

- [2] Moderate impact (supporting 3–5 SDGs)
- [3] Significant impact (supporting 6–9 SDGs)
- [4] High impact (supporting 10–13 SDGs)
- [5] Very high impact (supporting 14–17 SDGs)

Evidence is required

2. Energy and Climate Change (EC)

The university's attention to the use of energy and climate change issues is the indicator with the highest weighting in this ranking. In our questionnaire, we define several indicators for this area of concern, i.e., energy-efficient appliances usage, the implementation of smart buildings/automation buildings/intelligent buildings, renewable energy usage policy, total electricity usage, energy conservation programs, elements of green buildings, climate change adaptation and mitigation programs, greenhouse gas emission reductions policy, and carbon footprint. Within these indicators, the universities are expected to increase their efforts in energy efficiency in their buildings and to care more about nature and energy resources.

2.1. Energy efficient appliances usage (EC.1)

Please compare the number of energy-efficient appliances and the number of conventional ones used on your campus and provide them in percentages. Examples of energy-efficient appliances are A/C with environmentally friendly technology, LED light bulbs, Energy Star-certified computers, etc. The evidence provided may also include campus maps showing the location, area size, or distribution of facilities relevant to the indicators. Please select one of the following options:

- [1] < 1%
- [2] 1 - 25%
- [3] > 25 - 50%
- [4] > 50 - 75%
- [5] > 75%

Evidence is required

2.2. Total campus' smart building area (m²)

Please provide the information on the total area (including ground floors and other floors) of your university smart buildings on your campus. A building that is classified as a smart building must have the general requirements of smart building features: automation, safety (physical security, presence sensors, video surveillance/CCTV), energy, water (sanitation), indoor environment (thermal comfort and air quality), and lighting (Illumination, low power lighting). An example of detailed general requirements can be found in **Appendix 3** and the **template of evidence**. We expect that your smart buildings are supported with **Building Management System (BMS)/Building Information Modelling (BIM)/Building Automation System (BAS)/Facility Management System (FMS)** and are equipped with at least 5 (five) of the remaining identified requirements, where possible, interfaced with the BMS/BIM/BAS/FMS. BMS/BIM/BAS/FMS, which is a hardware and software system for data collection, management, control, and monitoring of the mechanical and/or electrical systems of the building, for example, ventilation, hydraulic, lighting systems, electro-motor force, security systems, fire prevention. All features should be established to generate a beneficial environmental impact over the building lifecycle. The efficiency introduced by the usage of smart appliances in the building(s) should be elaborated on an annual sustainability report.

2.3. Smart building implementation (EC.2)

Please provide the stage of smart building implementation in your university (percentage of the total floor areas of the smart building to the total all floor building areas (smart and non-smart building area)). The evidence provided may also include campus maps showing the location, area size, or distribution of facilities relevant to the indicators.

Formula: $((2.2/1.7) \times 100\%)$

Please select one of the following options:

- [1] < 1%
- [2] 1 - 25%
- [3] > 25 - 50%
- [4] > 50 - 75%
- [5] > 75%

Evidence is required

2.4. Number of renewable energy sources on campus (EC.3)

The availability of more sources of renewable energy is considered to indicate that a university has put more effort into providing alternative energy. Please select the number of renewable energy sources used on your campus:

- [1] None
- [2] 1 source
- [3] 2 sources
- [4] 3 sources
- [5] > 3 sources

2.5. Renewable energy sources and their amount of the energy produced (in kilowatt-hour)

Please select one or more of the following alternative energy sources used on your campus and please provide the amount of the energy produced in kilowatt-hours. The evidence provided may also include campus maps showing the location, area size, or distribution of facilities relevant to the indicators. If you have other sources of renewable energy, you may include and explain them in the evidence.

