

University of Haifa

2019 Carbon Footprint

May 2023



Preface by the University of Haifa

At the University of Haifa, our compass is set towards environmental and social sustainability, in accordance with the UN Sustainable Development Goals (SDGs). The 17 SDGs provide a roadmap for the future of humanity and our planet. We are advancing towards these goals through research, teaching, public engagement, and the management of our operations.

In particular, we strive towards a sustainable management of our facilities, attempting to limit the University's negative impact on the environment. For example, currently we are the country's only campus to be recognized as ISO 14001 compliant by the Israel Standards Institute, a certification that ensures we operate strategically in order to reduce carbon emissions; electricity, water, gas, and paper usage; and are committed to green building practices.

Moreover, our facilities serve as a living laboratory for the research of people and the environment, and the geographic area in which we operate – from the mountain (Carmel national park campus), through the city (Downtown Haifa Campus) and into the sea (laboratories along the Mediterranean) – offer unique opportunities for research that advances the SDGs.

In an attempt to further reduce the University of Haifa's impact on the environment, we have commissioned this assessment of the university's carbon footprint. The report helps in establishing a baseline that will inform our plans for further reducing our facilities' emissions.

Table of Contents

Preface by the University of Haifa	1
Table of Contents	3
Table of figures	5
Executive summary.....	6
Results	6
תקציר מנהלים	9
תוצאות	9
Analysis overview	11
Objectives and work process	11
Selected standard – GHG Protocol.....	12
Boundaries of the analysis.....	13
Setting organizational boundaries	13
Setting operational boundaries	14
Methodologies and data used.....	15
Scope 1 and 2.....	15
Scope 3	16
Identification of the applicable categories.....	16
Prioritization of data collection	18
Summary of methodological decisions	26
Results	28
Total emissions	28
Scope 1 – Direct emissions.....	29
Scope 2 – Indirect emissions from electricity consumption	30
Scope 3 – Other indirect emissions	31
Student and staff commuting	31
Purchase of goods and services	32
Business travels	34
Fuel and energy-related activities	34
Waste	35
Capital goods.....	36
Comparison with other universities	37

Comparability.....	37
Results	37
Ranking of the University of Haifa.....	37
Distribution patterns of GHG emissions.....	39
Conclusions.....	40
Bibliography	42
Annex 1. Scope 3 categories' description.....	44

Table of figures

Figure 1: Greenhouse gas emissions breakdown per scope (tCO ₂ e).....	7
Figure 2: Summary of main emissions source of the University of Haifa.....	7
Figure 3: Overview of GHG Protocol scopes and emissions across the value chain	12
Figure 4: Definition of the analysis' organizational boundaries	14
Figure 5: Summary of emissions sources included in the analysis.....	14
Figure 6: Emissions estimated for a 100 USD of annual revenue for an investee company according to investment sectors (in tCO ₂ e)	17
Figure 7: Summary of scope 3 categories included in the University of Haifa's carbon footprint.....	18
Figure 8: Methodological decision tree.....	19
Figure 9: Share of scope 3 emissions according to the data-specificity level.	20
Figure 10: Share of emissions according to the data-confidence level.....	27
Figure 11: 2019 emissions breakdown per scope (tCO ₂ e)	28
Figure 12: Scope 1 emissions by source	29
Figure 13: Refrigerants emissions breakdown per system type (left) and chillers emissions per building (right)	29
Figure 14: Scope 2 emissions per building	30
Figure 15: Scope 3 emissions per category	31
Figure 16: Student and staff commuting emissions by source.....	32
Figure 17: Breakdown of students (left) and staff's (right) arrival means	32
Figure 18: Emissions due to the purchase of goods and services by the University in 2019 (in tCO ₂ e)	33
Figure 19: Food, refreshment and hospitality related emissions by expense type	33
Figure 20: Business travels emissions by source	34
Figure 21: Fuel and energy-related activities emissions (tCO ₂ e).....	34
Figure 22: Waste-related emissions	35
Figure 23: Breakdown of waste quantities per collection source (left), breakdown of the food court waste per type of waste (right).....	35
Figure 24: Capital goods emissions by source (tCO ₂ e).....	36
Figure 25: Universities ranking – Emissions per capita (tCO ₂ e / capita).....	38
Figure 26: Universities ranking – Emissions per constructed area (tCO ₂ e / m ²)	38
Figure 27: Distribution pattern of impact categories emissions across universities.....	39
Figure 28: Summary of main emissions source of the University of Haifa.....	40

Executive summary

This report analyzes the carbon footprint of the University of Haifa, identifying the key emission sources and serving as a basis for the identification and implementation of abatement measures, in view to formulate the emissions reductions plan of the University.

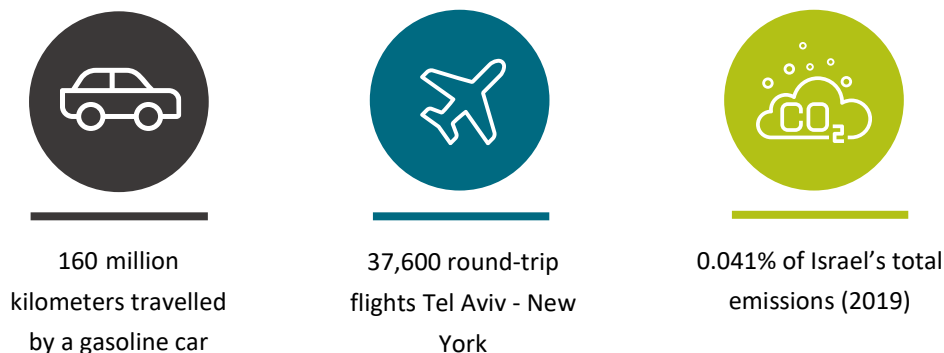
The analysis was conducted according to the GHG Protocol guidelines – the world's most widely used greenhouse gas accounting standard – and relates to the carbon footprint of the University of Haifa three campuses (Main campus (ראשי), City campus (דילן והנמל), Marine Sciences (חקר הימים והאגמים) and associated activities, including dormitories, cafeterias present in the campus, as well as other rented spaces such as post office, bank, etc.

The carbon footprint includes direct emissions at the University (associated with the fuel consumption in vehicles and buildings, and the use of refrigerants within the HVAC system) as well as indirect emissions from electricity and water consumption, waste treatment, business travels, staff and student commuting, and emissions associated with the manufacture, transport and provision of key goods and services.

Finally, the base year chosen was 2019, as it represents the most recent year for which data was available and which was not impacted by the COVID-19 pandemic, which dramatically altered university operations.

Results

The total 2019 emissions of the University of Haifa amounted to 32,769 tCO₂e, which is equivalentⁱ to:



Indirect emissions (scope 3) are the main emission source, representing 70.7% of total university emissions, while other indirect emissions from electricity consumption (scope 2) represented 25%.

ⁱ References of equivalence:

- Car: 0.205 kgCO₂e / km / car using gasoline (based on Fuel efficiency 2014, Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel and CBS emission factor)
- Round trip Tel Aviv – New York: 0.871 tCO₂e / passenger ((International Civil Aviation Organization (ICAO), no date)
- Israel total emissions in 2019: 79,044,644 tCO₂e (CBS, 2021)

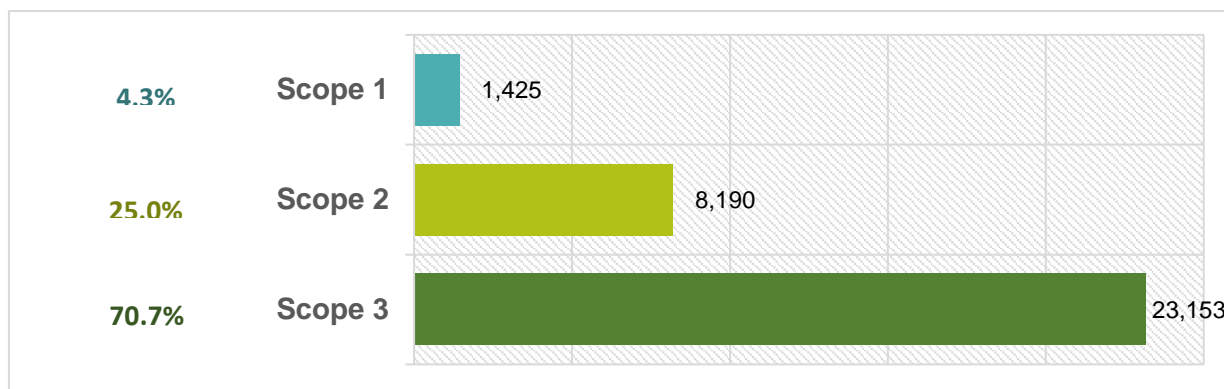


Figure 1: Greenhouse gas emissions breakdown per scope (tCO₂e)

1. Student and staff commuting was the main emissions source (43.7% of the total), followed by electricity consumption (25%), and purchase of goods and services (10.1%). Fuel consumption and fuel and-energy related activities combined were responsible of 8.4%.

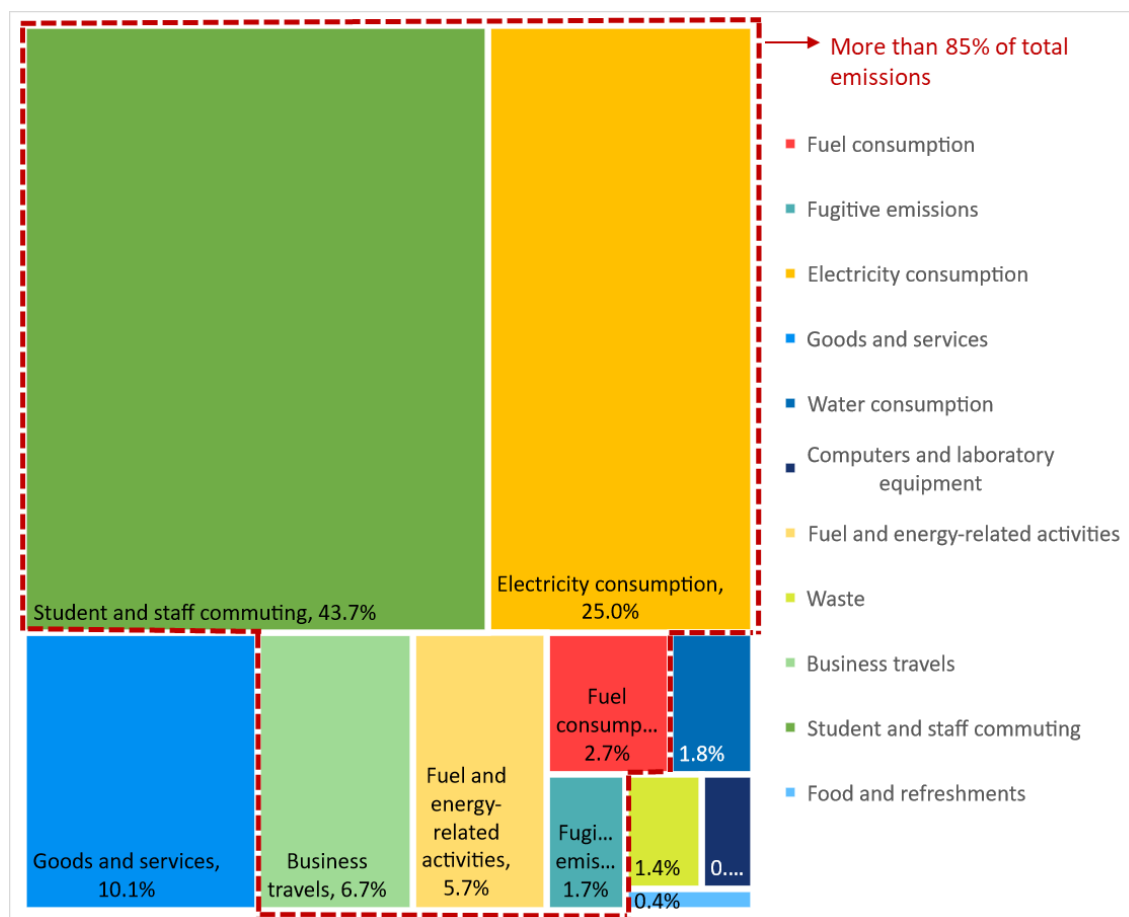


Figure 2: Summary of main emissions source of the University of Haifa

2. The identification of the main emission sources serves as a basis for formulating emission reduction measures. Mainly, measures to optimize energy consumption and transition to renewable energy will help reduce emissions from electricity consumption, while promoting public transportation for students

(and the staff) is crucial to reducing emissions from student commuting, as most of the students are currently assumed to arrive by car.

3. Further analysis of the staff and student commuting is required to provide a more accurate breakdown of modes of transportation and travelled distance (as national and Haifa-specific average values were used respectively for each parameter to estimate the emissions).
4. When comparing the University carbon footprint with 21 other international universities, for which data is publicly available, the University of Haifa is ranked 11th best in emissions per capita, and 12th best in emissions per built area. However, it should be noted that due to differences in data availability and accuracy for various emissions sources, it is difficult to accurately compare emissions between universities.

תקציר מנהלים

דו"ח זה מנתח את טביעת הרגל הפחמנית של אוניברסיטת חיפה. הניתוח מזהה את המקורות המרכזיים לפליטות גזי חממה ומהווה בסיס לגיבוש תוכנית הפחתת הפליטות של האוניברסיטה.

הניתוח התבצע בהתאם להנחיות פרוטוקול - GHG התקן המקובל בעולם לחשבונאות גזי חממה - ומתייחס לטביעת הרגל הפחמנית של שלושת הקמפוסים המרכזיים באוניברסיטה: קמפוס ראשי (ראשי), קמפוס עירוני (דילן והנמל), מדעי הים (חקר הימים והאגמים) וכן לפליטות הנובעות מפעילויות נלוות לרבות מעונות, קפיטריות, וכן חללים מושכרים נוספים כגון סניף דואר, בנק וכו'.

טביעת הרגל הפחמנית כוללת פליטות ישירות של האוניברסיטה (הקשורות לצריכת הדלק בכלי רכב ובבניינים, ושימוש בחומרי קירור בתוך מערכת HVAC) פליטות עקיפות הנובעות מצריכת חשמל ומים, טיפול בפסולת, נסיעות עסקים, ויוממות של אנשי הסגל והסטודנטים; פליטות הקשורות לייצור, הובלה ואספקה של סחורות ושירותים מרכזיים.

