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1. What is UI GreenMetric World University Rankings?

Universitas Indonesia (UI) initiated world university rankings in 2010, later known as UI GreenMetric World University Rankings, to measure campus sustainability efforts. It was intended to create an online survey to portray sustainability policies programs and in universities around the world.

We based the rankings broadly on the conceptual framework of Environment, Economy, and Equity. The ranking indicators and categories are intended to be relevant to all. We have designed the indicators and weightings to be as free of bias as possible. The work of collecting and submitting data is relatively straightforward and requires reasonable staff time. Ninety-five universities from 35 countries took part in the 2010 version of UI GreenMetric: 18 from America, 35 from Europe, 40 from Asia and 2 from Australia. In 2018, 719 universities from 81 countries around the world participated. This shows that UI GreenMetric has been recognized as the first and only world university rankings on sustainability.

Our theme this year is “Sustainable University in a Changing World: Lessons, Challenges and Opportunities”. We would like to focus on universities’ effort to work together with their partners in sustainable issues. We look into details of universities’ effort and impacts to improve campus sustainability and Sustainability Development Goals.

2. What are the objectives?

The rankings aim to:

- Contribute to academic discourses on sustainability in education and the greening of campus.
- Promote university-led social change with regard to sustainability goals.
- Be a tool for self-assessment on campus sustainability for higher education institutions (HEIs) around the globe.
- Inform governments, international and local environmental agencies, and the society about sustainability programs on campus.

3. Who can participate?

All universities in the world with a strong commitment to sustainability issues can participate in the annual UI GreenMetric World University Rankings.

4. What are the benefits?

Universities that participate in UI GreenMetric ranking by submitting their data can expect to enjoy a number of benefits such as internationalization and recognition, increased awareness of sustainability issues, social change and action, and networking. Registration is free of charge.

a. Internationalization and recognition

Participation in UI GreenMetric can help the university’s efforts in internationalization and recognition by getting its sustainability efforts on the global map. Participation in UI GreenMetric can result in an increase of hits to the university website, more mentions of the institution relative with the issues of sustainability on web pages, and more correspondence with institutions interested in the university.

b. Increasing awareness of sustainability issues

Participation can help to increase awareness in the university and beyond about the importance of sustainability issues. The world faces unprecedented global challenges such as population trends, global warming, overexploitation of natural resources, oil-dependent energy, water and food shortages and sustainability. We realize that higher education has a crucial role to play in addressing these challenges. UI GreenMetric leverages the crucial role that HEIs can play in raising awareness by doing an assessment and comparing efforts in education for sustainable development, sustainability research, campus greening, and social outreach.

c. Social change and action

UI GreenMetric is primarily about awareness raising, but in the future, it will be adapted to encourage concrete change. It is crucial that understanding move forward to action to address emerging global challenges.

d. Networking

All participants of UI GreenMetric are automatically members of UI GreenMetric World University Rankings Network (UIGWURN). In this network, participants can share their best practices in sustainability programs as well as networking with other participants worldwide by attending the annual UI GreenMetric International Workshop and regional/national workshops hosted by approved host universities. Participants can also arrange technical workshops on UI GreenMetric at their respective universities.

As a platform to turn sustainability issues into action, the network is managed by UI GreenMetric as the secretariat. Programs and directions are proposed and decided by the steering committee comprising the UI GreenMetric secretariat, regional, and national coordinators.

Currently, the network comprises 719 participating universities located in the dynamic and diverse Asia, Europe, Africa, Australia, America and Oceania, 1.997.294 faculty members, 16.413.522 students, with more than US\$ 7.529.219.073 total research funds on environment and sustainability.

5. How can universities participate?

To participate in the ranking is simple. The sustainability director or other persons in charge can visit www.greenmetric.ui.ac.id to learn about the ranking and if interested can e-mail the UI GreenMetric secretariat (greenmetric@ui.ac.id) to get an invitation letter and access to the system. If you have already participated in the rankings, you will be sent an invitation to participate. If you decide not to participate due to particular reasons, it would be appreciated if you inform the secretariat. Of course, you can join the survey again in the future. It is always useful if your university appoints a person in charge of a contact person. You are welcome to contact the secretariat for any inquiries regarding the survey.

6. How was UI GreenMetric World University Ranking developed?

The decision to establish UI GreenMetric was influenced by a number of factors:

a. Idealism

Future challenges to civilization include population pressure, climate change, energy security, environmental degradation, water and food security and sustainable development. Despite many scientific researches and public discussions, governments around the world have yet to commit to a sustainable agenda. Concerned people at Universitas Indonesia have come to the idea that universities have a privilege to help develop a consensus on key areas for action. They include such concepts as the Triple Bottom Line, the 3 Es (Equity, Economy, Environment),

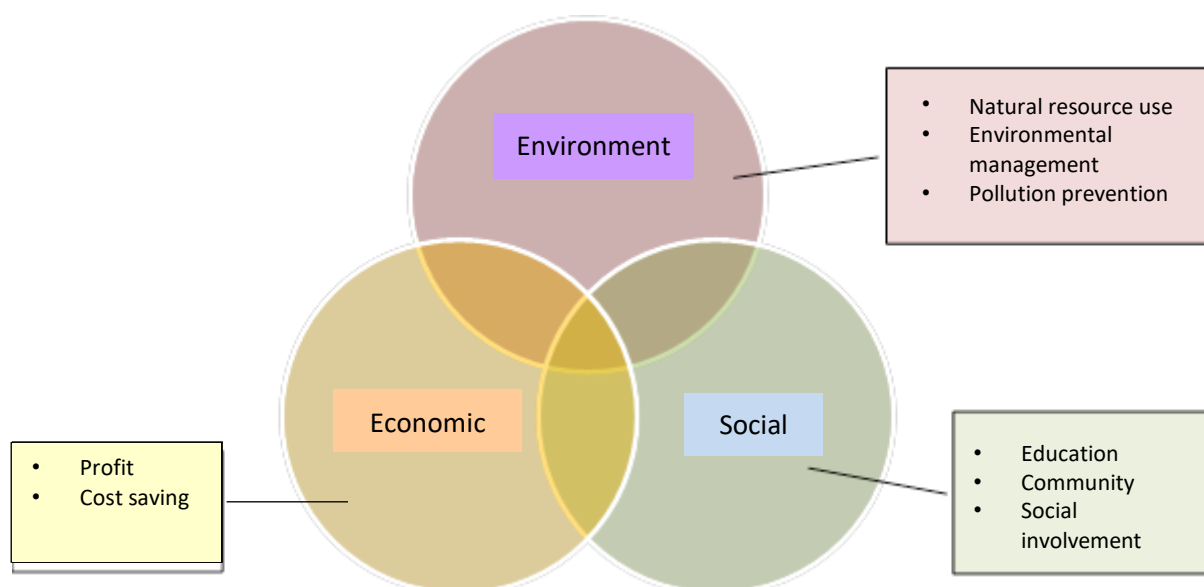
Green Building, and Education for Sustainable Development (ESD).

UI GreenMetric World University Rankings serves as a tool for universities to deal with sustainability challenges our world is facing. Universities can work together to reduce negative environmental impacts. UI GreenMetric is a nonprofit institution; therefore, many universities can participate for free.

b. UI GreenMetric World University Rankings model

Although UI GreenMetric was not based on any existing ranking system, it was developed with an awareness of a number of existing sustainability assessment systems and academic university rankings. Sustainability systems that were referred to during the design phase of UI GreenMetric included the Holcim Sustainability Awards, GREENSHIP (the rating system recently developed by the Green Building Council of Indonesia which was based on the Leadership in Energy and Environmental Design (LEED) system used in the U.S. and elsewhere), the Sustainability, Tracking, Assessment and Rating System (STARS) and the College Sustainability Report Card (also known as the Green Report Card).

In general, the instrument adopts environmental sustainability concept that has three elements, i.e. environmental, economic, and social (Figure 1). The environmental aspect includes natural resource use, environmental management, and pollution prevention, whereas the economic aspect includes profit and cost saving. The social aspect includes education, community, and social involvement. These three aspects are captured in the UI GreenMetric criteria.