- [1] None
- [2] Bio diesel (provide amount in kilowatt-hour)
- [3] Clean biomass (provide amount in kilowatt-hour)
- [4] Solar power (provide amount in kilowatt-hour)
- [5] Geothermal (provide amount in kilowatt-hour)
- [6] Wind power (provide amount in kilowatt-hour)
- [7] Hydropower (provide amount in kilowatt-hour)
- [8] Combine Heat and Power (provide amount in kilowatt-hour)

Evidence is required

Note:

- **Bio diesel:** Bio diesel is a renewable energy source made from natural oils and fats, typically used as an alternative to traditional diesel fuel in transportation and machinery.
- **Clean biomass:** Clean biomass refers to organic materials, such as wood, agricultural residues, or algae, used to produce energy through combustion or biochemical processes, with minimal environmental impact.
- **Solar power:** Solar power harnesses energy from the sun using photovoltaic cells or solar thermal systems to generate electricity or heat.
- **Wind power:** Wind power generates electricity by using wind turbines to convert the kinetic energy from wind into electrical energy.
- **Hydropower:** Hydropower, or hydroelectric power, generates electricity by using the energy of moving water, typically from rivers or dams, to drive turbines.
- **Combine Heat and Power:** Combined Heat and Power (CHP) systems simultaneously produce electricity and useful heat from the same energy source, improving overall energy efficiency.

2.6. Electricity usage per year (in kilowatt hours)

Please provide the total energy used in the last 12 months in your entire university area (in kilowatt hours or kWh) for all purposes such as lighting, heating, cooling, running university laboratories, etc.

Evidence is required

2.7. Total electricity usage divided by total campus' population (kWh per person) (EC.4)

Please provide the total electricity usage divided by the total campus' population.

Formula: (2.6) / (1.12+1.14)

Please select one of the following options:

- [1] ≥ 2400 kWh
- [2] $> 1500 - 2400$ kWh
- [3] $> 600 - 1500$ kWh
- [4] $\geq 250 - 600$ kWh
- [5] < 250 kWh

2.8. The ratio of renewable energy production divided by total energy usage per year (EC.5)

Please provide the ratio of renewable energy production divided by the total energy usage per year. Please select one of the following options:

- [1] $\leq 0.5\%$
- [2] $> 0.5 - 1\%$
- [3] $> 1 - 2\%$
- [4] $> 2 - 25\%$
- [5] $> 25\%$

Evidence is required

2.9. Elements of green building implementation as reflected in all buildings (EC.6)

Please provide information on the elements of green building implementation as reflected in all buildings. (i.e., natural ventilation, full natural daylighting, the existence of a building energy manager, the existence of a Green Building, etc.). Green Building elements classification can be found in Appendix 2 and the template of evidence. The evidence provided may also include campus maps showing the location, area size, or distribution of facilities relevant to the indicators. Please select one that applies from the following list:

- [1] None. Please select this option if there is no green building implementation at your university.
- [2] 1 element
- [3] 2 elements
- [4] 3 elements
- [5] > 3 elements

Evidence is required

2.10. Greenhouse gas emission reduction program (EC.7)

Please select a condition that reflects the current condition of your university in providing formal programs (from any scope) to reduce greenhouse gas emissions. The evidence provided may also include campus maps showing the location, area size, or distribution of facilities relevant to the indicators. Please select from the following options:

- [1] None. Please select this option if the reduction program is needed, but nothing has been done.
- [2] Program in preparation
- [3] Program(s) aims to reduce one out of three scopes emissions (Scope 1 or 2 or 3)
- [4] Program(s) aims to reduce two out of three scopes emissions (Scope 1 and 2 or Scope 1 and 3 or Scope 2 and 3)
- [5] Program(s) aims to reduce all three scopes emissions (Scope 1, 2, and 3)

Evidence is required

Please use Table 4 to answer question 2.10 on GHG emissions in your university.

