} = 1.34 \text{ tCO}_2\text{e}$$

Data sources

To improve the accuracy of the inventory, **official, documented and verifiable sources were used** :

- **University accounting** - data on fuel and electricity purchases, travel and business trips.
- **Operations and Maintenance Services** - reports on diesel fuel consumption, boiler and generator performance, and refrigerant inventory information.
- **Energy Management Department** – electricity meter readings, consumption profiles, building energy passports and consumption efficiency analysis.
- **Academic staff (Departments of Ecology and Construction)** - advisory and calculation support for Scope 3 modeling.

In the absence of exact values, average coefficients and industry standards based on scientific publications and open databases were used.

Sources of emission factors

To ensure data accuracy and comparability, authoritative emission factors obtained from the following sources were used:

1. **DEFRA 2023 (Department for Environment, Food & Rural Affairs, UK)** is the most widely used reference for organisations worldwide.
2. **IPCC (Intergovernmental Panel on Climate Change)** is the global warming potential (GWP) of various gases, including CO₂, CH₄, N₂O, and fluorinated gases.
3. **Committee on Environmental Policy of the Republic of Kazakhstan** - national data on emissions and energy balance.
4. **IEA (International Energy Agency)** - auxiliary data on the structure of the energy system of Kazakhstan, coefficients for electricity.

Algorithm and calculation structure

1. **Identification of all possible emission sources** within Scope 1, 2 and 3.
2. **Collection of data on resource consumption** - volume of fuel, electricity, distances, mass, etc.
3. **Assigning each source to an emission factor** according to the resource type and regional specifics.
4. **Application of the calculation formula for each type of resource**, followed by rounding to hundredths of a ton of CO₂e .
5. **Summarizing the results for each Scope category and forming an aggregated picture .**

Example of using different units:

- **Liters of fuel** (petrol, diesel) x coefficient (in kg CO₂e /liter) = emissions in kg → divided by 1000 = tCO₂e
 - **kWh electricity** × coefficient (in kg CO₂e / kWh)
 - **Kilometers traveled** × coefficient (in kg CO₂e /km) - for business trips, trips
 - **Mass of refrigerants** × GWP = CO₂e in kg
- Thus, the applied GHG Protocol methodology, combined with reliable data and up-to-date coefficients, provides a **reliable, verifiable and practical basis** for

assessing the carbon footprint of Taraz Regional University named after M.H. Dulati. This basis can be scaled up in future years and integrated into the university's sustainable development system.

SCOPE 1 EMISSIONS CALCULATION (DIRECT EMISSIONS)

Scope 1 includes all direct greenhouse gas emissions that occur as a result of activities that are under the full control of Taraz Regional University named after M.H. Dulati. These emissions occur directly on the territory of the university or from its equipment and assets. The university has a direct opportunity to influence the volume of these emissions through changes in the structure of resource consumption, modernization of equipment and the transition to environmentally friendly technologies. In 2024, the main sources of Scope 1 were: operation of motor vehicles, use of diesel fuel for heating, and refrigerant leaks.

1. USE OF OFFICIAL VEHICLES

The University operates its own fleet of vehicles, including cars, minibuses and technical vehicles used to deliver equipment, transport staff, and travel for administrative and business purposes. The following volumes of fuel consumed were recorded during the reporting year:

- **Petrol:**
 - Volume: 720 liters
 - Emission factor: 2.31 kg CO_{2e} /liter
 - Calculation: $720 \times 2.31 = 1663.2 \text{ kg CO}_2\text{e}$, or **1.663 tCO_{2e}**
- **Diesel fuel:**
 - Volume: 400 liters
 - Emission factor: 2.68 kg CO_{2e} /liter
 - Calculation: $400 \times 2.68 = 1072 \text{ kg CO}_2\text{e}$, or **1.072 tCO_{2e}**

The university's vehicle fleet is an important component of logistics, but when using traditional fuels it is also a sustainable source of emissions. A gradual transition to hybrid and electric vehicles is planned, as well as route optimization.