In addition, university academic ranking systems that were studied during the design phase of UI GreenMetric included: The *Times Higher Education World University Rankings* (THE) sponsored by Thompson Reuters, the *QS World University Rankings*, the *Academic Ranking of World Universities* (ARWU) published by Shanghai Jiao Tong University (SJTU), and the *Webometrics Ranking of World Universities* (Webometrics) published by Cybermetrics Lab, CINDOC-CSIC in Spain. UI has been one of the members of the International Ranking Expert Group (IREG) Observatory since 2011.

During the early stages of the design of UI GreenMetric assistance was sought on the issues from experts in both ranking and in sustainability. These included the holding of a conference on university ranking and video conferences as well as expert meetings on sustainability and green building. The latest expert workshop on UI GreenMetric was held on 14 - 16 April 2019 at University College Cork, in which rectors and representatives from

the following universities shared their experiences: University College Cork, Ireland; Universidade do Minho, Portugal; Mahidol University, Thailand; University of Turin, Italy; Universidad Nacional de Colombia, Colombia; University of Nottingham, UK; Umwelt - Campus Birkenfeld, Germany; Miguel Hernández of Elche University, Spain; Dublin City University, Ireland; Insec U, France; Federal University of Santa Catarina, Brazil; University of Sao Paulo (USP), Brazil; King Mongkut's University of Technology Thonburi, Thailand; University of Groningen, Netherland; Universidad Autónoma de Occidente, Colombia; Universiti Utara Malaysia, Malaysia; Université de Sherbrooke, Canada; Escuela Superior Politécnica De Chimborazo, Ecuador; University of Milan-Bicocca, Italy; Bogor Agricultural University (IPB), Indonesia; National Pingtung University of Science and Technology, Chinese Taipei; Shinshu University, Japan; Wageningen University & Research, Netherland; King Abdulaziz University, Saudi Arabia; Università di Bologna, Italy; Chulalongkorn University, Thailand; Universidad de Alicante, Spain; Al-Zaytoonah University of Jordan, Jordan; Universitas Sumatera Utara, Indonesia; Srinakharinwirot University, Thailand; University of Valladolid, Spain; University of Central Punjab, Pakistan; Chaoyang University of Technology, Chinese Taipei; National Cheng Kung University, Chinese Taipei; Universitas Gadjah Mada, Indonesia; Siam University, Thailand; Roma Tre University, Italy; Universitat Politècnica de Valencia, Spain; University of Chieti and Pescara, Italy; RUDN University, Russia, National Pingtung University of Science and Technology, Chinese Taipei; University of Zanjan, Iran; and National Chi Nan University, Chinese Taipei.

In 2010, 23 indicators were used within the five categories to calculate the ranking scores. In 2011, 34 indicators were used. Then in 2012, the indicator of “smoke-free and drug-free campus environment” was removed and 33 indicators were used to evaluate the green campus. In 2012, the indicators were also categorized into 6 categories including the education criteria. One change being considered was the formation of a new category for sustainability education and research. In 2015, the theme was the carbon footprint. We added two questions related to this issue in the energy and climate change section. We also improved our methodology by adding a few sub-indicators that were related to water and transportation in the 2015 ranking. A major change in methodology was done in 2017 by considering new trends in sustainability issues. In 2018, the theme was Universities, Impacts, and Sustainable Development Goals (SDGs). We added detailed answer options to the following indicators: total area on campus covered in forest, planted vegetation, water absorption besides forest and planted vegetation, energy efficient appliances usage, smart building implementation, ratio of renewable energy produce/production towards total energy usage per year, elements of green building implementation, greenhouse gas emission reduction program, all of waste and water criteria, ratio of parking area to total campus area, transportation initiatives to decrease private vehicles on campus, transportation program designed to limit or decrease the parking area on campus, shuttle services, Zero Emission Vehicles (ZEV) and pedestrian policy on campus, and the existence of a university-run sustainability website. We also added a new question on Education Criteria, i.e existence of published sustainability report. We changed the question of the bicycle into Zero Emission Vehicles by considering the green transportation related to universities worldwide. What is new in 2019 questionnaire is changes in the options for answers and more explanation about smart building indicators.

c. Realities and challenges

The goal of creating a world university sustainability ranking was done with an understanding that the diversity of types of universities, their missions and their contexts would pose problems for the methodology. In particular, we are fully aware of the fact that universities differ with regard to their levels of awareness and commitment to sustainability, their budgets, the amount of green cover on their campus and many other dimensions. These issues are complex, but UI GreenMetric is committed to continually improving the ranking so that it will be both useful and fair to all.

7. Who is the team?

UI GreenMetric World University Rankings is managed by a team under the Rector of Universitas Indonesia. The team members come from various academic backgrounds and experiences, such as Environmental Sciences, Engineering, Architecture and Urban Design, Computer Engineering, Dentistry, Public Health, Statistics, Chemistry, Physics, Linguistics and Cultural Studies.

8. What is the methodology?

a. The criteria

This year's categories and weighting of points are shown as follows.

Table 1 Categories used in the ranking and their weighting

No	Category	Percentage of Total Points (%)
1	Setting and Infrastructure (SI)	15
2	Energy and Climate Change (EC)	21
3	Waste (WS)	18
4	Water (WR)	10
5	Transportation (TR)	18
6	Education (ED)	18
	TOTAL	100

The specific indicators and their points awarded are shown in Table 2. Each indicator has been uniquely identified by a category code and a number (e.g. SI 5).

Table 2 Indicators and categories suggested for use in the 2019 ranking

No	Categories and Indicators	Points	Weighting
1	Setting and Infrastructure (SI)		15%
SI 1	The ratio of open space area to the total area	300	
SI 2	Total area on campus covered in forest vegetation	200	
SI 3	Total area on campus covered in planted vegetation	300	
SI 4	Total area on campus for water absorption besides the forest and planted vegetation	200	
SI 5	The total open space area divided by total campus population	300	
SI 6	Percentage of university budget for sustainability efforts within a year	200	
	Total	1500	
2	Energy and Climate Change (EC)		21%
EC 1	Energy efficient appliances usage	200	
EC 2	Smart building implementation	300	
EC 3	Number of renewable energy sources in campus	300	
EC 4	The total electricity usage divided by the total campus population	300	
EC 5	The ratio of renewable energy production divided by total energy usage per year	200	

No	Categories and Indicators	Points	Weighting
EC 6	Elements of green building implementation as reflected in all construction and renovation policies	300	
EC 7	Greenhouse gas emission reduction program	200	
EC 8	The total carbon footprint divided by total campus population	300	
	Total	2100	
3	Waste (WS)		18%
WS 1	Recycling program for university waste	300	
WS 2	Program to reduce the use of paper and plastic on campus	300	
WS 3	Organic waste treatment	300	
WS 4	Inorganic waste treatment	300	
WS 5	Toxic waste treatment	300	
WS 6	Sewage disposal	300	
	Total	1800	
4	Water (WR)		10%
WR 1	Water conservation program implementation	300	
WR 2	Water recycling program implementation	300	
WR 3	Water efficient appliances usage	200	
WR 4	Treated water consumed	200	
	Total	1000	
5	Transportation (TR)		18%
TR 1	The total number of vehicles (cars and motorcycles) divided by total campus population	200	
TR 2	Shuttle services	300	
TR 3	Zero Emission Vehicles (ZEV) policy on campus	200	
TR 4	The total number of Zero Emission Vehicles (ZEV) divided by total campus population	200	
TR 5	The ratio of the parking area to total campus area	200	
TR 6	Transportation program designed to limit or decrease the parking area on campus for the last 3 years (from 2016 to 2018)	200	
TR 7	Number of transportation initiatives to decrease private vehicles on campus	200	
TR 8	Pedestrian path policy on campus	300	
	Total	1800	
6	Education and Research (ED)		18%
ED 1	The ratio of sustainability courses to total courses/subjects	300	
ED 2	The ratio of sustainability research funding to total research funding	300	
ED 3	Number of scholarly publications on sustainability	300	
ED 4	Number of events related to sustainability	300	
ED 5	Number of student organizations related to sustainability	300	
ED 6	University-run sustainability website	200	
ED 7	Sustainability report	100	
	Total	1800	

b. Scoring

Scoring for each item will be numeric so that our data can be processed statistically. Scores will be simple counts of things or responses on a scale of some sort. Details of the scoring can be found in **Appendix 1**.