לבסוף, שנת הבסיס שנבחרה היא 2019, מכיוון שהיא מייצגת את השנה האחרונה שלגביה היו נתונים זמינים ושלא הושפעה ממגפת הקורונה, ששינתה באופן דרמטי את פעילות האוניברסיטה.

תוצאות

סך הפליטות של אוניברסיטת חיפה הוא 32,769 tCO₂e שהם שווי ערך ל:



נסיעה של 160 מיליון ק"מ ברכב עם מנוע בעירה פנימית

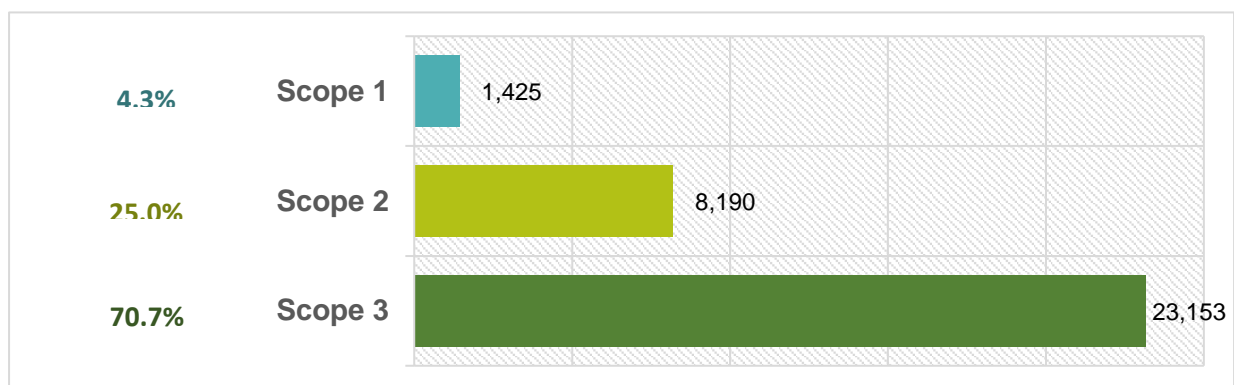


37,600 טיסות מתל אביב לניו יורק וחזרה



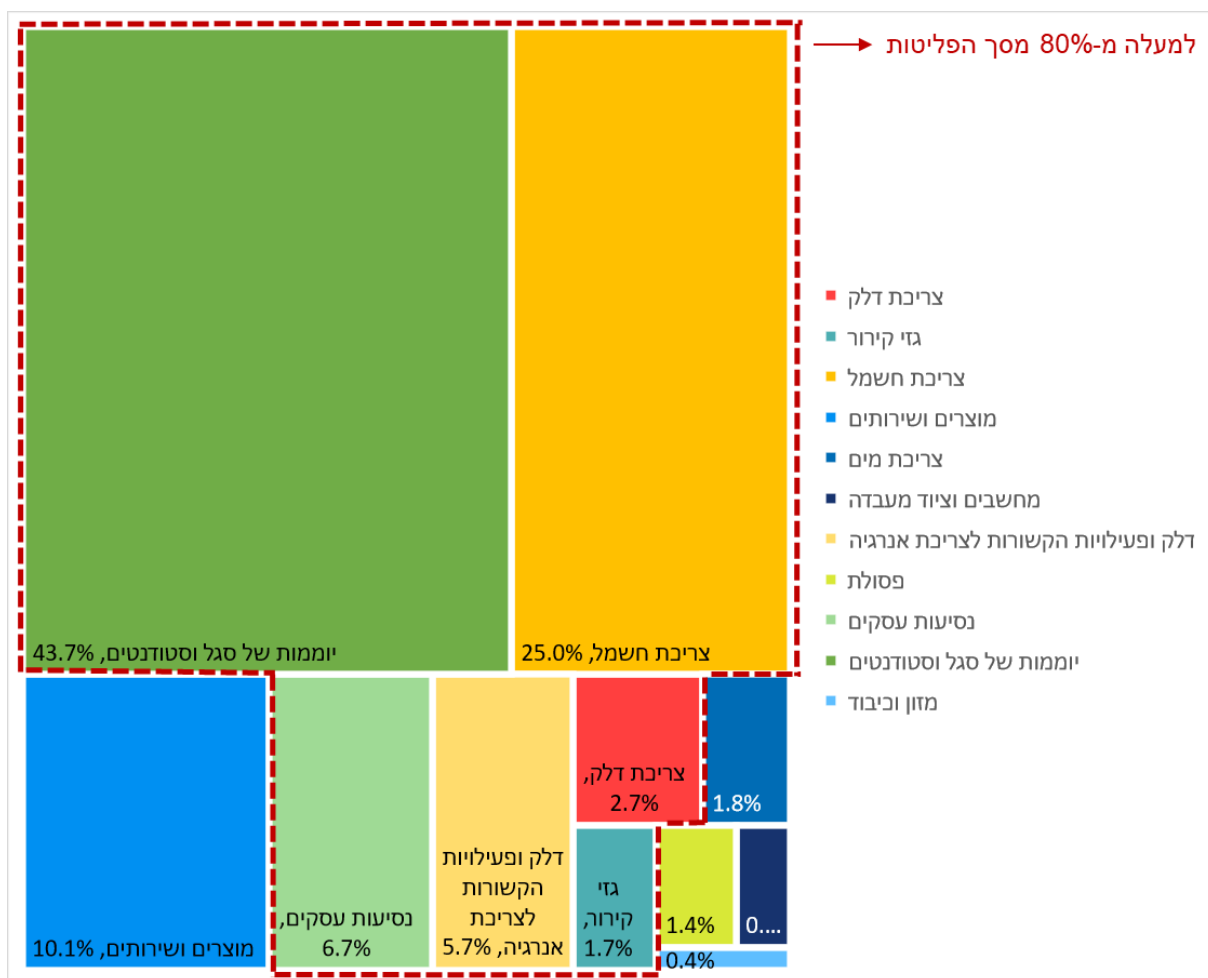
0.032% מסך הפליטות של ישראל (2019)

כפי שניתן לראות בגרף להלן, פליטות גזי חממה עקיפות (מכלול 3) הן החלק העיקרי והן מהוות 62.4% מסך הפליטות של האוניברסיטה, בעוד שפליטות עקיפות הנובעות מצריכת חשמל (מכלול 2) מהוות 32.1%.



גרף 1: התפלגות פליטות גזי חממה לפי מכלול (tCO₂e)

נסיעות של סטודנטים ועובדים היו מקור הפליטות העיקרי (43.7%), אחריהן צריכת החשמל (25%) ולאחר מכן רכישת סחורות ושירותים (10.1%). צריכת הדלק ופעילויות הקשורות לדלק ואנרגיה ביחד היוו 8.4%.



זיהוי מקורות הפליטה העיקריים משמש צעד הכרחי לגיבוש צעדים להפחתת פליטות. בפרט, צעדים ליעול צריכת האנרגיה ומעבר לאנרגיה מתחדשת יסייעו בהפחתת הפליטות מצריכת החשמל, בעוד שקידום התחבורה הציבורית לסטודנטים (והסגל) חיוני להפחתת הפליטות הנובעות מיוממות של סטודנטים, שכן מרבית הסטודנטים מגיעים כיום ברכב פרטי

נדרש ניתוח נוסף של נסיעות הסגל והתלמידים כדי לקבל פירוט מדויק יותר של דרכי התחבורה ומרחקי הנסיעה שנעשו (שכן נעשה שימוש בערכים ממוצעים של ישראל ושל העיר חיפה בהתאמה עבור כל פרמטר להערכת הפליטות).

כאשר משווים את טביעת הרגל הפחמנית של האוניברסיטה עם 21 אוניברסיטאות בינלאומיות אחרות, שנתונין זמינים ומפורסמים, אוניברסיטת חיפה מדורגת במקום ה-11 בפליטות לנפש, ובמקום ה-12 בפליטות לשטח בנוי. עם זאת, יש לציין כי בשל הבדלים בזמינות הנתונים ובדיוקם עבור מקורות פליטה שונים, קשה להשוות במדויק את הפליטות בין האוניברסיטאות.

Analysis overview

Objectives and work process

The main objectives of the carbon footprint study for the University of Haifa were:

1. Calculation of the direct and indirect emissions of the University of Haifa (2019)
2. Identification of key emission sources as a basis for potential emission reduction measures
3. Comparability with other international universities

This study was mandated and overseen by the following Work Team:

- Prof. Ofer Arazy, Director of Innovation and Sustainability,
- Alon Assour, Chief Business Development Officer,
- Baruch Marzan, Vice President for Internationalization and Sustainability,
- Aid Rohana, Manager of Data Collection and Analysis, Division of Innovation & Sustainability.

The data collection was conducted through the review of the University's Energy Survey, as well as through direct data collection. in conjunction with several personnel from the University, most notably:

- Eli Nadiv, Operations Department Director
- Haim Halevi, Director of the Maintenance Unit

Selected standard – GHG Protocol

The carbon footprint of the University of Haifa was conducted following the principles and requirements of the GHG Protocol Corporate Accounting and Reporting Standard (The Greenhouse Gas Protocol, 2011, 2015), which is the world's most widely-used greenhouse gas accounting standardⁱⁱ.

The GHG Protocol standard takes into account emissions across the value chain of an organization, a project or a product.

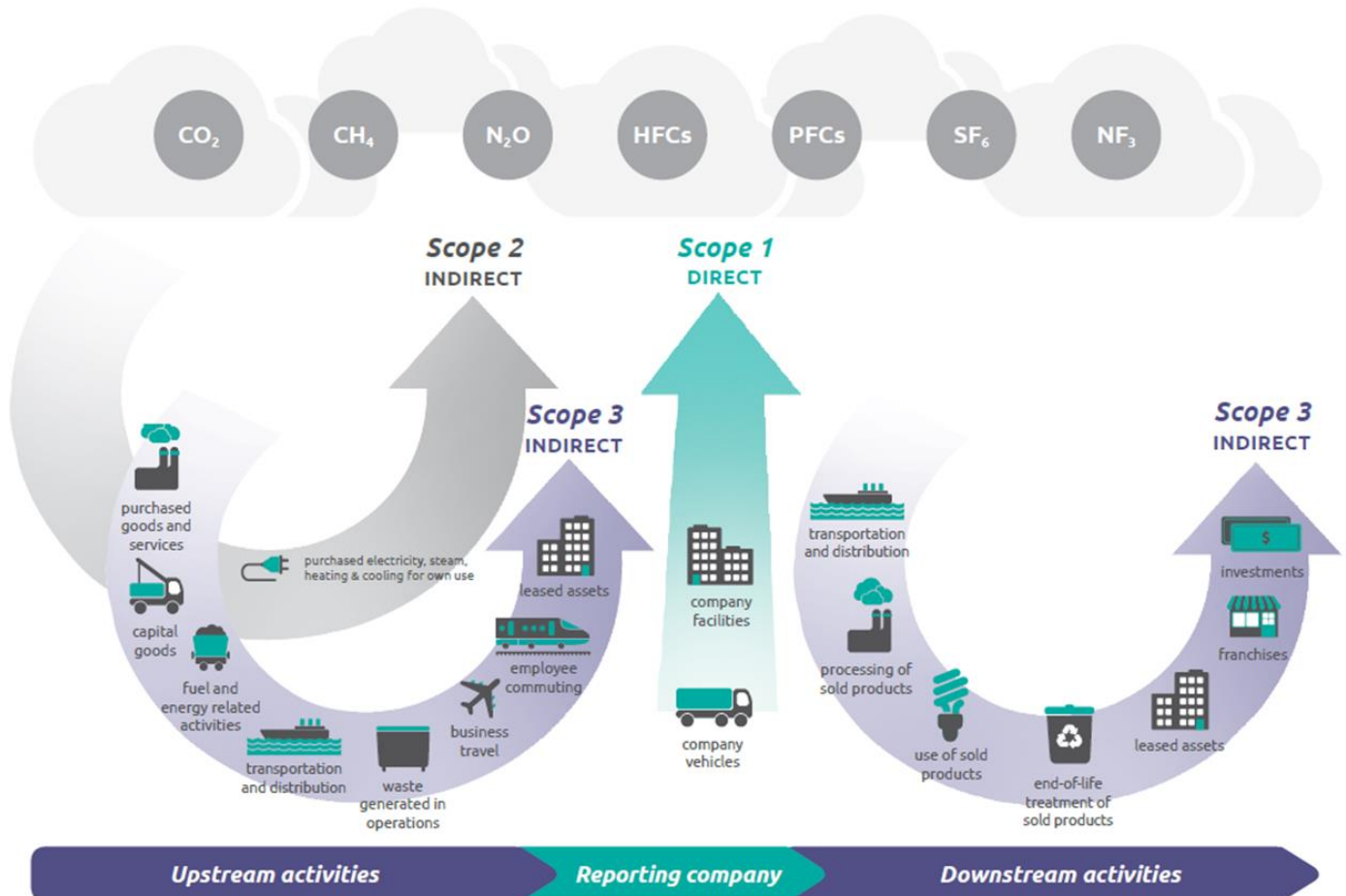


Figure 3: Overview of GHG Protocol scopes and emissions across the value chainⁱⁱⁱ

Direct and indirect emissions are categorized into three scopes:

- Scope 1 = Direct GHG emissions

Direct GHG emissions are emissions from sources that are owned or controlled by the organization and include emissions due to fuel consumption (in vehicles, heating equipment or other), and fugitive emissions due to the use of refrigerants in HVAC.

- Scope 2 and 3 = Indirect GHG emissions

ⁱⁱ The Greenhouse Gas Protocol (GHG Protocol) is a multi-stakeholder partnership of businesses, non-governmental organizations (NGOs), governments, and others convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). Launched in 1998, the mission of the GHG Protocol is to develop internationally accepted greenhouse gas (GHG) accounting and reporting standards and tools, and to promote their adoption in order to achieve a low emissions economy worldwide. <https://ghgprotocol.org/>

ⁱⁱⁱ Source: GHG Protocol

Indirect GHG emissions are emissions that are a consequence of the activities of the organization but occur at sources owned or controlled by another organization. Indirect emissions are divided into two scopes:

- Scope 2 = Indirect emissions from energy (electricity) consumption
- Scope 3 = Other indirect emissions (separated into 15 different categories, such as Goods and Services, Waste treatment, Business travel, Students and staff commuting, etc.). Detailed descriptions of each category are provided [annex 1](#).