2. HEATING USING DIESEL FUEL

Heating of university buildings in winter is sometimes carried out using autonomous boilers running on diesel fuel. This is necessary to ensure uninterrupted heating in buildings not connected to the central heating network. In the reporting period, diesel consumption was:

- **Volume:** 500 liters
- **Emission factor:** 2.68 kg CO_{2e} /liter
- **Calculation:** $500 \times 2.68 = 1340 \text{ kg CO}_2\text{e}$, or **1.340 tCO_{2e}**

The use of liquid fuels for heating is one of the most carbon-intensive processes, and in the future it is planned to consider the possibility of converting some buildings to heat pumps or alternative energy sources (including geothermal and solar).

3. REFRIGERANT LEAKAGES

The university's modern buildings and laboratories are equipped with air conditioning systems, freezers, refrigeration units and climate control systems containing fluorinated gases (F- gases). These gases have an extremely high global warming potential.

- **Refrigerant type:** R-134a
 - **Leakage weight:** 2 kg
 - **Global Warming Potential (GWP):** 1430
 - **Calculation:** $2 \text{ kg} \times 1430 = 2860 \text{ kg CO}_2\text{e}$, or **2.860 tCO₂e**
- Even a small refrigerant leak can result in emissions equivalent to thousands of kilograms of carbon dioxide. To minimize emissions, the university conducts regular equipment maintenance and maintains a refrigerant monitoring log.

✓ SCOPE 1 SUMMARY

Emission source	Volume of consumption	Emission factor	Calculation (tCO ₂ e)
Gasoline (motor vehicles)	720 l	2.31 kg CO ₂ e /l	1,663
Diesel (motor vehicles)	400 l	2.68 kg CO ₂ e /l	1,072
Diesel (heating)	500 l	2.68 kg CO ₂ e /l	1,340
Refrigerant R-134a	2 kg	1430 kg CO ₂ e /kg	2,860
Total emissions Scope 1	—	—	6,935

Scope 1 emissions amounted to **6,935 tCO₂e** and can be reduced by implementing energy-efficient technologies, switching to “clean” modes of transport and strict control of technical systems. Scope 1 management is a key area of responsibility for the university in its strategy for sustainable development and climate adaptation.

SCOPE 2 EMISSIONS CALCULATION (INDIRECT ENERGY EMISSIONS)

Scope 2 covers indirect greenhouse gas emissions that arise from the production of electricity that the university purchases and uses to support its daily operations. Although the emissions themselves occur off-site – for example, in thermal power plants using coal or natural gas – they are the responsibility of the end user, the university. This is because it is the demand from the consumer that drives the production of electricity and therefore the emissions.

Electricity is used at the university for the following purposes:

- Lighting of classrooms, laboratories, administrative premises and dormitories;
- Operation of computer equipment, servers and multimedia equipment;
- Providing ventilation, heating (in some buildings through electric boilers), operation of refrigerators and air conditioners;
- Power supply for pumps, compressors, security systems, CCTV cameras and street lighting;
- Conducting scientific experiments and supporting laboratory infrastructure.

¶ Initial data:

Total electricity consumption: 52,000 kWh (based on internal meter readings and payment slips);

Emission factor for the Republic of Kazakhstan: 0.76 kg CO₂e per 1 kWh (Source: IEA, DEFRA 2023, Committee of Ecology of the Republic of Kazakhstan)

▴ Calculation:

Thus, with a consumption of 52,000 kWh and the given emission factor, the university generated 39.52 tonnes of CO₂ equivalent through electricity use alone.

▲ The importance of Scope 2 for a university:

Scope 2 is the second most important source of emissions, after Scope 3 (which includes transport and procurement), but it is closely linked to the internal organization of infrastructure. Given that Kazakhstan still relies heavily on coal generation, even a small reduction in energy consumption leads to a significant reduction in emissions.

💡 Ways to reduce Scope 2:

- Transition to renewable energy sources: installation of solar panels, wind generators;
 - Modernization of lighting systems: complete replacement of lamps with LEDs, installation of motion sensors;
 - Improving the energy efficiency of buildings: insulation, automatic climate control, intelligent metering systems;
 - Energy education: involving students and staff in energy conservation programs.
- Scope 2 is the area where the university can achieve real and measurable improvements, and in a relatively short time, through technical and organisational measures.