c. The weighting of criteria

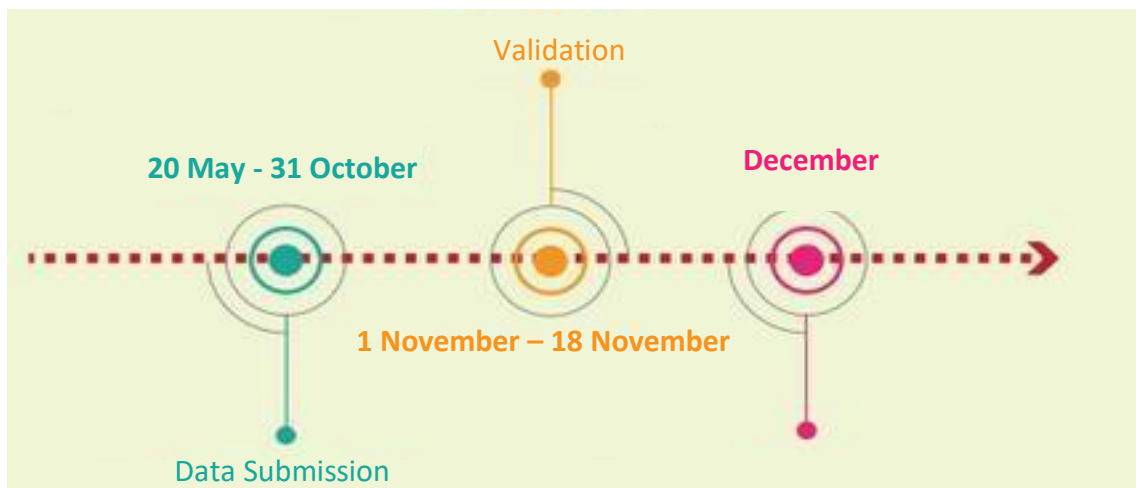
Each of the criteria will be categorized in a general class of information and when the results are processed, the raw scores will be weighted to give a final calculation.

d. Refining and improving the research instrument

While we have put every effort into the design and implementation of the questionnaire, we realize that there are bound to be shortcomings. Therefore, we will be reviewing the criteria and the weightings continuously to accommodate input from participants and state of the art developments in the field. We welcome your comments and input.

e. Data submission

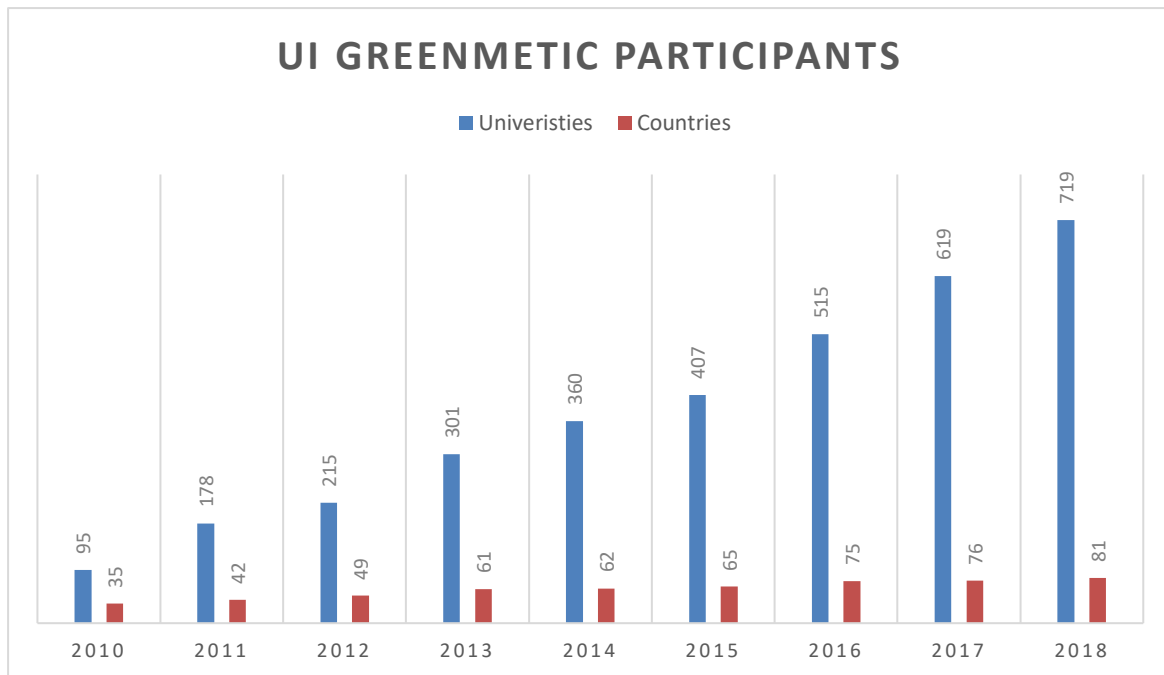
Data from the universities should be submitted through an online system between May – October 2019.



You could also email us some reports such as University Sustainability Tracking, Assessment and Rating System (STARS) report if you have one. We welcome any e-mail or hardcopy of your university sustainability evaluation and report as well as evidence on sustainability activities in your university.

f. Results

The preliminary results of the metrics are expected to be submitted in October 2019, and the final complete result will be released early December 2019.



The basic ranking results (overall rankings 2018, rankings by campus setting, rankings by country, and rankings by region) and the detailed scores can be accessed via <http://greenmetric.ui.ac.id/ranking- archive-2018/>

9. Who are our networks?

UI GreenMetric Agenda in 2019

GreenMetric
World University Rankings

Notes:

*: TBC (to be confirmed)

● IWGM ● International Conference

● UIGWURN Program ● National Workshop

- 1 **The 5th International Workshop on UI GreenMetric (IWGM)**
hosted by **University College Cork**
14-16 April | Cork, Ireland
- 2 **THE Innovation and Impact Summit 2019**
2-4 April | Daejeon, South Korea
- 3 **IREG Forum**
8-10 May | Bologna, Italy
- 4 **ISCN Conference**
11-14 June | Sao Paulo, Brazil
- 5 **General Assembly Meeting of Green University Union of Taiwan**
29 August | Chiayi, Chinese Taipei
- 6 **Building Universities Reputation Conference (BUR 2019)**
3-5 October | Piura, Peru
- 7 **CRUE Meeting 2019**
24-25 October | Oviedo, Spain
- 8 **National Workshop on Environmental for Sustainability Office 2019**
hosted by **Telkom U and University Padjajaran**
13-14 Maret | Bandung, Indonesia

- 9 **Universidad Autonoma de Occidente and ICESI University**
17-18 June | Cali, Colombia
- 10 **University of Szeged and University of Pecs***
15-16 July | Szeged, Hungary
- 11 **University of Sousse***
8-9 August | Sousse, Tunisia
- 12 **Universitas Hasanudin**
21-22 August | Makassar, Indonesia
- 13 **UIN Raden Intan Lampung**
15-16 August | Lampung, Indonesia
- 14 **Universidade Federal de Lavras – UFLA**
9-10 September | Lavras, Brazil
- 15 **RUDN University**
26 September | Moscow, Russia
- 16 **Cyprus International University**
October | Nicosia, Turkey

The idealism surrounding awareness of sustainability issues is now generating a network of like-minded organizations. The network is organized and run by UI GreenMetric World University Rankings secretariat, a steering committee consisting of national and/or regional coordinator representatives, in cooperation with universities which host UI GreenMetric World University Rankings events. In 2017, UI GreenMetric was presented in various events: the 3rd International Workshop on UI GreenMetric (IWGM), Turkey; IREG Forum, Qatar; International Campus Sustainability Network (ISCN) Conference, Canada; The 3rd General Assembly Meeting of Green, Taiwan; World Education Day 2017, China; Association for the Advancement of Sustainability in Higher Education's (AASHE) Conference & Expo, Texas; and Sustainable University Network (SUN) Conference, Thailand.