Boundaries of the analysis

The carbon footprint was performed for all three campuses of the University of Haifa (Main campus (ראשי), City campus (דילן והנמל), Marine Sciences Campus (חקר הימים והאגמים)). The first step in performing the carbon footprint is setting the boundaries of the analysis, both in terms of the organizational boundaries, as well as the operational boundaries, as detailed below.

Setting organizational boundaries

In addition to the direct operations of the University, the Haifa campus itself hosts activities by external organizations in its facilities, both on a regular (such as vendors) and an ad-hoc basis. Setting the organizational boundaries essentially determines which activities at the Haifa campus “belong” to the University of Haifa, and which do not.

In setting organizational boundaries, an approach is selected for consolidating GHG emissions. This approach is then consistently applied to define those buildings and operations that constitute the university for the purpose of accounting and reporting GHG emissions.

The operational control approach for the University of Haifa’s carbon footprint was selected as the consolidation approach: the analysis included emissions from operations over which the University has operational control, meaning if it has the full authority to introduce and implement its operating policies at the operation. As opposed to financial control, this approach did not account for GHG emissions from operations in which the University owns a financial interest, but does not have operational control; conversely, it includes activities for which the University has operational control despite having no direct financial interest.

Most importantly, this means that emissions associated with activities by external organizations conducted on-campus in the University facilities, such as organizational meetings and events, are included in the University’s organizational boundaries, as it is the University itself that has operational control over these facilities. However, on-campus facilities and activities that are not operated by the University are, to the extent that they provide services to the University, included as indirect emissions (scope 3 – for more detail see operational boundaries below).

Consequently, the boundaries of the analysis considered the following buildings:

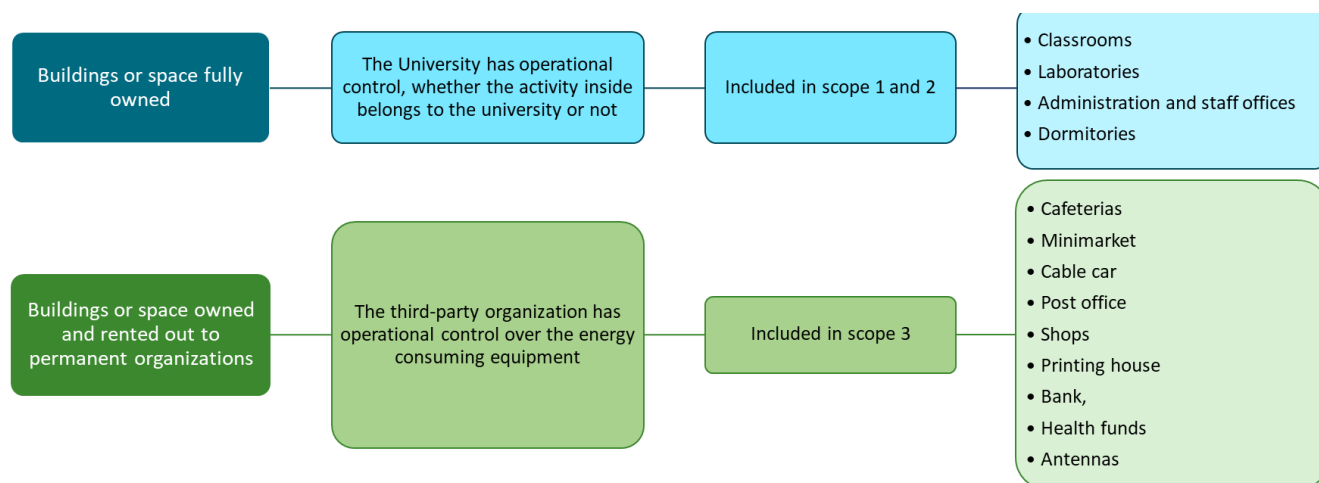


Figure 4: Definition of the analysis' organizational boundaries

Setting operational boundaries

After an organization has determined its organizational boundaries in terms of the operations that it owns or controls, it then sets its operational boundaries. This involves identifying emissions associated with its operations, categorizing them as direct and indirect emissions, and choosing the scope of accounting and reporting for indirect emissions.

What is classified as direct and indirect emissions is dependent on the consolidation approach selected previously for setting the organizational boundary.

Consequently, the following emissions sources were included in the analysis:

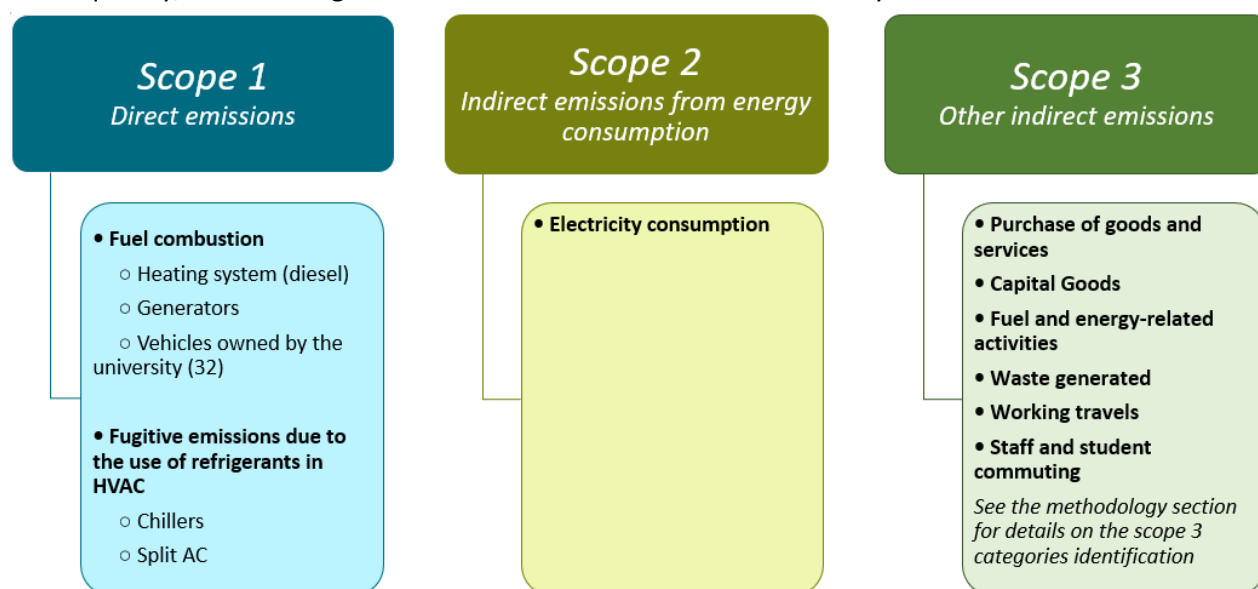


Figure 5: Summary of emissions sources included in the analysis

Finally, the base year chosen was 2019, as it represents the most recent year for which data was available and was not impacted by the COVID-19 pandemic, which altered university operations.

Methodologies and data used

Scope 1 and 2

In general, high-quality activity data was available at the University level for scope 1 and 2, and the associated emissions factors were University- and Israel-specific.

Therefore, for these scopes, the carbon footprint was conducted using the University's activity-specific data, as follows:

Scope	Methodologies	University activity data	Emission factors (EF) and other parameters used
Scope 1 – Direct emissions			
→ Fuel consumption in buildings	Application of documented emission factors per quantity of fuel	• Fuel consumption in generators and diesel for heating	Coefficients of 2019, Israel Voluntary CO2 Emissions Reporting Mechanism of the Ministry of Environmental Protection
→ Fuel consumption in vehicles		• Fuel consumption from vehicles (owned or leased by the University)	
→ Used of refrigerants in HVAC system	Since refrigerants quantities were available only from the warehouse withdrawals (without gas supplied by contractors), two different methodologies were applied: 1) For chillers using R410A and R22: application of GHG emission factors per quantity of gas refilled (data available) 2) For chillers using R134a and Split A/C: Use of the methodology applied in the Israeli PRTR, based on the estimation of fugitive emissions according to the number of HVAC units and their characteristics.	• Quantities of gas refilled in chillers using R410A and R22 (total data) • Number of split A/C and chillers (Energy survey, 2018)	• Coefficients of 2019, Israel Voluntary CO2 Emissions Reporting Mechanism of the Ministry of Environmental Protection • Average mass refrigerant per type of HVAC system, based on the cooling capacity of each system (Engineer estimation, EcoTraders, 2023)

Scope 2 – Indirect emissions from electricity consumption

→ Emissions from the combustion of fuels to generate electricity ^{iv}	Market-based: electricity purchased to one supplier. The University of Haifa purchases its electricity from a private natural gas-based electricity supplier, Ashdod Energy.	• Electricity consumption (global, campus and for specific buildings)	<u>Combustion</u> emission factor associated to Ashdod Energy* - around 0.335 tCO ₂ e/MWh (Personal communication between the University of Haifa and Ashdod Energy, September 2021)
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* This emission factor does not include the upstream emissions from production and transmission of the fossil fuels to the power plant, or the emissions related to T&D losses, as those are included separately under scope 3 (fuel and energy-related activities).

Scope 3

As mentioned previously, Scope 3 can be divided into 15 categories. However, categories might not all be relevant and GHG Protocol Scope 3 standard gives flexibility on whether and how to account for scope 3 emissions.

Identification of the applicable categories

The following categories were included in the carbon footprint under scope 3, as they are relevant to the University's activities: Categories 1- Purchased goods and services, 2 – Capital goods, 3 – Fuel and energy-related activities, 5 – Waste generated in operations, 6 – Business travels and 7 – Staff and students commuting.

Although relevant, categories 4 – Upstream transportation and distribution, 13 - Downstream leased assets and 15 – Investments were not included in the final analysis for the following reasons:

- Category 4 (Upstream transportation and distribution) is included in Category 1 (Purchased goods and services), as a sub-category of type of services necessary for the good functioning of the University.
- In the case of the University of Haifa and according to the standard requirements, Category 13 (downstream leased assets) shall include scope 1 and 2 emissions of leased buildings, namely cafeterias, minimarket, shops, printing house, bank, post office, health funds, antennas. However, fuel consumption and refrigerants data were not fully available. Therefore, in order to avoid double counting emissions from electricity consumption (data available) were included in category 3 (Fuel- and energy- related activities) as "electricity purchased and sold" by the University.
- Due to the complexity of obtaining detailed data regarding investments, the corresponding category (category 15) was not included in this analysis. The importance of investments within the carbon footprint depends ultimately on the size of the university investment portfolios, the types of companies invested in, and the share of equity that is hold. Investment decisions can have a

^{iv} Do not include the upstream emissions or the emissions related to T&D losses; such emissions are calculated in scope 3 – category "Fuel- and Energy-Related Activities".

significant impact on the emissions portfolios, as every 100 USD of annual revenue for an investee company in fossil and nuclear fuel activities would emit 19 more times than a 100 USD of annual revenue for an investee company in real estate activities (See graph below).

This estimation was conducted using the GHG Protocol “Scope 3 evaluator” online tool^v which combines financial data with an Environmentally Extended Input Output (EEIO) analysis.

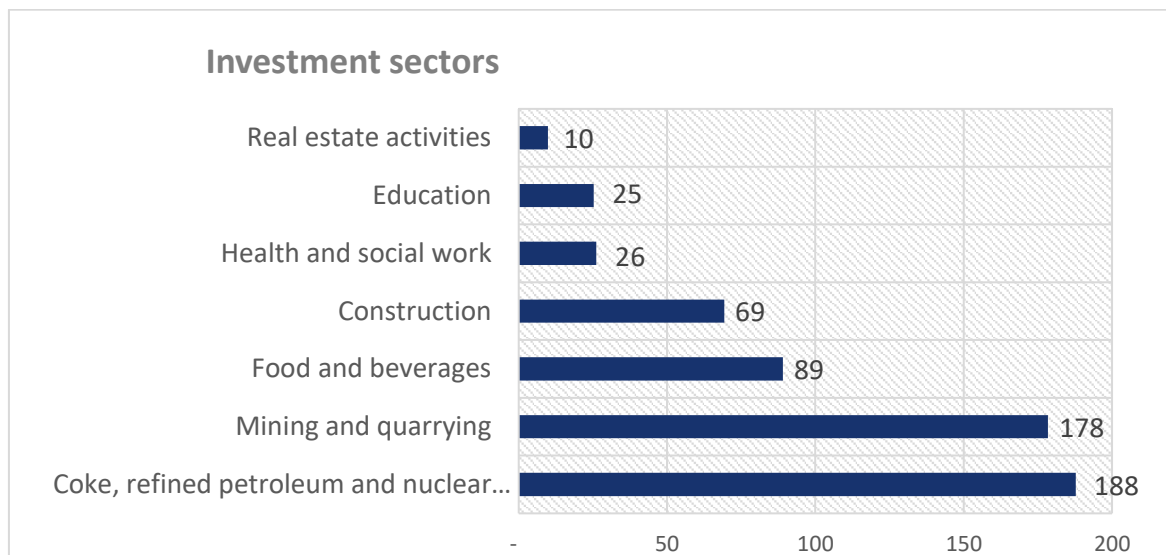


Figure 6: Emissions estimated for a 100 USD of annual revenue for an investee company according to investment sectors (in tCO2e)

Other categories were considered as not applicable.^{vi}

As a result, categories included in the analysis are the following:

^v <https://ghgprotocol.org/scope-3-evaluator>

^{vi} Non-applicable categories include: 4. Upstream transportation and distribution, 8. upstream leased assets, 9. Downstream transportation and distribution, 10. Processing of sold products, 11. Use of sold products, 12. End-of-life treatment of sold products, 14. Franchises.