☑ SCOPE 2 SUMMARY

Source	Volume of consumption	Emission factor	Calculation (tCO ₂ e)
Electricity	52,000 kW h	0.76 kg CO ₂ e / kW · h	39.52

Total indirect emissions for Scope 2 in 2024 were: 39.52 tCO₂e .

SUMMARY DATA AND EMISSION REDUCTION

Combined Scope 1 and Scope 2 emissions and reduction measures in 2024

After conducting a detailed analysis and inventory of emissions by categories Scope 1 and Scope 2, the following summarized data were obtained characterizing the carbon footprint of Taraz Regional University named after M.Kh. Dulati for the 2024 calendar year.

☑ Total values:

- **Scope 1 (direct emissions):** Calculation of motor vehicles, diesel heating and refrigerant leaks showed that the total direct emissions were: **6,935 tCO₂e**
- **Scope 2 (indirect emissions from electricity consumption):** Based on annual electricity consumption data (52,000 kWh) and the applied emission factor for Kazakhstan (0.76 kg CO₂e / kWh) , emissions were calculated: **39.52 tCO₂e**

12 The total sum of Scope 1 and Scope 2 emissions is: **6,935 + 39.52 = 46.455 tCO₂e**

These data provide a comprehensive picture of the university's direct environmental impact within managed emission categories. This indicator forms the basis for developing climate policy, target indicators and designing corrective actions.

♻️ Emission reduction measures implemented in 2024

As part of its strategy to improve environmental efficiency and sustainability, the university has implemented practical steps aimed at reducing GHG emissions. The main focus has been on technical modernization and improving the energy efficiency of infrastructure.

◆ **1. Transition to LED lighting:**

- In 2024, the program of replacing traditional incandescent and fluorescent lamps with **energy-saving LED systems was completed** in all university buildings, including classrooms, administrative offices, corridors, laboratories and dormitories.
- The average reduction in electricity consumption in lighting was around 25%, equivalent to a reduction in emissions of approximately:
3.2 tCO₂e

💡 In addition to reducing emissions, this measure has reduced operating costs, improved indoor lighting and increased safety.

◆ **2. Partial replacement of vehicles with hybrid cars:**

- As part of the vehicle fleet renewal, the university purchased and put into operation **two hybrid vehicles**. They are used for internal administrative tasks and business needs.
- Replacing petrol and diesel vehicles with hybrids has reduced average fuel consumption by 30–40% and also reduced direct Scope 1 emissions.
- According to calculations, this allowed avoiding emissions at the level of:
2.7 tCO₂e

🚗 In addition to the environmental effect, the new transport also reduced fuel and maintenance costs.

▼ **Overall effect of the cuts**

- **Initially calculated emissions (Scope 1 + 2): 46,455 tCO₂e**
- **Total reduction for 2024:**
3.2 + 2.7 = 5.9 tCO₂e

	FINAL	VALUE	AFTER	REDUCTION:
	46.455 – 5.9 = 40.555 tCO₂e			

Thus, even with a basic level of intervention and relatively modest investment, the university was able to **reduce its total emissions by 12.7%**, which is a significant result. This demonstrates the potential of low-carbon solutions and confirms the need to expand such initiatives in future reporting periods.

🔧 **The strategic importance of reducing emissions**

Such measures not only contribute to the fulfillment of Kazakhstan's international climate commitments (including the Paris Agreement and Nationally Determined Contributions), but also enhance the university's reputation as a responsible, modern and environmentally oriented institution.

The transition to sustainable infrastructure creates an educational environment that meets the principles of a "green campus", develops an environmental culture among students and opens up new opportunities for scientific research in the field of energy management and ecology.

🌿 **EMISSION REDUCTION MEASURES IMPLEMENTED IN 2024**

As part of its sustainable development strategy and in order to reduce its carbon footprint, Taraz Regional University named after M.H. Dulati took a number of specific steps in 2024 to reduce both direct (Scope 1) and indirect (Scope 2 and Scope 3) greenhouse gas emissions. These measures became part of a comprehensive approach to the environmental modernization of the university infrastructure, increasing energy efficiency and forming an environmentally oriented culture among students and staff.