The national workshop that held in 2017 i.e. Kazakh National Agrarian University, Kazakhstan; El Bosque University, Colombia; University of Sao Paulo, Brazil; Diponegoro University, Indonesia; University of Bologna, Italy; Aalborg University, Denmark; King Abdulaziz University, Saudi Arabia; and Peoples' Friendship University of Russia, Russia.

In 2018, UI GreenMetric's progress was also presented at other various opportunities: the 4th International Workshop on UI GreenMetric (IWGM), Indonesia; IREG Forum Belgium, ISCN Conference, Sweden; CRUI Working Group on International Academic Rankings, Italy; International Association for Impact Assessment (IAIA) Conference, Malaysia; and Global Symposium on Green Campus Development, China. In the same year UI GreenMetric also presented at the National Workshop in several universities as the hosts i.e. University of Zanjan and Ferdowsi University of Mashhad, Iran; Atyrau State University, Kazakhstan; King Abdulaziz University, Saudi Arabia; Nottingham University, United Kingdom; National University of Colombia and University del Rosario, Colombia; University of Sao Paulo, Brazil; Pakistan Higher Education Commission, Pakistan; Universiti Utara Malaysia, Malaysia; Institut Teknologi Sepuluh Nopember, Indonesia; Riga Technical University, Latvia; Peoples' Friendship University of Russia, Russia; Universidad Tecnica Federico Santa Maria, Chile; and Insec U., France.

10. What are the future plans?

A new version of UI GreenMetric should be developed to take into consideration how to better achieve its own goals, how to learn from constructive criticism about rankings and the advancement of ESD, and how to learn from the diverse experience of participants with different goals and in different settings. Among the ideas under consideration for possible future innovations in the ranking are:

- Better university profiling: universities create a profile based on their unique missions, objectives, typological features and contexts.
- Category focused results: scores are provided not just as a single aggregate but separately for the main ranking categories and indicators.
- To include the social-economic aspect as an indicator, also the impact of the ranking.

11. How to contact us?

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Website: <http://www.greenmetric.ui.ac.id/>

Questionnaire (Criteria and Indicators)

There are six main categories in the questionnaire which consist of setting and infrastructure (SI), energy and climate change (EC), waste (WS), water (WR), transportation (TR) and education (ED). These categories are divided into several sections, with detailed explanations of the questions. In general, you can use the data to reflect your university in the best possible way.

1. Setting and Infrastructure (SI)

The campus setting and infrastructure information will provide the basic information of the university consideration towards a green environment. This indicator also shows whether the campus deserves to be called a Green Campus. The aim is to trigger the participating universities to provide more spaces for greenery and to safeguard the environment, as well as the development of sustainable energy.

1.1. Types of the higher education institution

Please select one of the following options:

- [1] Comprehensive
- [2] Specialized higher education institution

1.2. Climate

Please select one of the following options that clearly describe the climate in your region:

- [1] Tropical wet
- [2] Tropical wet and dry
- [3] Semiarid
- [4] Arid
- [5] Mediterranean
- [6] Humid subtropical
- [7] Marine west coast / Oceanic Climate
- [8] Humid continental
- [9] Subarctic

1.3. Number of campus sites

Please state the number of separate locations in which your university runs academic purposes. For example, if your university has one campus or more than one campus in different districts, towns or cities which are separated from one another, please state the total number of university locations.

Evidence is required

1.4. Campus setting

Please select one of the following options:

- [1] Rural
- [2] Suburban
- [3] Urban
- [4] City center
- [5] High-rise building area

Evidence is required.

1.5. Total campus area (m²)

Please state the total areas of your campus (in square meters). It is expected that the total area counted are only those in which academic activities are conducted (including the administration building, rectorate, student and staff activities building). Forest and fields and other areas can only be counted if they are used for academic purposes.

Evidence is required.

1.6. Total campus ground floor area of buildings (m²)

Please provide information of the area occupied by buildings, by providing the total area of the ground floor parts of your university buildings in your campus.

1.7. Total campus buildings area (m²)

Please provide information of the area occupied by buildings, by providing the total floor area (all floors) including ground floors and other floors of your university buildings in your campus.

1.8. The ratio of open space area to total area (SI.1)

Please provide the percentage of open space area on campus.

Formula: $((1.5-1.6/1.5) \times 100\%)$

Please select one of the following options:

- [1] $\leq 1\%$
- [2] $> 1 - 80\%$
- [3] $> 80 - 90\%$
- [4] $> 90 - 95\%$
- [5] $> 95\%$

1.9. Total area on campus covered in forest vegetation (SI.2)

Please provide the percentage of the area on campus covered in vegetation in the form of forest (an area covered mainly with big-trees and its biodiversity, natural or/and planted; a large number or dense mass of vertical growth and undergrowth for conservation purposes), owned by the university, to the total campus area. Please select one of the following options:

- [1] $\leq 2\%$ (provide total area in square meters)
- [2] $> 2 - 9\%$ (provide total area in square meters)
- [3] $> 9 - 22\%$ (provide total area in square meters)
- [4] $> 22 - 35\%$ (provide total area in square meters)
- [5] $> 35\%$ (provide total area in square meters)

Evidence is required

1.10. Total area on campus covered in planted vegetation (SI.3)

Please provide the percentage of the area on campus covered in planted vegetation **excluding** forest (including lawns, gardens, green roofs, internal planting, vertical garden can be counted; for vegetation purposes) to the total campus area. Please select one of the following options:

- [1] $\leq 10\%$ (provide total area in square meters)
- [2] $> 10 - 20\%$ (provide total area in square meters)
- [3] $> 20 - 30\%$ (provide total area in square meters)
- [4] $> 30 - 40\%$ (provide total area in square meters)
- [5] $> 40\%$ (provide total area in square meters)

1.11. Total area on campus for water absorption besides the forest and planted vegetation (SI.4)

Please provide the percentage of surfaces (e.g. soil, grass, concrete block, synthetic field, etc.) on your campus for water absorption as a percentage to the total area of the campus sites. A larger water absorption area is desirable. Please select one of the following options:

- [1] <= 2% (provide total area in square meters)
- [2] > 2 - 10% (provide total area in square meters)
- [3] > 10 - 20% (provide total area in square meters)
- [4] > 20 - 30% (provide total area in square meters)
- [5] > 30% (provide total area in square meters)

1.12. Total number of regular students

Please provide the total number of regular students (full time and part time) at your university. Regular student is defined as registered and active student at one semester (Effective Full Time Students (EFTS)), excluding short term student (e.g., foreign exchange student).

1.13. Total number of online students

The total number of students registered as online students only, at your university.

1.14. Total number of academic and administrative staff

Please state the total number of effective full-time academic staff (lecturers, professors, and researchers) and administrative staff working in your university.

1.15. The total open space area divided by total campus population (SI.5)

Please provide the open space area per person in your campus.

Formula: $((1.5-1.6)/(1.12+1.14))$

Please select one of the following options:

- [1] <= 10 m²
- [2] > 10 – 20 m²
- [3] > 20 – 40 m²
- [4] > 40 – 70 m²
- [5] > 70 m²

1.16. Total university budget (in US Dollars)

Please provide the average of university budget per annum over the last 3 years in US Dollars.

1.17. University budget for sustainability efforts (in US Dollars)

Please provide the average of university budget for infrastructure, facilities, personnel cost, and others related to the sustainability efforts per annum over the last 3 years in US Dollars.

1.18. Percentage of university budget for sustainability efforts within a year (SI.6)

Please provide the percentage calculation of sustainability budget (infrastructure, facilities, personnel cost, and others related to the sustainability efforts) to the total university budget.