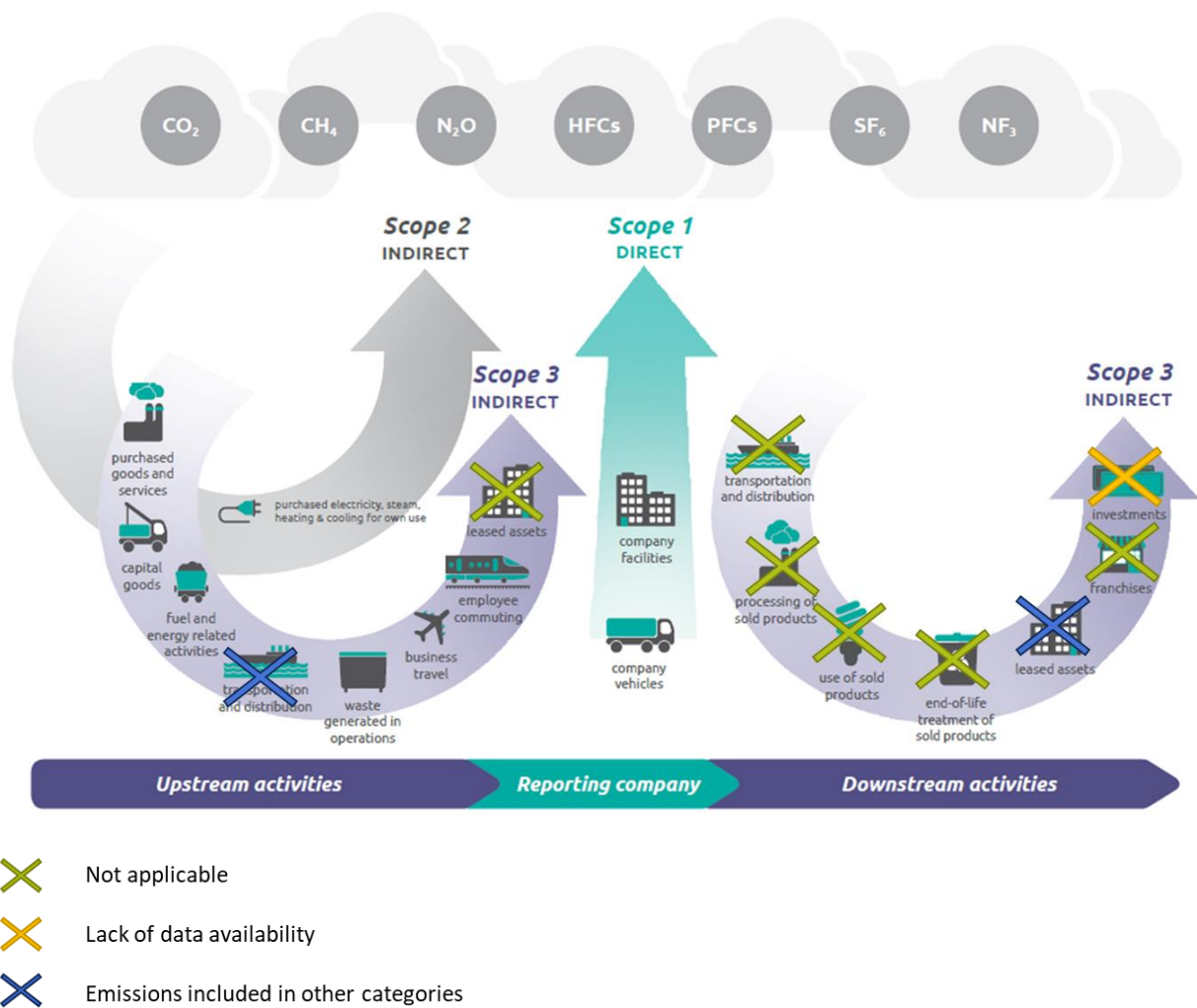


Figure 7: Summary of scope 3 categories included in the University of Haifa's carbon footprint.

Prioritization of data collection

Data collection efforts were prioritized on specific scope 3 activities. Collecting higher quality data for priority activities allows to focus resources on the most significant GHG emissions in the value chain, more effectively set reduction targets, and track and demonstrate GHG reductions over time.

A combination of approaches and criteria to identify priority activities was used. Broadly speaking, higher quality data was sought for all:

- Activities where more accurate data can be easily obtained
- Activities that are significant in size.
- Activities where the university can potentially reduce emissions
- Activities that were deemed critical by the Steering Committee, such as food.
- Activities that were included in other universities' carbon footprint, in order to be able to compare the results between one another. Key activities included in other universities' carbon footprints are student and staff commuting, business travels, waste generation, and purchases of office supply and detergents (see Chapter "[Comparison with other universities](#)").

For activities that were expected to have insignificant emissions or where accurate data was not available in a timely manner, broader, less site-specific approaches were used to estimate emissions.

Consequently, methodological decisions were taken for each category based on the following decision tree:

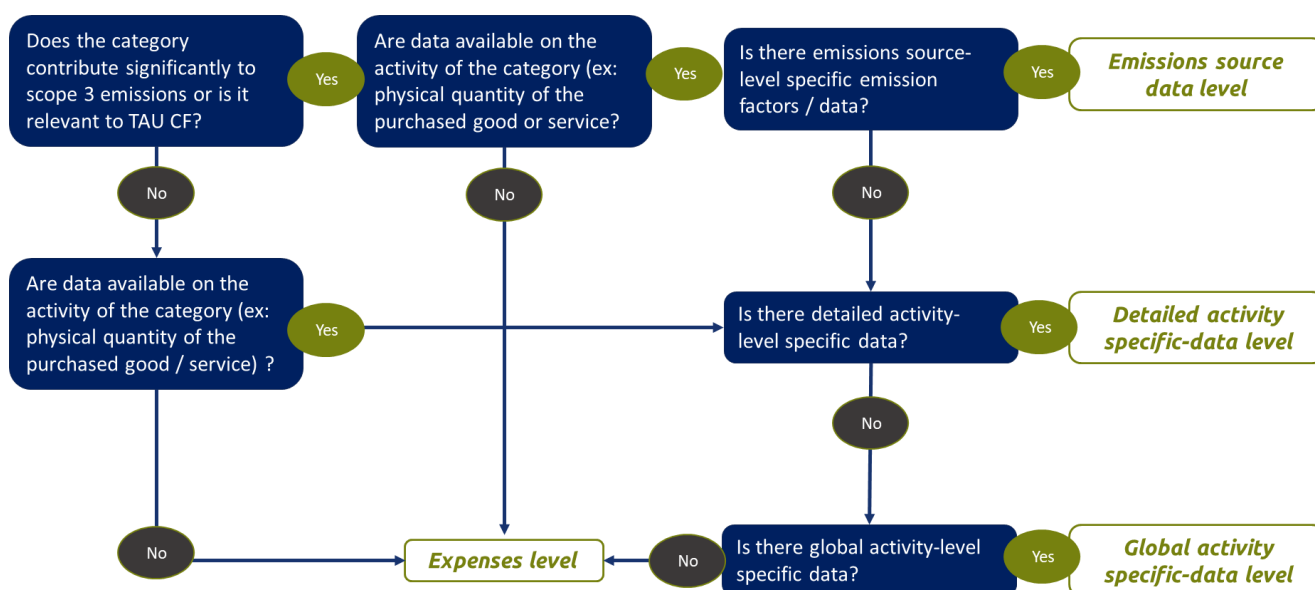


Figure 8: Methodological decision tree.

The specific methods applied under each level are as follows, in order of how site-specific the resulting emissions calculation is:

- **Emissions source data level**, which requires collection of emissions factors directly from the emissions source.
 - *Supplier-specific method*. This method collects product-level cradle-to-gate GHG inventory data from goods or services suppliers or fuel providers.
- **Detailed activity specific level**, which requires collection detailed activity data from the University. Depending on the category, it can correspond to the following method:
 - *Average-data method*. This method was applied to some sub-categories of “Goods and services purchases”, and “Fuel- and Energy-Related Activities” categories. It estimates emissions for goods and services by collecting data on relevant physical units of goods or services purchased (e.g. kilograms, liter) and multiplying by the relevant secondary (e.g., industry average) emission factors.
 - *Waste-type specific method*. As the name indicates, this method applies to the waste category and involves using emission factors for specific waste types and waste treatment methods.
 - *Distance-based method*. Relevant for “Business travels”, this method involves determining the distance and mode of business trips, and applying appropriate emission factors for the modes used.
- **General activity-specific level**, which requires data relevant to the University’s activities but based on national-level data. This level was only used for student and staff commuting – and is based on the “average-data method” using national commuting patterns.
- **Expenses level**, based on the *spend-based method*, emissions are estimated by collecting data on the economic value of goods and services purchased and multiplying it by relevant secondary emission factors. This method is relevant only to “Goods and services purchases”, “Capital goods” and part of “Business travel” categories.

7% of the total scope 3 emissions (corresponding to the campus water consumption and the electricity consumption of third parties) were estimated based on the highest level of data specificity, i.e. collecting data at the emissions source level, and a further 15% were estimated based on detailed activity-specific data. Only 16% were estimated based on the University's expenses, the lowest level of data specificity.

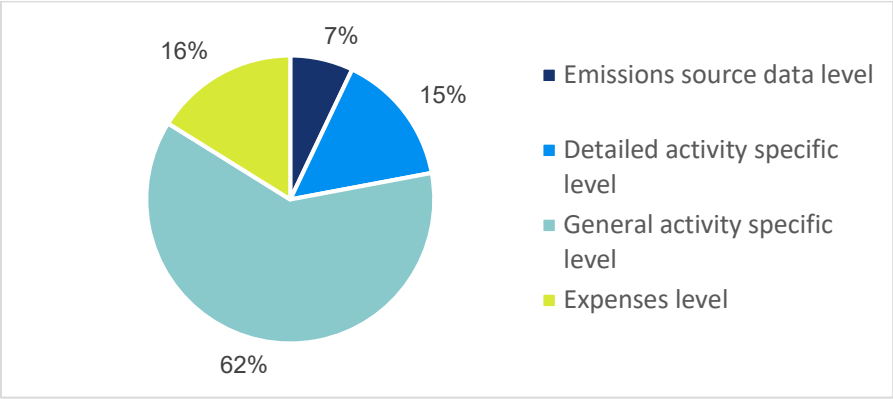


Figure 9: Share of scope 3 emissions according to the data-specificity level.

Detailed methodologies and data description related to scope 3 are provided in the following table.

Scope and category	Description of the methodology used to calculate emissions	Description of the activity-data collected from the University	Main assumptions used to calculate emissions	Data sources of the emission factors (EF) and other essential parameters used
Scope 3 emissions				
Category 1: Purchased goods and services				
→ Water consumption	Supplier-specific method	Include quantity of water consumed in the three campuses	-	<ul style="list-style-type: none"> Israeli-specific LCA study on the water supply system (Meron, Blass and Thoma, 2020)
→ All other categories	Spend-based method	Expenses in NIS of the most important purchases, aggregating them into subcategories (e.g., food purchases, detergents and cleaning products, paper, office supply, etc.).	<p>Total expenses of goods and services (including capital goods) summed to around 121 million NIS. 51% of it was successfully subcategorized, and the associated emissions were estimated. The remainder (59 million NIS) was spent on a variety of goods and services that could not be sub-categorized. The emissions related to these 59 million NIS were thus not included in the present analysis.</p>	<ul style="list-style-type: none"> United States Environmentally-Extended Input-Output (USEEIO) (U.S. Environmental Protection Agency, 2020)
Category 2: Capital goods				
→ Laboratory equipment and computers	Spend-based method	Expenses in NIS	-	<ul style="list-style-type: none"> United States Environmentally-Extended Input-Output (USEEIO) (U.S. Environmental Protection Agency, 2020)

Category 3: Fuel- and energy-related activities (not included in scope 1 or scope 2)

→ Upstream emissions ^{vii} of purchased fuels and purchased electricity	Average-data method based on quantity of fuels and electricity consumption	<ul style="list-style-type: none"> • Data collected for scope 1 and 2 on electricity and fuel consumed by the University • In addition, it includes third-party electricity consumption (electricity purchased by the University and sold to rented spaces such as cafeterias, bank, etc.) 	Assumption that only natural gas is used to generate the electricity purchased	<ul style="list-style-type: none"> • Emission factor from CDM projects (United Nations. Framework Convention on Climate Change, 2014)
→ Transmission and distribution (T&D) losses ^{viii}	Average-data method estimating emissions by using national average on T&D loss rate	<ul style="list-style-type: none"> • Data collected for scope 2 on electricity consumed and purchased by the University. 	-	<ul style="list-style-type: none"> • National average on T&D loss rate (6% - conventional power) (Ministry of Environmental Protection, 2021)
→ Power that is purchased and sold (only combustion emissions)	<ul style="list-style-type: none"> • Supplier-specific method: electricity purchased to one supplier (Ashdod Energy) 	<ul style="list-style-type: none"> • Electricity consumption of rented spaces such as cafeterias, bank, post office, etc.. 	<ul style="list-style-type: none"> • Include the emissions from the combustion of fuels to generate electricity, upstream emissions are included in its specific category (see above) 	<ul style="list-style-type: none"> • Combustion emission factor associated to Ashdod Energy (Personal communication between the University of Haifa and Ashdod Energy, September 2021)

Category 5: Waste generated in operations

→ Waste	Waste-type specific method, using emission factors for	<ul style="list-style-type: none"> • Collected waste quantity per type of waste: 	<ul style="list-style-type: none"> • In the absence of monitored data on waste composition of the University of 	<ul style="list-style-type: none"> • IPCC landfill emissions model per type of waste
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^{vii} Emissions related to the extraction, production, and transportation of fuels purchased directly by the University or of fuels consumed in the generation of electricity that is purchased by the University, Emissions from fuels combustion to generate the electricity are accounted in scope 2.

^{viii} Emissions related to generation (upstream activities and combustion) of electricity reported by the University

specific waste types and waste treatment methods (landfilling, recycling and composting were included). In addition, in order to determine the final waste quantity going to landfill, recycling rates were applied to each collected waste stream (organic, paper and cardboard, plastic, etc.) separated at the source or sorted out from municipal solid waste.

○ Mixed waste, from the food court (אתר הסעודה) – collected by Veridis Environment (2019 data), → *treatment*: sorting and landfilling.

○ Mixed waste, from the rest of the University – collected by the municipality of Haifa (estimation based on quantity collected from mid-December 2021 to mid-December 2022), → *treatment*: direct landfilling in the Evron and Afeh sites; sorting and landfilling in Dudaim site.

○ Paper and cardboard (separated at source), collected by the company Infinia, → *treatment*: recycling

○ Fat pit (בור שומן): → *treatment*: landfilling

• Emissions from recycling of batteries, electronic waste, toners and ink, beverages cans and the inert waste part of the mixed waste (glass, metals and others) were assumed not significant and were not included in the analysis.