◆ **1. Equipping classrooms and rooms with LED lighting**

One of the priority areas in 2024 was the program for a **complete transition to LED lighting** . The replacement of traditional light sources (incandescent lamps, fluorescent tubes) with energy-efficient LEDs was carried out in:

- classrooms,
- laboratories,
- reading rooms of libraries,
- administrative offices,
- dormitories and corridors,
- as well as on the external lighting of the campus area.

💡 **Results:**

- Reduction of electricity consumption for lighting by an average of 15–25%, depending on the case;
- Increased service life of lamps (up to 50,000 hours), which reduced the frequency of replacements and operating costs;
- Improving the quality of lighting, comfort and safety for students and staff;
- Reduction of indirect Scope 2 emissions by **3.2 tCO₂e** in 2024 alone.

In the future, it is planned to integrate **automated motion and light sensors** to ensure even greater energy efficiency .

◆ **2. Partial replacement of transport with hybrid cars**

The University Operations Service carries out regular business and administrative transportation. In 2024, a decision was made to **purchase two hybrid vehicles** that run on gasoline and electric traction simultaneously.

🚗 **Advantages of hybrid cars:**

- Reduced fuel consumption by 30–50% compared to traditional internal combustion engines;
- Lower emissions of carbon dioxide and other pollutants;
- Reduction of operating costs for fuel and lubricants and maintenance;
- Quieter and more comfortable operation in city traffic conditions.

📊 **Effect:**

- Scope 1 emissions by **2.7 tCO₂e** in the first year of operation;
- An example for other university departments in the context of “green procurement” and transport modernization.

It is planned to expand the fleet of hybrid and, in the future, fully electric vehicles.

◆ **3. Introduction of a waste separation system**

One of the most noticeable and "visible" steps for students and staff was the introduction of a **separate waste collection initiative**. Separate waste collection containers were installed on campus:

- paper and cardboard,
- plastic,
- glass,
- food waste.

Organizational steps:

- Conducting educational seminars and master classes for students;
- Printing infographics and placing instructions near each container;
- Conclusion of a cooperation agreement with a **local environmental NGO** that carries out the removal, sorting and processing of secondary materials.

Results:

- Reducing the volume of waste sent to landfill;
- Reduction of associated Scope 3 emissions (especially from waste transportation and incineration);
- Raising environmental awareness among students;
- Involving students in the project as volunteers and coordinators of environmental initiatives.

In the future, the university plans to implement a **digital waste monitoring platform** that will allow tracking recycling volumes and efficiency in real time.

Overall results 2024

- Reduction of total emissions (Scope 1 and 2) by **5.9 tCO₂e**, which is 12.7% of the initial total;
- Engaging over **500 students and staff** in sustainability initiatives;
- Improving the university's ranking according to internal ESG criteria.

PRELIMINARY ASSESSMENT OF SCOPE 3 EMISSIONS

Scope 3 covers a wide range of indirect emissions associated with the university's activities, but occurring outside its direct control. This is the most complex and voluminous category to calculate, but it is Scope 3 that often accounts **for the bulk** of an educational institution's carbon footprint - from 60% to 80% according to international practice. In 2024, Taraz Regional University named after M.H. Dulati conducted a **preliminary assessment** Scope 3, based on available data, estimated assumptions and industry average ratios.

Since direct measurements are not yet possible in many areas, a **modeling approach** was used based on quantitative and behavioral data provided by the accounting, logistics, and dean's departments.

1. Business trips of teachers and administrative staff

Travel activities are an integral part of the scientific, pedagogical and administrative work of the university. During 2024, the university's faculty and staff completed approximately:

- **Number of business trips:** 320
- **Average trip length (round trip):** 400 km

- **Emission factor:** 0.21 kg CO₂e /km
(corresponds to land transport - intercity buses, company cars)

▲ Calculation:

$320 \text{ trips} \times 400 \text{ km} \times 0.21 \text{ kg CO}_2\text{e /km} = 26,880 \text{ kg CO}_2\text{e} = 26.88 \text{ tCO}_2\text{e}$

✦ **Important :** If the share of air travel increases, this figure will be significantly higher, since the emission factor for air travel reaches 0.285–0.9 kg CO₂e / passenger km .