Please select one of the following options:

[1] ≤ 1%

[2] > 1 - 3%

[3] > 3 - 10%

[4] > 10 - 12%

[5] > 12%

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 particular 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)

Energy efficient appliances usage includes the use of energy efficient appliances/lighting fixtures (e.g. A/C with inverter technology, LED light bulbs, computer, etc.). For example, the percentage of LED lamp used in the total building area. 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 of the total area (including ground floors and other floors) of your university smart buildings in your campus. A building that is classified as a smart building must have the general requirement of a 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 requirement can be found in **Appendix 2** and **template of evidence**. It is expected that smart buildings are supported by the presence of a **Building Management System (BMS) / Building Information Modelling (BIM) / Building Automation System (BAS) / Facility Management System (FMS)** and equipped with at least 5 of the remaining identified requirements, where possible, interfaced with the BMS/BIM/BAS/FMS. BMS/BIM/BAS/FMS 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 in 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 area of the smart building to the total all floors building area (smart and non-smart buildings area)).

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 in campus (EC.3)

Availability of more sources of renewable energy is considered to indicate that a university has put more efforts in providing alternative energy. Please select the number of renewable energy sources used in your campus:

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

2.5. Please specify renewable energy sources in campus and provide capacity produced in kilowatt hour

Please select one or more of the following alternative energy sources used in your campus and please provide the capacity of the energy produced in kilowatt-hour:

- [1] Not applicable
- [2] Biodiesel (provide capacity in kilowatt hour)
- [3] Clean biomass (provide capacity in kilowatt hour)
- [4] Solar power (provide capacity in kilowatt hour)
- [5] Geothermal (provide capacity in kilowatt hour)
- [6] Wind power (provide capacity in kilowatt hour)
- [7] Hydropower (provide capacity in kilowatt hour)
- [8] Combine Heat and Power (provide capacity in kilowatt hour)

Evidence is required.

2.6. Electricity usage per year (in kilowatt hour)

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

Evidence is required.

2.7. The 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] ≥ 2424 kWh
- [2] $< 2424 - 1535$ kWh
- [3] $< 1535 - 633$ kWh
- [4] $< 633 - 279$ kWh
- [5] < 279 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] $> 25\%$

2.9. Elements of green building implementation as reflected in all construction and renovation policies (EC.6)

Please provide information on the elements of green building implementation as reflected in the construction and renovation policies in your university (e.g. natural ventilation, full natural daylighting, the existence of building energy manager, and the existence of Green Building, etc.). Please select one that apply 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 which reflects the current condition of your university in providing formal programs (from any scope) to reduce greenhouse gas emissions. 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 (e.g. feasibility study and promotion)
- [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)

Please use Table 3 to answer question 2.10 on GHG emission in your university.

Table 3. 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 resulting 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 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 to and from institutions by students and employees
	Air travel	Indirect GHG emissions resulting from air travels paid by institutions.

2.11. Please provide the 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 footprint from flights and secondary carbon sources such as dishes and clothes. To calculate your university carbon footprint please refer to **Appendix 3**.

Evidence is required.

2.12. The 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] < 2.05 - 1.11 metric tons
- [3] < 1.11 - 0.42 metric tons
- [4] < 0.42 - 0.10 metric tons
- [5] < 0.10 metric tons

3. Waste (WS)

Waste treatment and recycling activities are major factors in creating a sustainable environment. The activities of university staff and students on campus will produce a lot of waste; therefore, some recycling and waste treatments programs should be among the concern of the university, i.e. recycling program, organic waste treatment, inorganic waste treatment, toxic waste recycling, sewage disposal, policies to reduce the use of paper and plastic on campus.

3.1. Recycling program for university waste (WS.1)

Please select a condition which reflects the current condition of your university efforts to encourage staff and students to recycle waste, from the following options:

- [1] Not applicable. Please select this option if there is no program at your university.
- [2] Partial (1 - 25% of waste)
- [3] Partial (> 25 - 50% of waste)
- [4] Partial (> 50 - 75% of waste)
- [5] Extensive (> 75% of waste)

Evidence is required.

3.2. Program to reduce the use of paper and plastic on campus (WS.2)

Please select one from the following options which best reflects the current condition of your university in establishing formal policy to reduce the use of paper and plastic (e.g. double-sided printing policy program, the use of tumblers, the use of reusable bags, print when necessary, free water distribution, policies for dematerialization of administrative procedures, etc.):

- [1] Not applicable. Please select this option if there is no program at your university.
- [2] 1 program
- [3] 2 programs
- [4] 3 programs
- [5] More than 3 programs

Evidence is required.

3.3. Organic waste treatment (WS.3)

The method of organic waste (e.g. garbage, discarded vegetable and plant matter) treatment in your university. Please select an option that best describes your university's overall treatment of the bulk of organic waste:

- [1] Open dumping
- [2] Partial (1 - 25% treated)
- [3] Partial (> 25 - 50% treated)
- [4] Partial (> 50 - 75% treated)
- [5] Extensive (> 75% treated)

Evidence is required.

3.4. Inorganic waste treatment (WS.4)

Please describe the method of inorganic waste (e.g. rubbish/garbage, trash, discarded paper, plastic, metal, etc.) treatment in your university. Please select an option that best describes your university's overall treatment of the bulk of the inorganic waste:

- [1] Burned in the open
- [2] Partial (1 - 25% treated)
- [3] Partial (> 25 - 50% treated)
- [4] Partial (> 50 - 75% treated)
- [5] Extensive (> 75% treated)

Evidence is required.

3.5. Toxic waste treatment (WS.5)

Please select a condition which reflects the current condition of how your university handles toxic wastes. The handling process includes whether toxic wastes are dealt with separately, for example, by classifying and handling them over to a third party or certified handling companies. Please select one of the following options:

- [1] Not managed
- [2] Partial (1 - 25% treated)
- [3] Partial (> 25 - 50% treated)
- [4] Partial (> 50 - 75% treated)
- [5] Extensive (> 75% treated)

Evidence is required

3.6. Sewage disposal (WS.6)

Please describe the primary method of sewage treatment at your university. Please select an option that best describes how the bulk of the sewage is disposed of:

- [1] Untreated into waterways
- [2] Treated conventionally
- [3] Treated technically for reuse
- [4] Treated technically for downcycling
- [5] Treated technically for upcycling

Evidence is required.

4. Water (WR)

Water usage on campus is another important indicator in the UI GreenMetric. The aim is to encourage universities to decrease ground water usage, increase conservation programs, and protect the habitats. Water conservation programs, water recycling programs, water efficient appliances usage, and treated water usage are among the criteria.

4.1. Water conservation program implementation (WR.1)

Please select a condition describing your current stage in a program that is systematic and formalized that supports water conservation (e.g. for lakes and lake management systems, rain harvesting systems, water tanks, bio pore, recharge well, etc.) in your university, from the following options:

- [1] None. Please select this option if conservation program is needed, but nothing has been done
- [2] Program in preparation (e.g. feasibility study and promotion)
- [3] 1 - 25% implemented at an early stage (e.g. measurement of potential surface runoff volume)
- [4] > 25 - 50% water conserved
- [5] > 50% water conserved

Evidence is required.

4.2. Water recycling program implementation (WR.2)

Please select a condition which reflects the current condition of your university in establishing formal policies for water recycling programs (e.g. the use of recycled water for toilet flushing, car washing, watering plants, etc.). Please select an option that describes the current stage of your program:

- [1] None. Please select this option if the water recycling program is needed, but nothing has been done
- [2] Program in preparation (e.g. feasibility study and promotion)

- [3] 1 - 25% Implemented at an early stage (e.g. measurement of wastewater)
- [4] > 25 - 50% water recycled
- [5] > 50% water recycled

Evidence is required.

4.3. Water efficient appliances usage (WR.3)

Water efficient appliance usages are replacing conventional appliances. This also includes the use of water efficient appliances (e.g. using censored/automated handwashing taps, highly efficient toilet flush, etc.). Please select one of the following options:

- [1] None. Water efficient appliances are needed, but nothing has been done.
- [2] Program in preparation (e.g. feasibility study and promotion)
- [3] 1 - 25% of water efficient appliances installed
- [4] > 25 - 50% of water efficient appliances installed
- [5] > 50% of water efficient appliances installed

Evidence is required.