Haifa, the following compositions were used:

○ Mixed waste, from the food court: based on a UK waste study on hospitality and food service sector (WRAP, 2013)

○ Mixed waste, from the rest of the University: based on national CBS data (CBS, 2017)

• **Recycling rates** were determined after contacting the relevant entities and waste treatment sites:

○ For the food court mixed waste: Since 50% is recycled (cardboard and paper, plastic, metals, and organic waste goes is composted) and 50% is landfilled (mainly wet cardboard and nylon), the following recycling rates were assumed:

- Organic waste: 95%
- Other (glass, metals and other): 95%
- Paper and cardboard: 5%
- Plastic: 9%

○ For the rest of the University mixed waste: it was assumed that 1/3 of the waste goes to each of the three landfill sites (Dudaim, Evron and Afeh). Only Dudaim has a sorting station, the following national recycling rates were assumed for this site (CBS, 2017):

(Intergovernmental Panel on Climate Change (IPCC).

National Greenhouse gas inventories programme., 2006)

- National recycling rate per waste stream (CBS, 2017)
- Collection of methane from landfill site: 6%, based on CBS value
- GWP methane = 25

			<ul style="list-style-type: none"> – Organic waste: 36% – Paper: 19% – Cardboard: 45% Plastic: 9% 	
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Category 6: Business travel

→ Plane travels of the University staff	Distance-based method	<ul style="list-style-type: none"> • Total number of flights • Percentage of travels per destination (country) <p><u>Note</u>: 10% were not assigned to a specific destination.</p>	<ul style="list-style-type: none"> • Assumption that the city of arrival is the capital city of the destination country • For the USA, assumption that half of the travels were to the east coast (New York), and half to the west coast (San Francisco) • Assumptions were made on the layover city when no direct flights were available. • For the 10% of the unassigned flights, an average emission factor was calculated excluding the main destination countries. 	<ul style="list-style-type: none"> • ICAO (International Civil Aviation Organization, a UN organization) Carbon Emissions Calculator (based on the cabin class, number of passengers, city of departure and city of arrival) (International Civil Aviation Organization (ICAO), no date)
→ Plane travels of the management staff	Spend-based method	Expenses in NIS	-	<ul style="list-style-type: none"> • United States Environmentally-Extended Input-Output (USEEIO) (U.S. Environmental Protection Agency, 2020)
→ Bus travels, car rentals, sailing and boats, hotels reservation	Spend-based method	Expenses in NIS	-	<ul style="list-style-type: none"> • United States Environmentally-Extended Input-Output (USEEIO) (U.S. Environmental Protection Agency, 2020)

Category 7: Staff and student commuting

→ Staff and students

Average-data method, using average national data on workers commuting patterns (Haim Bleikh, 2018):

- Regarding average distance: data representative of the Haifa area
- Regarding transport modes: national average. Transport modes include the following: car, shuttle, bus, train and bicycle /by foot.

- Number of students
- Number of staff
- Number of students in dormitories

- Estimation on number of academic days (University of Haifa, 2018)
- Estimation on number of working days (University of Haifa, 2018)
- Percentage of workers per transport mode was recalculated considering the following:
 1. All students from the dormitories arrived by foot.
 2. There is a shuttle organized by the University (distance: 10 km)
 3. People taking the train are living at least 10 km from the University, with the average distance being 20 km.
 4. We assumed that all people taking the train take the bus to arrive to the University.

- Fuel efficiency and load factor per transport mode (Ministry of Environmental Protection, EcoTraders Ltd., and Ricardo Energy & Environment, 2015)

Summary of methodological decisions

Main decisions impacting the analysis are summarized in the following table:

Parameters	Methodological decisions taken
Chosen consolidation approach	Operational Control
Description of the operations included in the company's organizational boundary	<ul style="list-style-type: none"> • All buildings on the three campuses were included within the analysis' boundaries. • Only emissions sources from the electricity consumption related to buildings rented out to permanent organizations (cafeterias, bank, post office, etc.) were included in scope 3.
Reporting period covered	2019. Also chosen as the base year since it represents activities as they were pre COVID-19
Scope 3 activities (other indirect emissions) included in the analysis	1- Purchased goods and services, 2 – Capital goods, 3 – Fuel and energy-related activities, 5 – Waste generated in operations, 6 – Business travels and 7 – Staff and students commuting
Scope 1, scope 2, and scope 3 activities excluded from the analysis with justification for their exclusion	<ul style="list-style-type: none"> • All scope 1 and 2 activities were included in the analysis • Non-applicable scope 3 categories include: 8. upstream leased assets, 9. Downstream transportation and distribution, 10. Processing of sold products, 11. Use of sold products, 12. End-of-life treatment of sold products, 14. Franchises • Scope 3 category 4 (upstream transportation and distribution) is included in category 1. • Scope 3 Category 13 (downstream leased assets) is included in category 3. • Scope 3 category 15 - Investments was not included due to data availability.

Data confidence:

Data were ranked according three levels of confidence:

- High-confidence: activity data monitored and site/supplier-specific emission factor
- Medium confidence: activity data monitored, but the emission factor applied was not site/supplier-specific, or the activity data was estimated but the emission factor was site/supplier-specific
- Low confidence: activity data estimated and non-site/supplier specific emission factor.

43% of total emissions were estimated based on high-confidence data, which includes:

1. Fuel consumption (scope 1): actual fuel consumption was collected, and specific emission factor for each fuel were used;
2. Consumption of refrigerants in chillers using R410A and R22: activity data was sourced through the warehouse inventory, while emission factors were specific to each refrigerant.
3. Scope 2 emissions: electricity consumption was read from electricity meter, and the emission factor used is specific to the University electricity supplier, Ashdod Energy.
4. Water consumption in scope 3;
5. Power that is purchased and sold in scope 3;

57 % of total emissions were estimated based on medium-confidence data:

1. Consumption of refrigerants in chillers using R134A and in split AC units which were based on the number of units (sourced from the Energy Survey), with the mass of refrigerants estimated based on the cooling capacity and the average value of gas per cooling capacity (expert estimation).
2. Remainder of scope 3 categories.

No data was ranked with a low confidence.

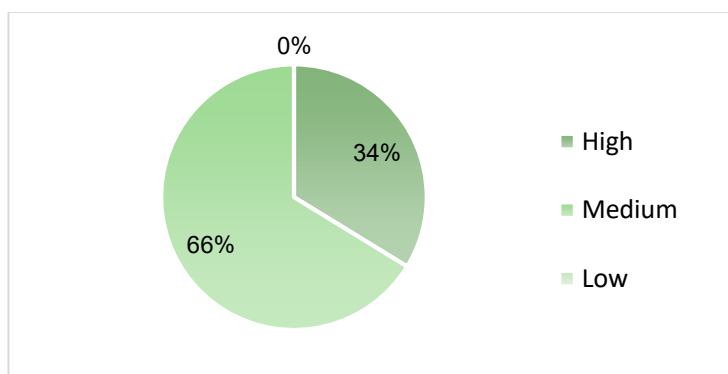


Figure 10: Share of emissions according to the data-confidence level.

Results confidence:

Emissions were calculating via an Excel tool and subject to a dual QA/QC process:

- One technical, conducted by a fellow project manager who reviewed all the formulas, data relations, conversions, etc.
- One from a final results point of view, conducted by the team manager who reviewed the logic of the results in terms of scale, or comparison with similar projects.

Results

Total emissions

In 2019, the University of Haifa emitted a total of 32,769 tCO₂e.

Other indirect emissions (scope 3) was the main emission category, representing 70.7% of total emissions from the University, while indirect emissions from electricity consumption (scope 2) represented 25%. Direct emissions due to fuel consumption and the use of refrigerants in the HVAC system constituted only 4.3% of total emissions.

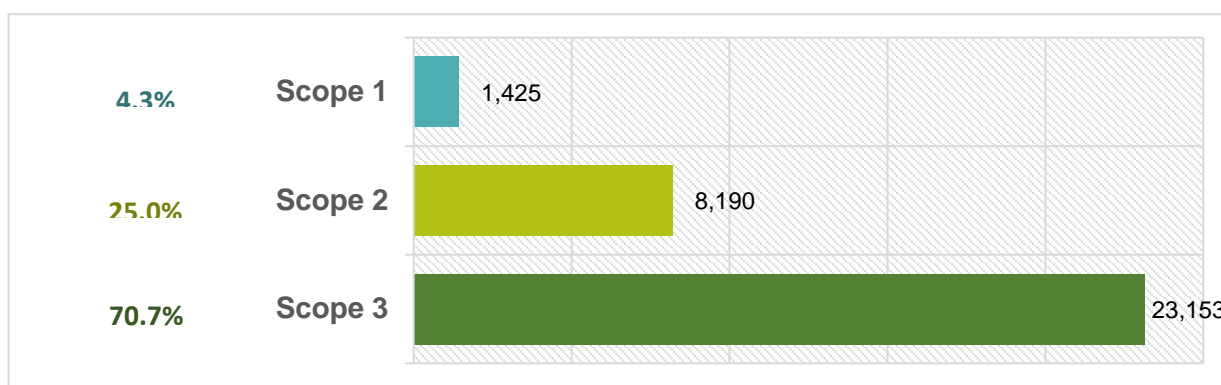


Figure 11: 2019 emissions breakdown per scope (tCO₂e)

With 17,353 students and 2,333 staff members (faculty and administrators) the emissions amounted to 1.7 tCO₂e / capita.

When considering the total gross constructed buildings' area, equal to 175,479 m², the University emitted 0.187 tCO₂ per square meter.

Scope 1 – Direct emissions

Scope 1 emissions = 1,425 tCO₂e, representing 4.3% of total emissions

Direct emissions were mainly due to the use of diesel for heating (50% of direct emissions), which is used only in three buildings: the Main building (ראשי), Migdal (מגדל), and Rabin (רבין).

The use of refrigerants in the University's HVAC systems (gas used for the air-conditioning of the buildings – R410A, R22 or R134A) was responsible for 38%. According to the repartition of the chiller's units indicated in the Energy Survey, emissions from such system mainly occur in the Rabin, Tower and Terrace buildings.

Emissions from fuel consumption in vehicles owned and leased by the University (32 vehicles in total) represented 10% of direct emissions, while generators, used only for emergencies, represented only 2%.

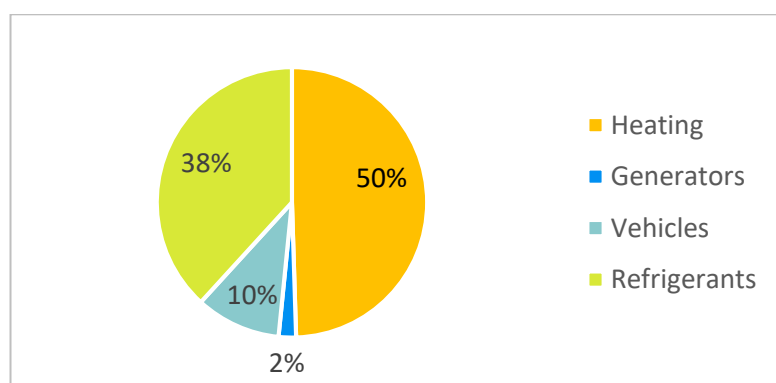


Figure 12: Scope 1 emissions by source

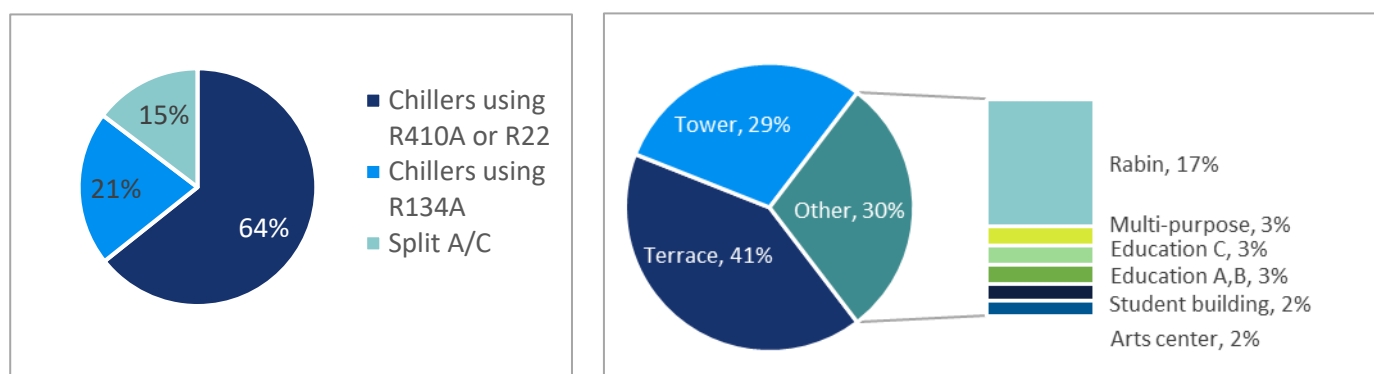


Figure 13: Refrigerants emissions breakdown per system type (left) and chillers emissions per building (right)

Scope 2 – Indirect emissions from electricity consumption

Scope 2 emissions = 8,190 tCO₂e, representing 25% of total emissions

The University of Haifa purchases its electricity from a private natural gas-based electricity supplier, Ashdod Energy.⁹

According to the breakdown of electricity consumption by building, the primary source of emissions due to electricity consumption occurs in the Main Building (34%), followed by the “multipurpose” building (רב תכליתי) (15%) and the dormitories (11%).