Table 4 List of greenhouse gas emission sources (Woo & Choi, 2013)

	Emission data	Definition
Scope 1	Stationary combustion	Stationary combustion refers to the burning of fuels to produce electricity, steam, and heat in a fixed location, such as boilers, burners, heaters, kilns, and engines.
	Mobile combustion	Burning of fuels by institution-owned transportation devices
	Process emissions	Direct greenhouse gas (GHG) emissions from physical or chemical processes rather than from fuel combustion
	Fugitive emissions	Hydrofluorocarbon releases during the use of refrigeration and air conditioning equipment and methane leakage from natural gas transport
Scope 2	Purchased electricity	Indirect GHG emissions result from the generation of the electricity purchased and used by the institution
Scope 3	Waste	Indirect GHG emissions resulting from the incineration or landfill of your institution's solid waste
	Purchased waste	Indirect GHG emissions resulting from the generation of water supply purchased and used by the institution
	Commuting	Indirect GHG emissions resulting from regular commuting from and to institutions by students and employees (i.e., reducing regular commuting by using shared vehicles, carpooling)
	Air travel	Indirect GHG emissions resulting from air travels paid by institutions (i.e., reducing the number of staff air travel opportunities)

2.11. Total carbon footprint (CO₂ emission in the last 12 months, in metric tons)

Please provide the total carbon footprint of your university. Please exclude carbon footprints from flights and secondary carbon sources, such as dishes and clothes. To calculate your university carbon footprint, please refer to **Appendix 4**.

Evidence is required

2.12. Total carbon footprint divided by total campus' population (metric tons per person) (EC.8)

Please provide the total carbon footprint divided by the total campus population.

Formula: (2.11)/(1.12+1.14)

Please select one of the following options:

- [1] ≥ 2.05 metric tons
- [2] > 1.11 - 2.05 metric tons
- [3] > 0.42 - 1.11 metric tons
- [4] > 0.10 - 0.42 metric tons
- [5] < 0.10 metric tons

2.13. Number of innovative program(s) in energy and climate change (EC.9)

Please provide the total number of innovative program(s) in energy and climate change, i.e. (Smart Indoor Health and Comfort System, new energy approach, new climate change mitigation problem solutions, etc). Innovative programs are defined as those created and developed by the university, leading to new approaches or solutions in energy use, climate change mitigation, or sustainability efforts. This includes novel

technologies, patented inventions, campus-specific products, or recognized discoveries that directly contribute to energy efficiency or climate change solutions. Note that technologies or products purchased from external manufacturers (e.g., factory-made devices or systems) do not qualify. Only those developed by the university itself, with recognition, intellectual property rights (such as patents, copyrights, or inventions) are considered as innovative. Please select one of the following options:

- [1] None
- [2] 1 program
- [3] 2 programs
- [4] 3 programs
- [5] More than 3 programs

Evidence is required

2.14. Impactful university program(s) on climate change (EC.10)

Please select program(s) on climate change risks, impacts, mitigation, adaptation, impact reduction, and early warning. Supporting evidence must include the training materials and a list of participants. Please select one of the following options:

- [1] None
- [2] Program in preparation
- [3] Provide training, educational materials, seminars/conferences, and activities which are implemented by surrounding communities.
- [4] Provide training, educational materials, seminars/conferences, and activities which are implemented by communities at the national level.
- [5] Provide training, educational materials, seminars/conferences, and activities which are implemented by communities at the international level.

Evidence is required

2.15. Planning, implementation, monitoring and/or evaluation of all programs related to Energy and Climate Change through the utilization of Information and Communication Technology (ICT) (EC.11)

Please provide information regarding planning, implementation, monitoring, and/or evaluation of all programs related to energy and climate change through the utilization of ICT on campus. We recommend dashboard to input EC data. Please select one of the following options

- [1] None
- [2] The program is currently in the planning stage
- [3] Program has been implemented
- [4] Program has been implemented and evaluated
- [5] Program has been implemented, evaluated, and is currently revised

Evidence is required

2.16. Impact of Energy and Climate Change programs in supporting the Sustainable Development Goals (SDGs).

Please indicate the extent to which your university's Energy and Climate Change (EC) programs contribute to the achievement of the UN Sustainable Development Goals (SDGs). Select the option that best reflects the number of SDGs directly supported by these programs. Please select one of the following options

- [1] Low impact (supporting 1–2 SDGs)
- [2] Moderate impact (supporting 3–5 SDGs)
- [3] Significant impact (supporting 6–9 SDGs)
- [4] High impact (supporting 10–13 SDGs)
- [5] Very high impact (supporting 14–17 SDGs)

Evidence is required