4.4. Treated water consumed (WR.4)

Please indicate the percentage of treated water consumed from water system treatment compared to all water sources (e.g. rainwater tank source, groundwater, surface water, etc.) in your university. The water source can be from the treated water installation inside and/or outside your university. Please select one of the following options:

- [1] None
- [2] 1 - 25% treated water consumed
- [3] > 25 - 50% treated water consumed
- [4] > 50 - 75% treated water consumed
- [5] > 75% treated water consumed

5. Transportation (TR)

Transportation systems play an important role in carbon emission and pollutant levels in universities. Transportation policies to limit the number of motor vehicles on campus uses of campus buses and bicycles will encourage a healthier environment. The pedestrian policy will encourage students and staff to walk around campus and avoid using private vehicles. The use of environmentally friendly public transportation will decrease the carbon footprint around campus.

5.1. Number of cars actively used and managed by the university

Please indicate the number of cars operated on campus owned and managed by the university (including those outsourced to third parties).

5.2. Number of cars entering the university daily

Please indicate the average number of cars that enter your university daily based on a balanced sample, taking term and holiday periods in consideration.

5.3. Number of motorcycles entering the university daily

Please indicate the average number of motorcycles that enter your university daily based on a balanced sample, taking terms and holiday periods in consideration.

5.4 The total number of vehicles (cars and motorcycles) divided by total campus population (TR.1)

Please provide the total number of vehicles divided by total campus population.

Formula: $(5.1+5.2+5.3)/(1.12+1.14)$

Please select one of the following options:

- [1] ≥ 1
- [2] $< 1 - 0.5$
- [3] $< 0.5 - 0.125$
- [4] $< 0.125 - 0.045$
- [5] < 0.045

5.5. Shuttle services (TR.2)

Please describe the condition of the availability of shuttles for journeys within the campus and whether the ride is free or charged, operated by a university or by other parties. Please select an option from the following options:

- [1] Shuttle service is possible but not provided by the university
- [2] Shuttle service is provided (by the university or other parties) and regular but not free
- [3] Shuttle service is provided (by the university or other parties) and the university contributes a part of the cost.
- [4] Shuttle service is provided by the university, regular, and free
- [5] Shuttle service is provided by the university, regular, and zero emission. Or shuttle use is not possible (not applicable)

Evidence is required.

5.6. Number of shuttles operated in your university

Please indicate the number of campus shuttles operating in your university. The campus shuttle can be in the form of buses, Multi-purpose Vehicle (MPV) cars or minivans which are operated inside the campus.

5.7. The average number of passengers of each shuttle

Please indicate the average number of passengers of each shuttle on one trip. You can estimate from the seat availability of the shuttle.

5.8. Total trips of each shuttle services each day

Please indicate the total number of trips for each shuttle service per day.

5.9. Zero Emission Vehicles (ZEV) policy on campus (TR.3)

Please describe the extent to which the use of Zero Emission Vehicles (e.g. bicycles, canoe, snowboard, electric car, etc.) is supported for transportation on your campus. Please select an option from the following list that applies to your campus:

- [1] Zero Emission Vehicles are not available
- [2] Zero Emission Vehicles use is not possible or practical
- [3] Zero Emission Vehicles are available, but not provided by the university
- [4] Zero Emission Vehicles are available, and provided by the university and charged
- [5] Zero Emission Vehicles are available and provided by the university free

Evidence is required.

5.10. The average number of Zero Emission Vehicles (ZEV) on campus per day

Please indicate the average number of Zero Emission Vehicles (e.g. bicycles, canoe, snowboard, electric car, compressed bio-methane gas shuttle cars, etc.) on your campuses daily which includes both vehicles owned by the university and privately owned.

5.11. The total number of Zero Emission Vehicles (ZEV) divided by total campus population (TR.4)

Please provide the total number of Zero Emission Vehicles (ZEV) divided by total campus population.

Formula: (5.10)/(1.12+1.14)

Please select one of the following options:

- [1] ≤ 0.002
- [2] > 0.002 to ≤ 0.004
- [3] > 0.004 to ≤ 0.008
- [4] > 0.008 to ≤ 0.02
- [5] > 0.02

5.12. Total parking area (m²)

Please provide the information of the total parking area in your university. You can estimate or validate this area by using the google maps feature.

5.13. The ratio of the parking area to total campus area (TR.5)

Please select a ratio of the parking area to the total campus area of your university.

Formula: ((5.12/1.5) x 100%)

Please select one of the following options:

- [1] $> 11\%$
- [2] $< 11 - 7\%$
- [3] $< 7 - 4\%$
- [4] $< 4 - 1\%$
- [5] $< 1\%$

Evidence is required.

5.14. Transportation program designed to limit or decrease the parking area on campus for the last 3 years (from 2016 to 2018) (TR.6)

Please select a condition which reflects current university program on transportation designed to limit or decrease the parking area on your campuses. Please select an option that best describes your university from the following options:

- [1] Not applicable
- [2] Program in preparation (e.g. feasibility study and promotion)
- [3] The program resulting in less than 10% decrease in the parking area
- [4] Program resulting in 10 - 30% decrease in the parking area
- [5] The program resulting in more than 30% decrease in the parking area or parking is restricted

5.15. Number of transportation initiatives to decrease private vehicles on campus (TR.7)

Please select a condition which reflects your university's current initiatives on the availability of transportation to limit or decrease the number of private vehicles on your campuses (e.g. car sharing, charging high parking fees, metro/tram/bus services, bike sharing, low fare subscriptions, etc.). Please select an option that best describes your university from the following:

- [1] Not applicable
- [2] 1 initiative
- [3] 2 initiatives
- [4] 3 initiatives
- [5] > 3 initiatives

Evidence is required.

5.16. Pedestrian path policy on campus (TR.8)

Please describe the extent to which the use of the pedestrian path is supported. Please select an option from the following list that applies to your campus:

- [1] Pedestrian paths are not applicable
- [2] Pedestrian paths are available
- [3] Pedestrian paths are available and designed for safety
- [4] Pedestrian paths are available, designed for safety and convenience
- [5] Pedestrian paths are available, designed for safety, convenience, and in some parts provided with disabled-friendly features

Evidence is required.

Note:

- **Safety:** equipped with enough lighting, separator between road for vehicle and pedestrian path, and some handrail.
- **Convenience:** Level difference with a mild slant for walking alongside the pavement, some area covered, using soft (rubber, woods, etc.) material, availability of location information and directions
- **Disabled-friendly:** ramps and guiding blocks which have suitable design for pedestrian having physical disabilities.

5.17. The approximate daily travel distance of a vehicle inside your campus only (in Kilometers)

Please provide the approximate daily travel distance of a vehicle (e.g. bus, car, motorcycle) inside your campus only in kilometers.

6. Education and Research (ED)

6.1. Number of courses/subjects related to sustainability offered

The number of courses/subjects the contents of which are related to sustainability offered at your university. Some universities have already tracked on how many courses/subjects available for this. The definition of the extent to which a course can be seen as related to sustainability (environment, social, economic) or both, can be defined according to your university's situation. If a course/subject contributes in more than a minor or passing way to increase awareness, knowledge, or action related to sustainability, then it counts. The number of courses/subjects can be counted by specifying related sustainability keywords used in the subjects. For example, environmental chemistry is the subjects for the study program of chemistry.

Evidence is required.

6.2. Total number of courses/subjects offered

The total number of courses/subjects offered at your university yearly. This information will be used to calculate to what extent environment and sustainability education have been defined in your university teaching and learning.

Evidence is required.

6.3. The ratio of sustainability courses to total courses/subjects (ED.1)

Please select the ratio of sustainability courses to total number of courses (subjects) your university.

Formula: $((6.1/6.2) \times 100\%)$

Please select one of the following options:

- [1] $\leq 1\%$
- [2] $> 1 - 5\%$
- [3] $> 5 - 10\%$
- [4] $> 10 - 20\%$
- [5] $> 20\%$

6.4. Total research funds dedicated to sustainability research (in US Dollars)

Please provide the average funding for research on sustainability per annum over the last 3 years.

Evidence is required.

6.5. Total research funds (in US Dollars)

The average total research funds per annum over the last 3 years. This information will be used to calculate the percentage of environment and sustainability research funding to the overall research funding.

Evidence is required.

6.6 The ratio of sustainability research funding to total research funding (ED.2)

Please select a ratio of sustainability research funding to total research funding your university.