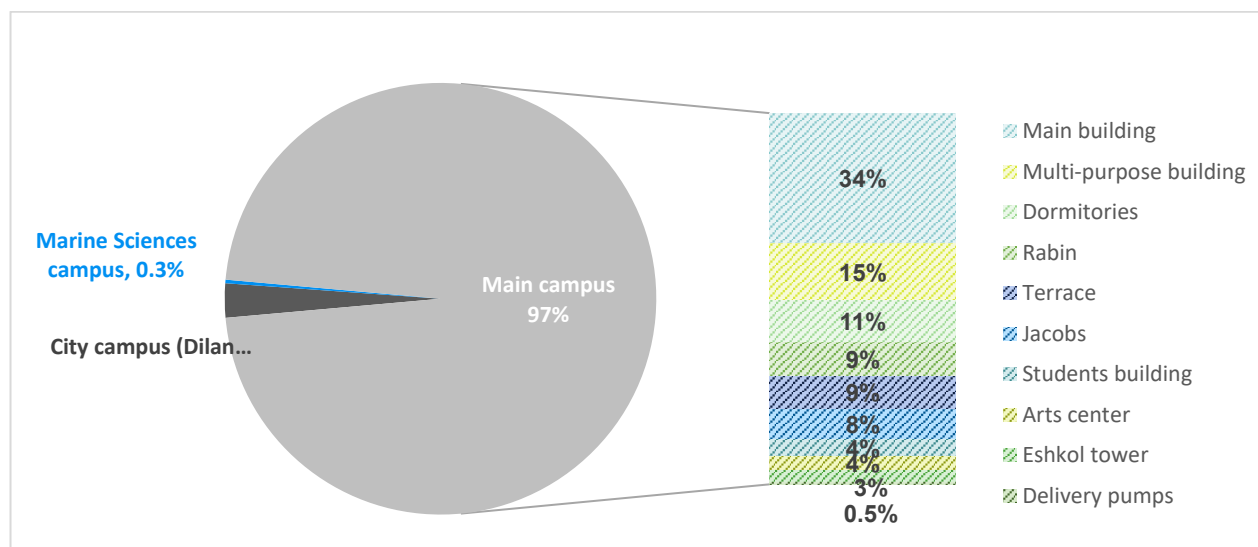


Figure 14: Scope 2 emissions per building

⁹ The corresponding emission factor to the electricity generated by Ashdod Energy is around 0.335 tCO₂e/MWh.

Scope 3 – Other indirect emissions

Scope 3 emissions = 23,153 tCO₂e, representing 70.7% of total emissions

Student and staff commuting is the main indirect emission source. Purchase of goods and services, is second, followed by business travels.

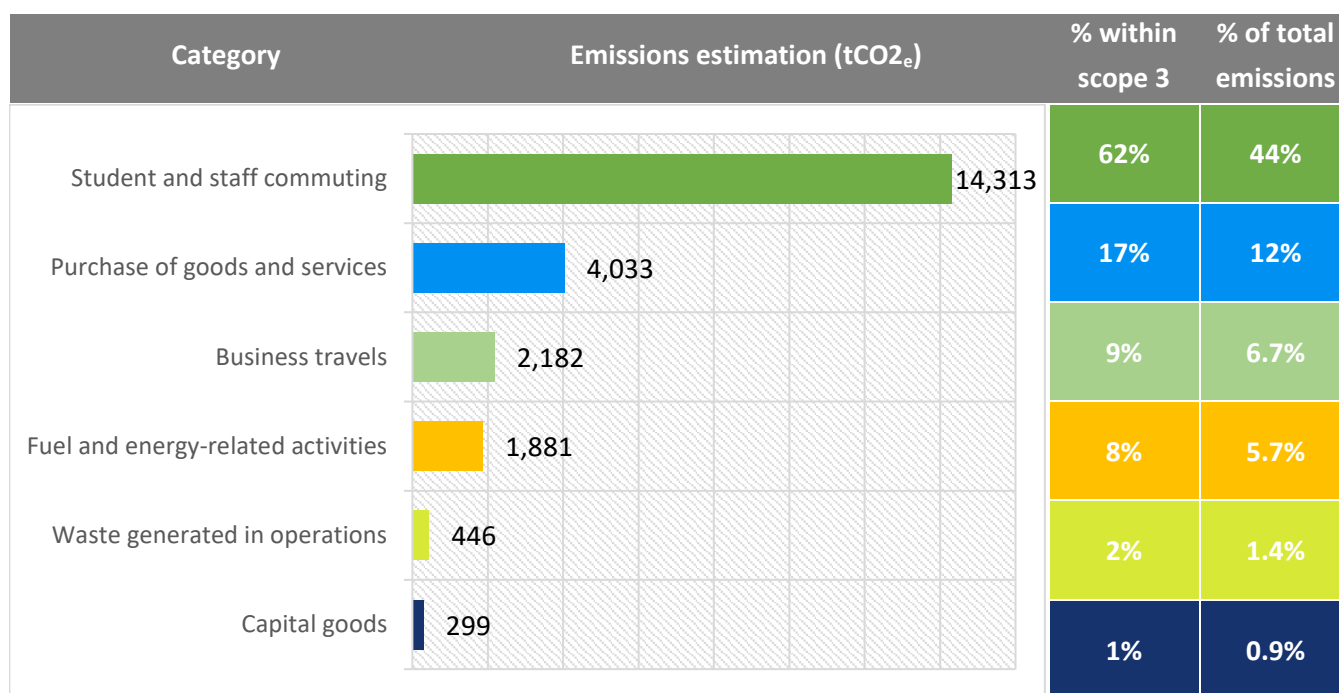


Figure 15: Scope 3 emissions per category

Student and staff commuting

Represent 44% of total emissions

In the absence of monitored data (such as an employee and student transportation survey), national data on employee commuting by transportation mode was used in combination with Haifa-specific data on commuting distances to estimate total annual person-kilometers travelled by staff and students by mode as a basis for the emissions calculation.

Consequently, 60% of the 2,333 staff were assumed to arrive by car; 56% of the 17,353 students were assumed to arrive by car, due to the fact that the national and Haifa-specific data were only applied to the 94% of the student body that do not reside in the dormitories. The 6% of the students that do reside in the dormitories were assumed to arrive by foot.

Student commuting represents three quarters of the commuting emissions. Taking into account that on average, a student arriving by car emits around 3.5 times as much as a student arriving by bus or by train, they emit 85% of the emissions associated with student commuting emissions.

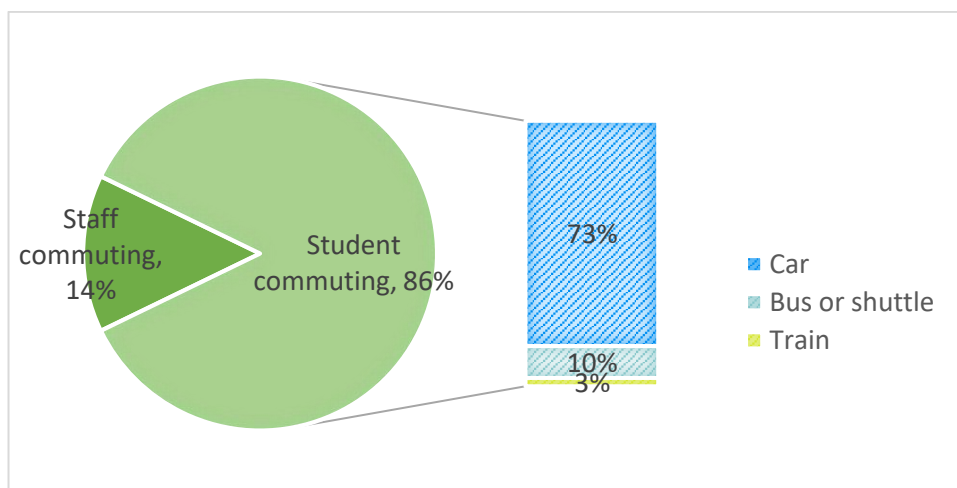


Figure 16: Student and staff commuting emissions by source

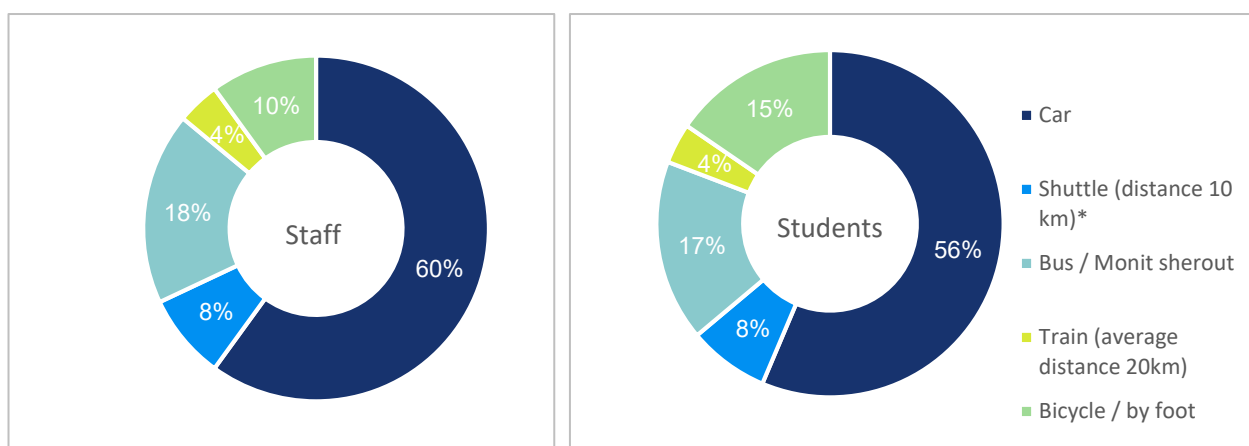


Figure 17: Breakdown of students (left) and staff's (right) arrival means

Purchase of goods and services

Represents 12% of total emissions.

The breakdown of emissions from the purchase of goods and services by category is presented in the graph below.

Renovation and maintenance were responsible for around 20% of the emissions in this category, followed by water consumption (15%), teaching and training activities (11%), purchase of laboratory animals (mainly mice and flies) and professional consulting (6% each). The "other" category includes all the categories that are less than 1% of emissions from the purchase of "goods and services" while the remaining categories represent less than 5% each.

All categories apart from "water consumption" were calculated using the spend-based method. The expenses related to these categories totaled 62 million NIS.

It should be noted that an additional 59 million NIS were spent on a variety of goods and services that could not be sub-categorized further. Consequently, the emissions related to these additional purchases were not included in the present analysis.

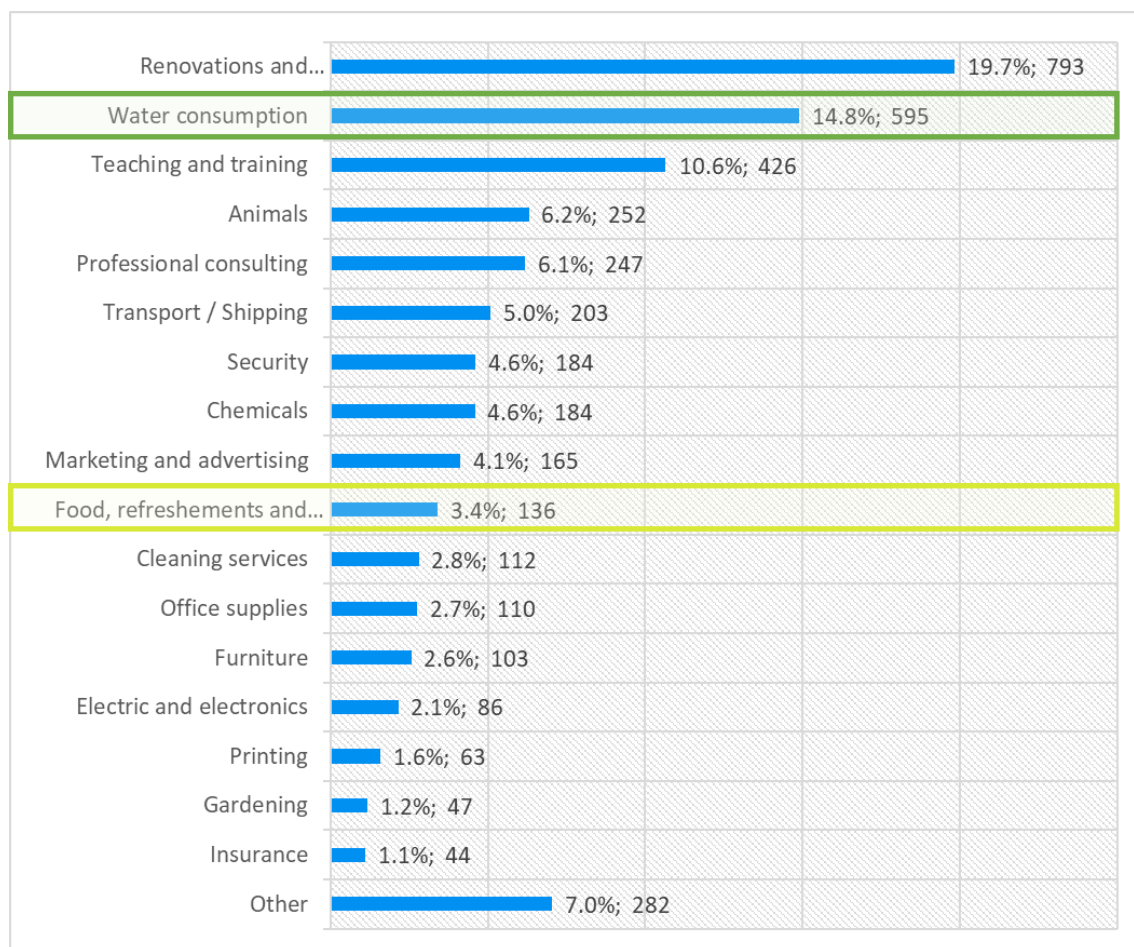


Figure 18: Emissions due to the purchase of goods and services by the University in 2019 (in tCO₂e)

Expenses related to food purchase and refreshments totaled only 3.4% of this category emissions, with 32% of the emissions due to the purchase of food cheques, vouchers or “Tenbis” cards (32%). It should be noted that for this type of expense, a general emission factor associated to “Food and beverage and tobacco products” was used.

Disposable cutlery and tablecloth were responsible for only 5% of the food and refreshments emissions.

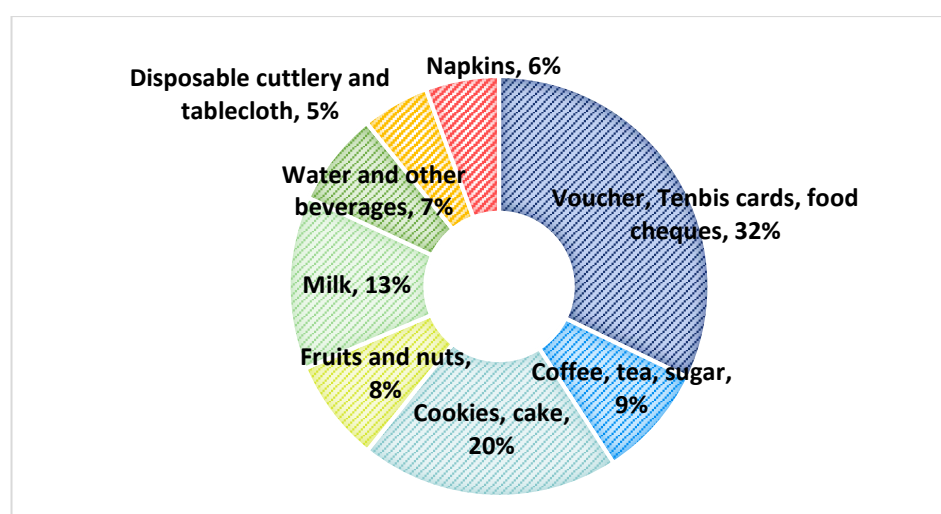


Figure 19: Food, refreshment and hospitality related emissions by expense type

Business travels

Represent 6.7% of total emissions

Flights are the main source of emissions in the business travels' category, accounting for 80% of emissions. It should be noted that only flights from the staff are calculated with a distance-based method, the rest is based on the spend-based method.