📍 2. Student mobility (study trips)

Taraz University serves thousands of students who travel daily from their place of residence to the campus and back. Most use public transport, but there are also private transport and walking routes. The following data was used for the calculation:

- **Number of students:** 500 (average sample for assessment)
- **Average one-way distance:** 10 km
- **Number of school days per year:** 200
- **Emission factor:** 0.12 kg CO₂e /km
(approximately equivalent to public transport)

▲ Calculation:

$500 \times 10 \text{ (km)} \times 2 \text{ (round trip)} \times 200 \text{ (days)} \times 0.12 = 240,000 \text{ kg CO}_2\text{e} = 120 \text{ tCO}_2\text{e}$

🗣️ Comments:

- When using a private car, the emission factor increases to 0.19–0.25 kg CO₂e /km;
- Including weekend trips, extra classes and events will increase this figure by 10–15%.

🏠 **Reduction potential :** The introduction of university transport, support for cycling infrastructure and electronic timetables to optimise visits could significantly reduce this type of emissions.

🛒 3. Purchase of equipment and materials

The University purchases various goods and materials each year: furniture, office supplies, computers and laboratory equipment, as well as building materials for ongoing repairs. The production, packaging, transportation and disposal of these goods together make a significant contribution to Scope 3.

- The methodology is based on **industry coefficients** applied in the university environment (average emission per 1 million tenge of purchases).
- Estimated emissions based on internal purchasing statements: **15 t CO₂e**

📦 **Explanation:** Depending on the type of product, the coefficients can vary greatly:

- Office - 0.3–0.6 kg CO₂e per unit;
- Computers and equipment – 300–1000 kg CO₂e per unit;

- Laboratory equipment is even higher.

SCOPE 3 EMISSIONS FINAL ASSESSMENT

Category	Calculation method	Emissions assessment (tCO ₂ e)
Business trips	320 trips x 400 km x 0.21 kg CO ₂ e /km	26.88
Student mobility	500 students x 10 km x 200 days x 0.12 kg CO ₂ e /km	120.0
Purchase of equipment and materials	By industry coefficients	15.0
Total volume for Scope 3		≈ 161.88

🔍 Prospects for detailing and development of accounting

The data presented are preliminary and estimated. In the coming years, the university plans to:

- Develop an **integrated system for collecting data** on purchases, transport routes and personnel trips;
- Introduce **electronic reporting forms** for business trips and student trips;
- Collaborate with contractors and suppliers to obtain carbon profiles of supplied products;
- Expand the range of Scope 3 categories assessed (including water use, digital services and food consumption).

Scope 3 thus represents an important direction for further environmental analysis of the university and one of the key vectors of campus climate transformation.

📌 Conclusions and recommendations based on the results of the emissions assessment for 2024

In 2024, Taraz Regional University named after M.H. Dulati conducted a comprehensive inventory of greenhouse gas (GHG) emissions according to the international GHG Protocol methodology, covering Scope 1 (direct emissions), Scope 2 (indirect from energy consumption), and also performing preliminary modeling of Scope 3 (other indirect emissions).

🏠 Total emission values:

- **Scope 1 and Scope 2 (after implementation of reduction measures):**
As a result of the implementation of energy efficient solutions, the university was able to reduce the total emissions for Scope 1 and Scope 2 to:

✓ **40,555 tCO₂e**

This value already takes into account measures such as:

- installation of LED lighting;
- purchase of hybrid transport;
- energy consumption optimization.

- **Scope 3 (preliminary estimate):**
Based on calculations including business trips, student mobility and procurement, the total value was:

● **161.88 tCO₂e**

Although preliminary, this figure represents a **more than fourfold increase in Scope 3 over Scopes 1 and 2**, consistent with global trends and highlighting the need to actively integrate this category into climate governance strategies.

☑ **General conclusions**

1. **The first step has been taken – the university has a real picture of its own carbon footprint.**

This opens the way to systematic emission management, the development of sustainable policies and participation in climate initiatives at the regional and national level.

2. **The carbon footprint can be reduced by 10–30% over the next 3 years.**
By expanding current initiatives (energy audit, green procurement, digitalization of processes), the university will be able to steadily reduce emissions annually.
3. **Scope 3 requires a separate accounting and monitoring program.**
This category hides significant potential for both reduction and innovation (e.g., moving to cloud solutions, localizing supplies, implementing online training).