Formula: $((6.4/6.5) \times 100\%)$

Please select one of the following options:

- [1] $\leq 1\%$
- [2] $> 1 - 8\%$
- [3] $> 8 - 20\%$
- [4] $> 20 - 40\%$
- [5] $> 40\%$

6.7. Number of scholarly publications on sustainability (ED.3)

Please provide the average number of indexed publications (Google scholar) on environment and sustainability published annually over the last 3 years, using keywords: green, environment, sustainability, renewable energy, climate change. Please select one of the following options:

- [1] 0
- [2] 1 - 20
- [3] 21 - 83
- [4] 84 - 300
- [5] > 300

6.8. Number of events related to sustainability (ED.4)

Please provide the number of events (e.g. conferences, workshops, awareness raising, practical training, etc.) related to the issues of environment and sustainability hosted or organized by your university (average per annum over the last 3 years). Please select one of the following options:

- [1] 0
- [2] 1 - 4
- [3] 5 - 17
- [4] 18 - 47
- [5] > 47

Evidence is required.

6.9. Number of student organizations related to sustainability (ED.5)

Please provide the total number of student organizations at faculty and university levels. For example, a student association on a green campus in a Faculty of College level can be considered as an organization. Please select one of the following options:

- [1] 0
- [2] 1 - 2
- [3] 3 - 4
- [4] 5 - 10
- [5] > 10

6.10. University-run sustainability website (ED.6)

If your university has a sustainability website, please provide the address of the web. Some detailed information on a university website to educate students and staff as well as providing information about their latest involvement on green campus, environment and sustainability programs will be very useful. Please select the following options:

- [1] Not available
- [2] Website in progress or under construction
- [3] Website is available and accessible
- [4] Website is available, accessible, and updated occasionally
- [5] Website is available, accessible, and updated regularly

6.11. Sustainability website address (URL) if available

Please provide your university sustainability link/website (URL)

6.12. Sustainability report (ED.7)

If your university has a sustainability report. Please select the following options:

- [1] Not available
- [2] A sustainability report is in preparation
- [3] A sustainability report is available and accessible
- [4] A sustainability report is available, accessible and updated occasionally
- [5] A sustainability report is available, accessible and updated annually

Evidence is required.

Data submission

1. Please submit the latest yearly (annual) data that you have according to your 12 months data gathering schedule (e.g. for Questions 2.6, 2.8) unless otherwise requested. Please check questions 1.16, 1.17, 1.18, 6.3, 6.4, 6.5, 6.7, and 6.8.
2. Please note that the scale of answer options in question number 1.6, 1.10, 1.11, 1.12, 1.15, 1.16, 2.4, 2.5, 2.8, 5.4, 5.11, 5.12, 6.3, 6.6, 6.7, 6.8, and 6.9 are determined based on 2018 data submitted by Universities.

Evidence Guideline

This is the second year we request evidence for the questionnaire. The purpose of the evidence is to support your university submission when reviewed by our validators. For this purpose, please observe the following guidance:

1. Evidence is mandatory.
2. Lack of evidence may result in a declined score.
3. All evidence should comply with the template provided in the website link:
http://greenmetric.ui.ac.id/wp-content/uploads/2015/07/UIGM-template_evidence_2019.pdf
4. Evidence could be pictures, graphs, tables, data, etc.
5. Please provide an explanation in the description section for the pictures submitted.
6. Explanation of evidence should be in English.
7. For each question provided with evidence, the maximum size for evidence is 2 MB (.doc/.docx/.pdf).

Reference

- [1] Buckman, A.H., Mayfield, M. and Beck, S. B. M. (2014) 'What is a smart building?', *Smart and Sustainable Built Environment*, 3(2), pp. 92-109.
- [2] Woo, J. and Choi, K. S. (2013) 'Analysis of potential reductions of greenhouse gas emissions on the college campus through the energy saving action programs', *Environmental Engineering Research*, 18(3), pp. 191-197.
- [3] Silveira, R. (2015) 'Recycling – Upcycling, Repurpose or Downcycling'. Available at: <https://tudelft.openresearch.net/page/13094/recycling-upcycling-repurpose-or-downcycling>
- [4] RUS Energia. (2019) 'UI GreenMetric 2018: Energy and Climate Change Guidelines for Compilation'. Università Ca' Foscari.
- [5] Ghaffarianhoseini, A., Berardi, U., AlWaer, H., Chang, S., Halawa, E., Ghaffarianhoseini, A. and Clements-Croome, D. (2016) 'What is an intelligent building? Analysis of recent interpretations from an international perspective', *Architectural Science Review*, 59(5), pp. 338-357.
- [6] Ghaffarianhoseini, A., AlWaer, H., Ghaffarianhoseini, A., Clements-Croome, D. Berardi, U., Raahemifar, K. and Tookey, J. (2018), 'Intelligent or smart cities and buildings: a critical exposition and a way forward', *Intelligent Buildings International*, 10(2), pp. 122-129.

Related Papers and Publications on UI GreenMetric

- [1] Evaluating UI GreenMetric as a tool to Support Green Universities Development: Assessment of the Year 2011 Ranking by Dr. Nyoman Suwartha and Prof. Riri Fitri Sari, *Journal of Cleaner Production*, Volume 61, Pages 46–53 (2013)
- [2] Critical review of a global campus sustainability ranking: GreenMetric by Allan Lauder, Riri Fitri Sari, Nyoman Suwartha, and Gunawan Tjahjono, *Journal of Cleaner Production*, Volume 108, Part A, Pages 852–863 (2015)
- [3] University contributions to environmental sustainability: challenges and opportunities from the Lithuanian case by Renata Dagiliut and Genovaite Liobikien, *Journal of Cleaner Production*, Volume 108, Part A, Pages 891–899 (2014)
- [4] Opening up the Pandora's box of sustainability league tables of universities: a Kafkaesque perspective by David R. Jones, *Studies in Higher Education*, Volume 40, Pages 480-503 (2015)
- [5] Sustainable Universities – From Declarations on Sustainability in Higher Education to National Law by Thomas Skou Grindsted, *Journal of Environmental Economics and Management*, Volume 2 (2011)
- [6] Moving Toward Socially and Environmentally Responsible Management Education—A Case Study of Mumbai by Ela Goyal and Mahendra Gupta, *Journal Applied Environmental Education & Communication*, volume 13, Pages 146-161 (2014)
- [7] The comprehensiveness of competing higher education sustainability assessments by Graham Bullock and Nicholas Wilder, *International Journal of Sustainability in Higher Education*, Volume 17, Pages 282-304 (2016)
- [8] Green Campus initiative and its impacts on quality of life of stakeholders in Green and Non-Green Campus universities by Ronnchai Tiyyarattanachai and Nicholas M. Hollmann, *SpringerPlus*, Volume 5, no info pages (2016)
- [9] Environmental management and sustainability in higher education: The case of Spanish Universities by Yolanda León-Fernández and Eugenio Domínguez-Vilches, *International Journal of Sustainability in Higher Education*, Volume 16, Pages 440-455 (2015)
- [10] Getting an empirical hold of the sustainable university: a comparative analysis of evaluation frameworks across 12 contemporary sustainability assessment tools by Daniel Fischer, Silke Jenssen and Valentin