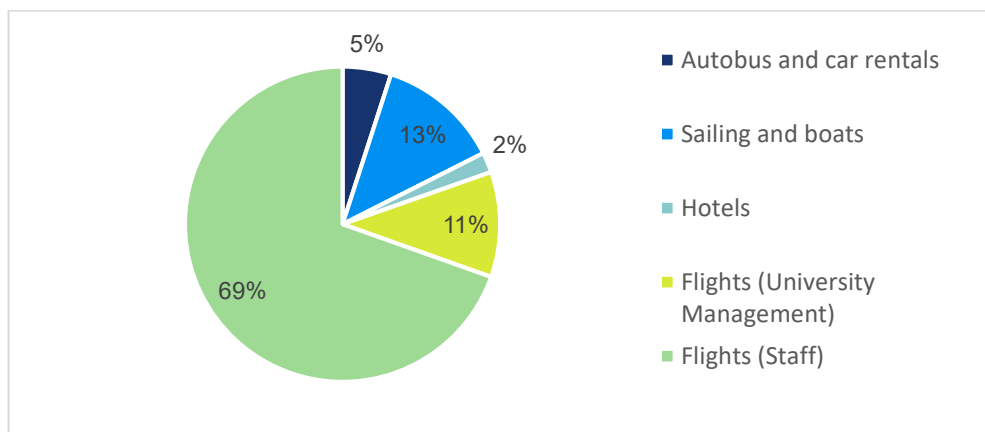


Figure 20: Business travels emissions by source

Fuel and energy-related activities

Represent 5.7% of total emissions

Fuel and energy-related activities emissions (not included in scope 1 or scope 2) encompass the emissions related to the production of fuels and energy purchased and consumed by the University.

These emissions are divided into four sub-categories. Power that is purchased and sold (emissions due to fuel combustion to generate the electricity) is the main source (55%), followed by emissions due to transmission and distribution losses (34%).

In 2019, total electricity purchased and sold amounted to 3,117,269 kWh, and relates to the electricity consumed by the cafeterias, minimarket, shops, printing house, bank, post office, health funds, or antennas present on campus.

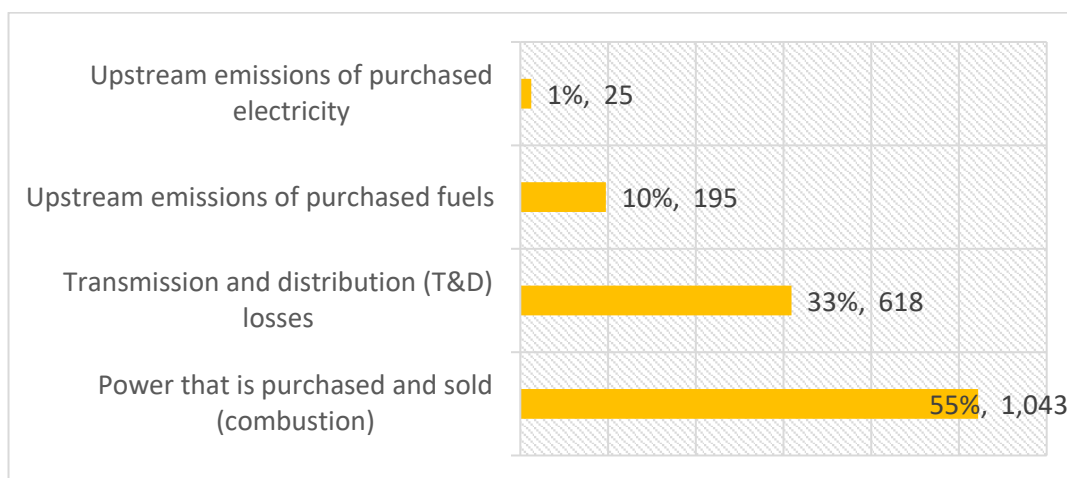


Figure 21: Fuel and energy-related activities emissions (tCO₂e)

Waste

Represent 1.4 % of total emissions

Waste emissions are mainly due to the landfilling of mixed waste that was not separated at the source. Indeed, 81% of the total waste generated on campus is non-separated mixed waste, of which 64% is biodegradable waste going to landfill, around 19% is recycled and the remaining is inert waste going to landfill (with zero emissions).

It should be noted that emissions included in the analysis are only related to landfilling, composting, and the recycling of paper and cardboard and plastic. Emissions from recycling of batteries, electronic waste, toners and ink, beverages cans and the inert waste part of the mixed waste (glass, metals and others) were assumed to be insignificant and were not included in the analysis.

In order to determine the final quantity landfilled, the following stages were applied (see the [methodology](#) for further details):

1. Waste composition was applied to the mixed waste to determine the fraction of each waste stream (organic, paper, plastic, cardboard, garden waste, etc.):
2. Recycling rates were then applied to each collected waste stream that are sorted out from municipal solid waste or separated at the source, in accordance with the recycling rates applicable to the company or waste station site in charge of sending the waste to treatment.

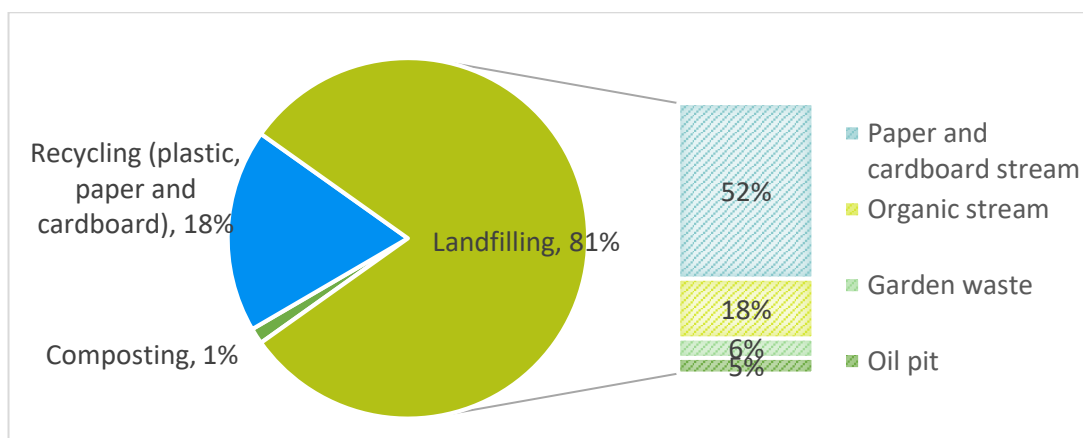


Figure 22: Waste-related emissions

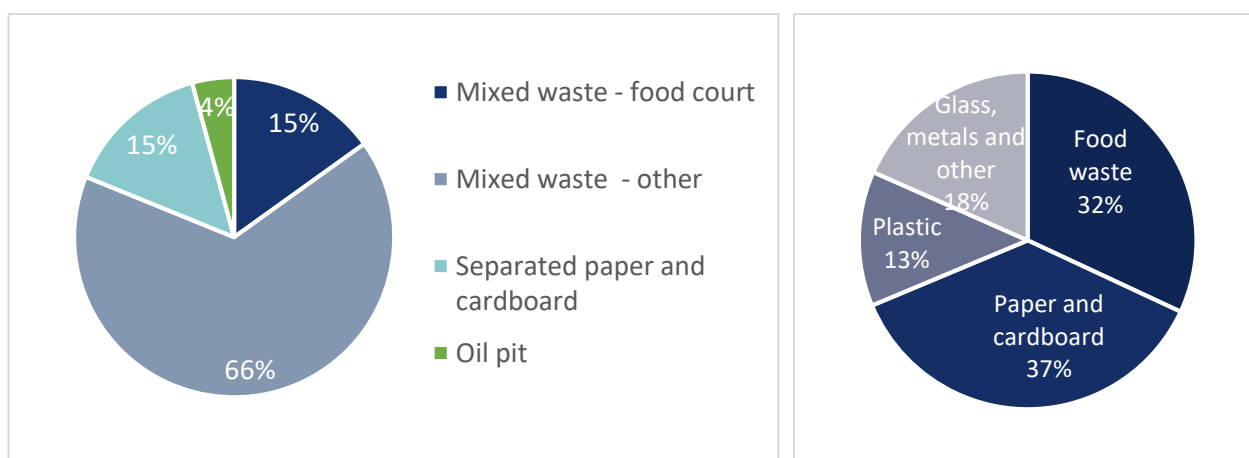


Figure 23: Breakdown of waste quantities per collection source (left), breakdown of the food court waste per type of waste (right)

Capital goods

Represent 0.9% of total emissions

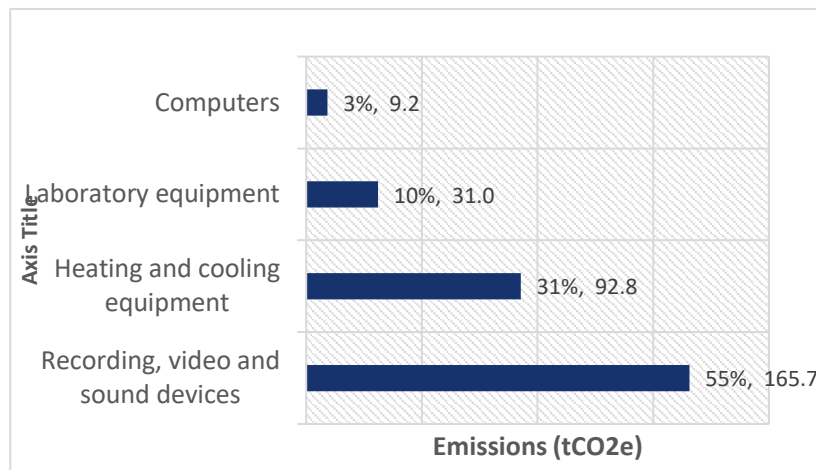


Figure 24: Capital goods emissions by source (tCO2e)

Recording, video and sound devices represent around 56% of capital goods emissions, followed by the purchase of heating and cooling equipment (31%).

All emissions were based using the spend-based method.

Comparison with other universities

Comparability

The carbon footprint of the University of Haifa was compared to other universities based on a study by Helmers et al. (2021), which surveyed available information on the carbon footprint of 21 universities across the world (Helmers, Chang and Dauwels, 2021).

It should be noted that carbon footprints cannot be compared across universities on the basis of scopes 1, 2 and 3. For example, large universities sometimes run their own power plants, shifting the emissions related to electricity consumption from scope 2 to scope 1. And each university does not include the same categories in their scope 3, as this scope encompasses a great variety of emissions sources.

Consequently, the comparison was performed on “impact” categories instead of scopes, taking into account those impact categories that were included in the analyses for other universities:

- Energy, which includes emissions related to electricity and heat
- Mobility, which includes emissions related to transport, campus vehicles, staff and student commuting, business trips (domestic and international).
- Further impacts, which include emissions related to fresh and wastewater, office supplies, chemicals and detergents, waste.

Taking into account **only** these impact categories, the following comparison considered an “adjusted” carbon footprint of the University of Haifa, which totaled 27,326 tCO₂e. This means that 83% of the total emissions from the University of Haifa (32,769 tCO₂e) were included in the comparability analysis, the rest being out of the scope of the other universities’ carbon footprint analyses.

It should be noted that due to differences in data availability and accuracy for various emissions sources, it is difficult to accurately compare emissions between universities.

Results

Ranking of the University of Haifa

In view of the differences between universities – for example, in terms of number of students and personnel – the comparison between universities was based on the impact categories’ total emissions per constructed area and per capita.

The University’s 2019 emissions – again, adjusted to exclude categories not accounted for by other universities – were 1.4 tCO₂e / capita, and 156 kgCO₂ / m².

That ranks the University 11th best when considering the emissions per capita (the University of Haifa emits 90% more than the lowest emissions per capita – which is achieved by the University of Luneburg, Germany), and 12th best when considering the emissions per constructed area (the University of Haifa emits 231% more than the lowest emissions per m² – which is achieved by the ETH of Zurich, Switzerland).