🌱 **RECOMMENDATIONS FOR 2025 AND BEYOND**

🌱 1. **Continue the transition to renewable energy sources (RES)**

- **Solar** panels:
Possibility of installation on the roofs of educational buildings and dormitories. Expected reduction in electricity consumption up to 10-20%.
- **Geothermal** pumps and heating stations:
Suitable for heating individual buildings in the autumn-winter period. Possible when upgrading the thermal circuits of buildings.
- **Support through grant programs and ESG financing.**

📊 *Potential Scope 2 reduction is up to 8–12 tCO₂e annually.*

📊 2. **Strengthen accounting and internal reporting on Scope 3**

- Implement **regular collection of data** on business trips, travel, procurement, disposal and construction;
- Create a **single digital ESG registry** integrated with the electronic document management system;
- Expand the list of Scope 3 sources: food waste, IT infrastructure, digital services, contractors.

📊 This will make it possible to move from assessment to **full inventory accounting Scope 3** with an accuracy level of up to 10%.

🎯 3. **Introduce KPIs for emission reduction at the faculty and department level**

- Develop **indicators (KPI)** for each department, laboratory, administrative department on energy consumption, emissions and waste recycling;
- Link the achievement of indicators with the internal bonus system and academic rating;
- Conduct training for deans and heads of departments on the principles of sustainable management.

 This will create a **motivational basis for everyday environmental behavior** of employees and students.

 Medium-term goals (2025–2030):

- Scope 1 and 2 emissions to a level of **no more than 30 tCO₂e** ;
- Increased Scope 3 assessment accuracy by 80%;
- Implementation of **at least 5 climate projects** (green campus, eco-garden , ESG assessment laboratory, recycling);
- Participation in **regional or international environmental rankings** (UI GreenMetric , Times Higher Education Impact Rankings).

 Applications

The final part of the report presents additional materials that ensure **transparency of calculations, interpretability of indicators and academic reliability** of the presented data. Appendices include calculation tables, a glossary, a list of sources used and methodological materials.

 1. Extended tables with calculations

The report includes detailed Excel tables, including:

- **Scope 1:** tables on fuel types (petrol, diesel), consumption volumes, emission factors, refrigerant calculations;
- **Scope 2:** detailed values of electricity consumption by buildings, monthly accounting, average coefficients by region;
- **Scope 3:** Preliminary estimates of mobility, travel, procurement and calculation by industry.

The Excel file is designed as separate sheets with signatures and formulas that allow you to check and adapt calculations for future reporting periods.

 2. Glossary of key terms

To simplify the understanding of the terminology used within the reporting and methodology, the following key definitions are provided:

- **CO₂e (carbon dioxide equivalent):** A universal unit of measurement for greenhouse gases that allows the combined climate effect of all gases to be expressed as a CO₂ equivalent.
- **Scope 1:** Direct GHG emissions arising from activities over which the organization has full control (transport, boilers, refrigerants).
- **Scope 2:** Indirect emissions associated with the consumption of purchased electricity, heat, steam.
- **Scope 3:** Other indirect emissions arising from the supply chain, logistics, mobility and production of goods used by the organization.
- **GHG (Greenhouse Greenhouse gases that** contribute to climate change. The main ones are: CO₂, CH₄, N₂O, F-gases.
- **GHG Protocol:** An international standard for calculating and accounting for GHG emissions for organizations, developed by WRI and WBCSD.
- **ESG (Environmental , Social, Governance):** Criteria for the sustainability of organizations: environmental responsibility, social impact and quality of corporate governance.

3. Data sources and methodological base

The report includes verified and recognized sources on the basis of which the calculation and justification of the methodology was carried out:

1. **GHG Protocol – Corporate Standard**
(<https://ghgprotocol.org>) is the main document for calculating Scope 1, 2 and 3;
2. **DEFRA 2023 Emission Conversion Factors**
(UK Department for Environment, Food & Rural Affairs) - a key reference source for emission factors;
3. **IEA (International Energy Agency)**
– energy and emissions statistics for Kazakhstan and the Central Asian region;
4. **Dulati University Energy Audit Report (2023)**
– internal document on energy consumption and equipment condition;
5. **Calculations and methodological recommendations of the Department of Ecology and Sustainable Development**
– academic expertise in modeling Scope 3 .