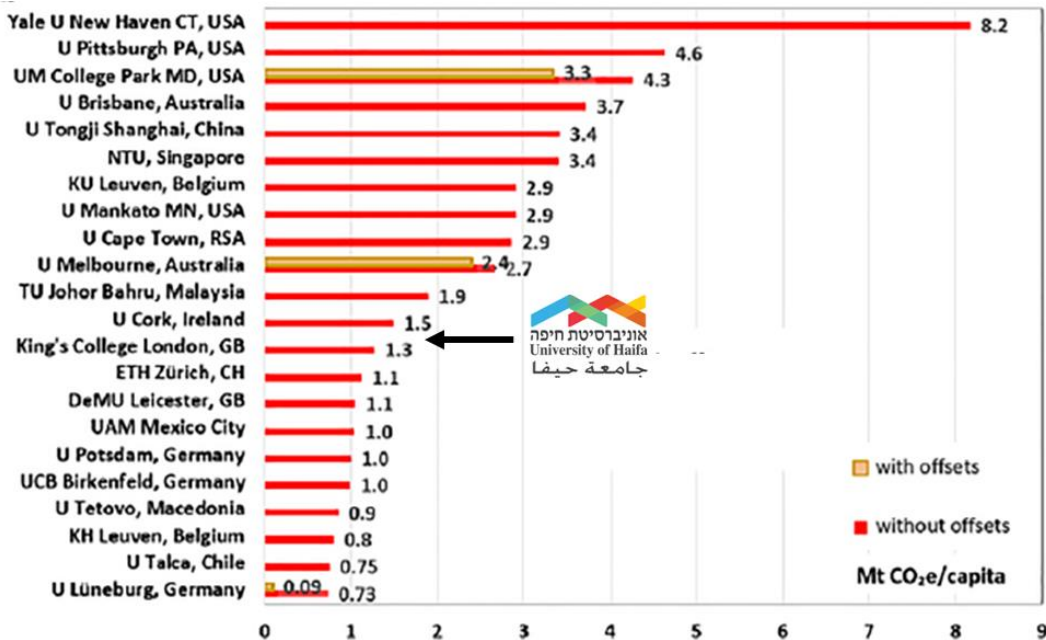


Figure 25: Universities ranking – Emissions per capita (tCO₂e / capita)

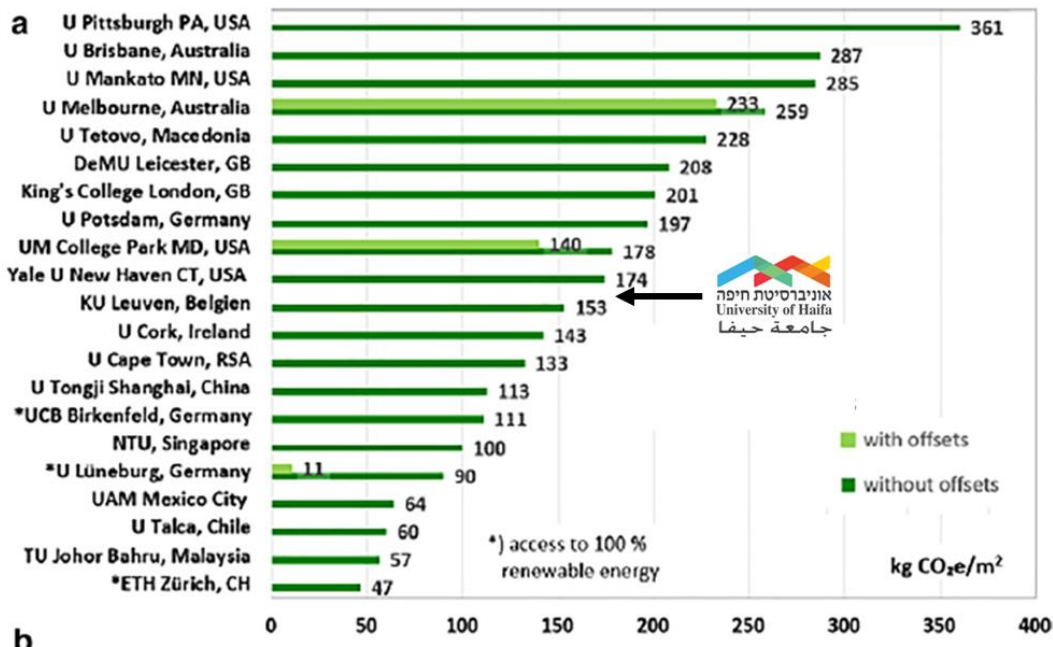


Figure 26: Universities ranking – Emissions per constructed area (tCO₂e / m²)

Distribution patterns of GHG emissions

- Emissions from energy constitute 40% of total emissions, which is slightly below most of the universities included in the comparison (the energy share average of 18 universities¹⁰ is around 50%). Three out of the seven universities with an energy share below 36%, benefit from 100% renewable electricity production. Further analysis would be required to understand the reasons behind the low share of energy-related emissions in the other four.
- Emissions from mobility constitute 55% of total emissions, which is in the average range of the other universities (11 universities have a mobility share below 50% while the other 7 are above). Difference between universities can be explained by the location of the campuses (being in the city is limiting somewhat the student and staff commuting distance while shifting more students to public transport).
- Emissions due to waste generation (indicated in “further impacts” which accounts for 5% of total emissions) is in the upper-range of other universities’ value. This might be explained by the fact that the other universities are all located in developed countries where landfilling is not the main waste treatment method, and in some cases is not used at all (indeed, landfilling of mixed waste is prohibited in most European countries).

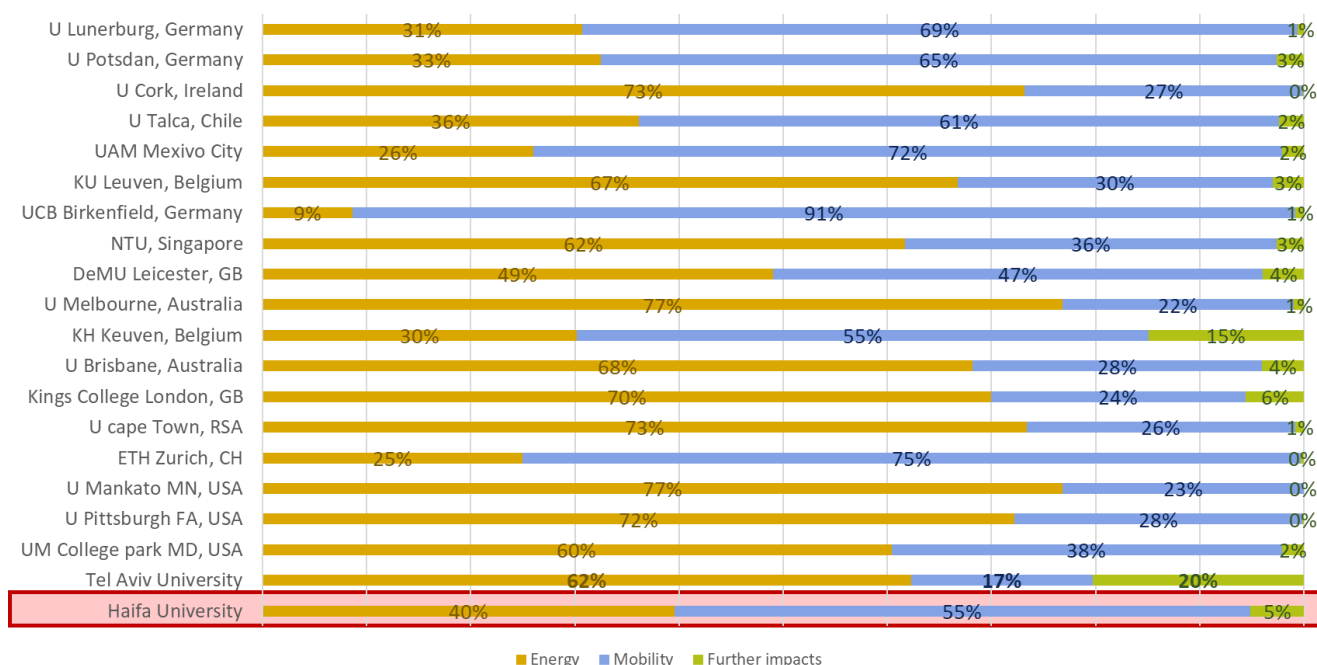


Figure 27: Distribution pattern of impact categories emissions across universities

¹⁰ Only 18 universities out of the 21 mentioned in the article had detailed information to evaluate their carbon footprint according to the impact categories.

Conclusions

The total 2019 emissions of the University of Haifa amounted to 32,769 tCO₂e, which is equivalent¹¹ to:



160 million
kilometers travelled
by a gasoline car



37,600 round-trip
flights Tel Aviv - New
York



0.041% of Israel's total
emissions (2019)

Student and staff commuting was the main emissions source (43.7% of the total), followed by electricity consumption (25%), and purchase of goods and services (10.1%). Fuel consumption and fuel and-energy related activities combined were responsible of 8.4%.

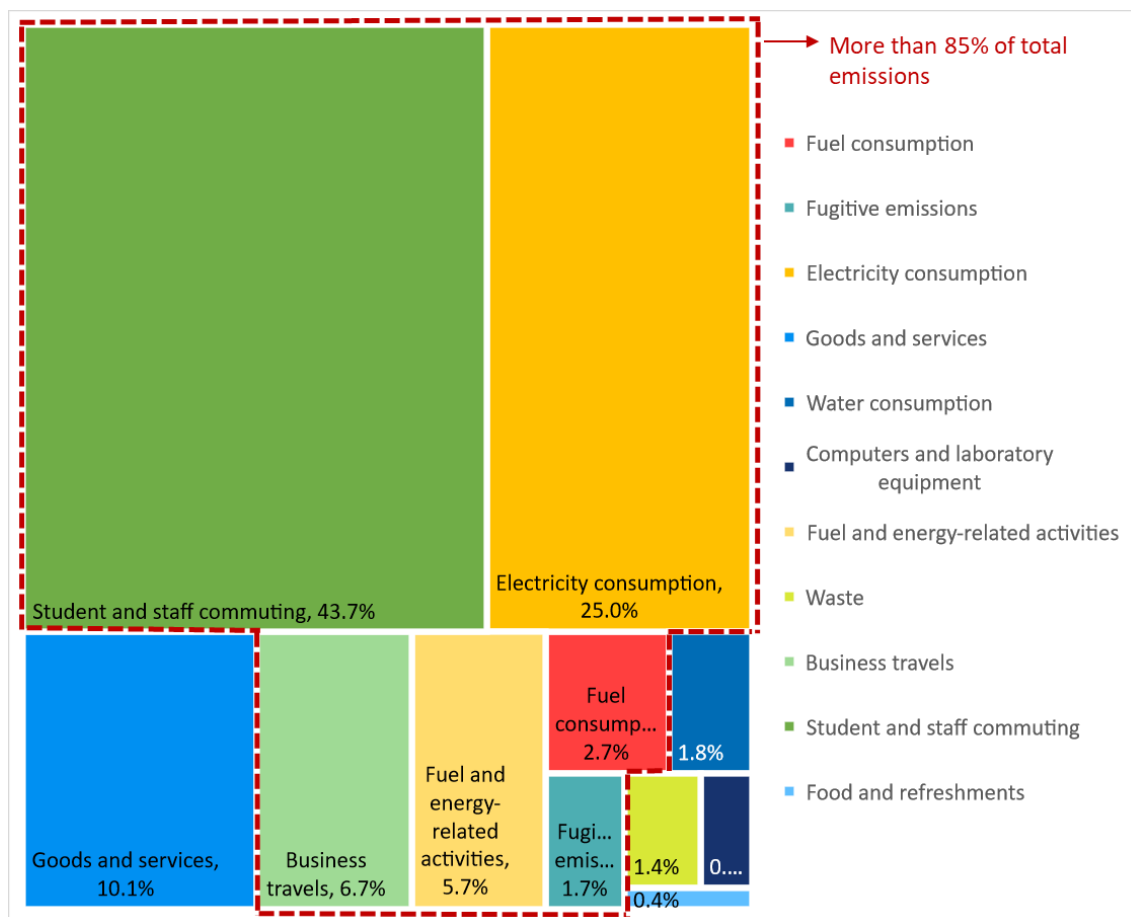


Figure 28: Summary of main emissions source of the University of Haifa.

¹¹ References of equivalence:

- Car: 0.205 kgCO₂e / km / car using gasoline (based on Fuel efficiency 2014, Assessment of Greenhouse Gas Emission Reduction Potential and Recommended National Target for Israel and CBS emission factor)
- Round trip Tel Aviv – New York: 0.871 tCO₂e / passenger ((International Civil Aviation Organization (ICAO), no date)
- Israel total emissions in 2019: 79,044,644 tCO₂e (CBS, 2021)

The identification of the main emissions sources provides a basis on which to focus future efforts to reduce GHG emissions. As such, future mitigation measures should deal with those sources that account for more than 85% of the university emissions:

- Measures to optimize and save energy as well as the generation of renewable energy via solar PV or biogas would be essential to reduce electricity consumption and its associated emissions.
- Promoting public transportation for students could potentially reduce part of the emissions due to their commuting (80% of student commuting emissions is due to car use). However, further analysis is required to understand better the current breakdown of staff and student means of arrival, as the emissions calculations were based on national average.
- Reduction of international business travels would also impact the total GHG emissions, as it represents 6.7%.
- Measures to reduce direct emissions, due to fuel consumption and fugitive emissions from refrigerants, would impact the total GHG emissions to a lesser extent, as these sources represent only 2.7% and 1.7% of total emissions, respectively.
- Although the emissions due to the purchase of goods and services is high, they relate to the basic functioning of the University and it would require further sub-categorization and analysis on the data to be able to reduce the emissions related to this category.

Finally, it is worth noting that although the emissions due to the University's investments were not estimated due to a lack of detailed data availability, the significance of the proposition to divest from high-environmental impact companies should not be overlooked, as it would position the University of Haifa in line with a key global abatement effort. Indeed, divesting has gained momentum in recent years – as of mid-2021, more than 1,300 institutional investors and institutions worth nearly USD 15 trillion had committed to divest partially or fully from fossil fuel-related assets, up 36% from USD 11 trillion in 2019.

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Annex 1. Scope 3 categories' description

Upstream scope 3 emissions

Category	Category description
1. Purchased goods and services	<ul style="list-style-type: none"> Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 - 8
2. Capital goods	<ul style="list-style-type: none"> Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year
3. Fuel- and energy-related activities (not included in scope 1 or scope 2)	<ul style="list-style-type: none"> Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2, including: <ol style="list-style-type: none"> Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company) Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company) Transmission and distribution (T&D) losses (generation of electricity, steam, heating and cooling that is consumed (i.e., lost) in a T&D system) – reported by end user Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users) – reported by utility company or energy retailer only

Upstream scope 3 emissions

Category	Category description
4. Upstream transportation and distribution	<ul style="list-style-type: none"> • Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company) • Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company)
5. Waste generated in operations	<ul style="list-style-type: none"> • Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company)
6. Business travel	<ul style="list-style-type: none"> • Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company)
7. Employee commuting	<ul style="list-style-type: none"> • Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)
8. Upstream leased assets	<ul style="list-style-type: none"> • Operation of assets leased by the reporting company (lessee) in the reporting year and not included in scope 1 and scope 2 – reported by lessee

Downstream scope 3 emissions

Category	Category description
9. Downstream transportation and distribution	<ul style="list-style-type: none"> Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company)
10. Processing of sold products	<ul style="list-style-type: none"> Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers)
11. Use of sold products	<ul style="list-style-type: none"> End use of goods and services sold by the reporting company in the reporting year
12. End-of-life treatment of sold products	<ul style="list-style-type: none"> Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life
13. Downstream leased assets	<ul style="list-style-type: none"> Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in scope 1 and scope 2 – reported by lessor

Category	Category description
14. Franchises	<ul style="list-style-type: none"> Operation of franchises in the reporting year, not included in scope 1 and scope 2 – reported by franchisor
15. Investments	<ul style="list-style-type: none"> Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2