- Tappeser, *Journal Assessment & Evaluation in Higher Education*, Volume 40, Pages 785- 800 (2015)
- [11] Environmental sustainability practices in South Asian university campuses: an exploratory study on Bangladeshi universities by Asadul Hoque, Amelia Clarke, and Tunazzina Sultana, Springer Nature, Volume 19, Issue 6, pp 2163–2180 (2017)
- [12] Principles, Implementation and Results of the New Assessment and Accreditation System “Engineering Education for Sustainable Industries” (QUESTE-SI) by Jurgis K. Staniškis and Eglė Katiliūtė, Springer Nature, *New Developments in Engineering Education for Sustainable Development* pp 283-294 (2016)
- [13] Promotion of Sustainable Development at Universities: The Adoption of Green Campus Strategies at the University of Southern Santa Catarina, Brazil by João Marcelo Pereira Ribeiro, Samuel Borges Barbosa, Jacir Leonir Casagrande, Simone Sehnem, Issa Ibrahim Berchin, Camilla Gomes da Silva, Ana Clara Medeiros da Silveira, Gabriel Alfredo Alves Zimmer, Rafael Ávila Faraco, and José Baltazar Salgueirinho Osório de Andrade Guerra, Springer Nature, *Handbook of Theory and Practice of Sustainable Development in Higher Education* pp 471-486 (2017)
- [14] The Need to Go Beyond “Green University” Ideas to Involve the Community at Naresuan University, Thailand by Gwyntorn Satean, Springer Nature, *Sustainability Through Innovation in Product Life Cycle Design* pp 841-857 (2017)
- [15] Environmental sustainability of universities: critical analysis of a green ranking by Marco Ragazzi and Francesca Ghidini, Elsevier, *Energy Procedia*, Volume 119, July 2017, Pages 111-120 (2017)

Appendix 1

Details of the scoring are described as follows:

No	Categories and Indicators	Points	Score	Weighting
1	Setting and Infrastructure (SI)			15%
SI 1	The ratio of open space area to the total area	300		
	<= 1%		0	
	> 1 - 80%		0.25×300	
	> 80 - 90%		0.50×300	
	> 90 - 95%		0.75×300	
	> 95%		1.00×300	
SI 2	Total area on campus covered in forest vegetation	200		
	<= 2 %		0	
	> 2 - 9%		0.25×200	
	> 9 - 22%		0.50×200	
	> 22 - 35%		0.75×200	
	> 35%		1.00×200	
SI 3	Total area on campus covered in planted vegetation	300		
	<= 10%		0	
	> 10 - 20%		0.25×300	
	> 20 - 30%		0.50×300	
	> 30 - 40%		0.75×300	
	> 40%		1.00×300	
SI 4	Total area on campus for water absorption besides the forest and planted vegetation	200		
	<= 2%		0	
	> 2 - 10%		0.25×200	
	> 10 - 20%		0.50×200	
	> 20 - 30%		0.75×200	
	> 30%		1.00×200	
SI 5	The total open space area divided by total campus population	300		
	<= 10 m ²		0	
	> 10 – 20 m ²		0.25×300	
	> 20 – 40 m ²		0.50×300	
	> 40 – 70 m ²		0.75×300	
	> 70 m ²		1.00×300	
SI 6	Percentage of university budget for sustainability efforts within a year	200		
	<= 1%		0	
	> 1 - 3%		0.25×200	
	> 3 - 10%		0.50×200	
	> 10 - 12%		0.75×200	
	>12%		1.00×200	
	Total	1500		

No	Categories and Indicators	Points	Score	Weighting
2	Energy and Climate Change (EC)			21%
EC 1	Energy efficient appliances usage	200		
	< 1%		0	
	1 - 25%		0.25×200	
	> 25 - 50%		0.50×200	
	> 50 - 75%		0.75×200	
	> 75%		1.00×200	
EC 2	Smart building implementation	300		
	< 1%		0	
	1 - 25%		0.25×300	
	> 25 - 50%		0.50×300	
	> 50 - 75%		0.75×300	
	> 75%		1.00×300	
EC 3	Number of renewable energy sources in campus	300		
	None		0	
	1 source		0.25×300	
	2 sources		0.50×300	
	3 sources		0.75×300	
	> 3 sources		1.00×300	
EC 4	The total electricity usage divided by total campus population (kWh per person)	300		
	>= 2424 kWh		0	
	< 2424 - 1535 kWh		0.25×300	
	< 1535 - 633kWh		0.50×300	
	< 633 - 279kWh		0.75×300	
	< 279 kWh		1.00×300	
EC 5	The ratio of renewable energy production divided by total energy usage per year	200		
	<= 0.5%		0	
	> 0.5 - 1%		0.25×200	
	> 1 - 2%		0.50×200	
	> 2 - 25%		0.75×200	
	> 25%		1.00×200	
EC 6	Elements of green building implementation as reflected in all construction and renovation policies	300		
	None (There is no green building implementation in your university)		0	
	1 element		0.25×300	
	2 elements		0.50×300	
	3 elements		0.75×300	
	> 3 elements		1.00×300	
EC 7	Greenhouse gas emission reduction program	200		
	None (Reduction program is needed, but nothing has been done)		0	

No	Categories and Indicators	Points	Score	Weighting
	Program in preparation (e.g. feasibility study and promotion)		0.25×200	
	Program(s) aims to reduce one out of three scopes emissions (Scope 1 or 2 or 3)		0.50×200	
	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)		0.75×200	
	Program(s) aims to reduce all three scopes emissions (Scope 1, 2 and 3)		1.00×200	
EC 8	The total carbon footprint divided by total campus population	300		
	>= 2.05 metric tons		0	
	< 2.05 - 1.11 metric tons		0.25×300	
	< 1.11 - 0.42 metric tons		0.50×300	
	< 0.42 - 0.10 metric tons		0.75×300	
	< 0.10 metric tons		1.00×300	
	Total	2100		
3	Waste (WS)			18%
WS 1	Recycling program for university waste	300		
	Not applicable		0	
	Partial (1 - 25% of waste)		0.25×300	
	Partial (> 25 - 50% of waste)		0.50×300	
	Partial (> 50 - 75% of waste)		0.75×300	
	Extensive (> 75% of waste)		1.00×300	
WS 2	Program to reduce the use of paper and plastic on campus	300		
	Not applicable		0	
	1 program		0.25×300	
	2 programs		0.50×300	
	3 programs		0.75×300	
	More than 3 programs		1.00×300	
WS 3	Organic waste treatment	300		
	Open dumping		0	
	Partial (1 - 25% treated)		0.25×300	
	Partial (> 25 - 50% treated)		0.50×300	
	Partial (> 50 - 75% treated)		0.75×300	
	Extensive (> 75% treated)		1.00×300	
WS 4	Inorganic waste treatment	300		
	Burned in the open		0	
	Partial (1 - 25% treated)		0.25×300	
	Partial (> 25 - 50% treated)		0.50×300	
	Partial (> 50 - 75% treated)		0.75×300	
	Extensive (> 75% treated)		1.00×300	
WS 5	Toxic waste treatment	300		
	Not managed		0	

No	Categories and Indicators	Points	Score	Weighting
	Partial (1 - 25% treated)		0.25×300	
	Partial (> 25 - 50% treated)		0.50×300	
	Partial (> 50 - 75% treated)		0.75×300	
	Extensive (> 75% treated)		1.00×300	
WS 6	Sewage disposal	300		
	Untreated into waterways		0	
	Treated conventionally		0.25×300	
	Treated technically for reuse		0.50×300	
	Treated technically for downcycling		0.75×300	
	Treated technically for upcycling		1.00×300	
	Total	1800		
4	Water (WR)			10%
WR 1	Water conservation program implementation	300		
	None (Conservation program is needed, but nothing has been done)		0	
	Program in preparation (e.g. feasibility study and promotion)		0.25×300	
	1 - 25 % implemented at an early stage (e.g. measurement of potential surface runoff volume)		0.50×300	
	> 25 - 50% water conserved		0.75×300	
	> 50% water conserved		1.00×300	
WR 2	Water recycling program implementation	300		
	None (Water recycling program is needed, but nothing has been done)		0	
	Program in preparation (e.g. feasibility study and promotion)		0.25×300	
	1 - 25% implemented at an early stage (e.g. measurement of wastewater)		0.50×300	
	> 25 - 50% water recycled		0.75×300	
	> 50% water recycled		1.00×300	
WR 3	Water efficient appliances usage	200		
	None (Water efficient appliances are needed, but nothing has been done)		0	
	Program in preparation (e.g. feasibility study and promotion)		0.25×200	
	1 - 25 % of water efficient appliances installed		0.50×200	
	> 25- 50% of water efficient appliances installed		0.75×200	
	> 50% of water efficient appliances installed		1.00×200	
WR 4	Treated water consumed	200		
	None		0	
	1 - 25% treated water consumed		0.25×200	
	> 25 - 50% treated water consumed		0.50×200	
	> 50 - 75% treated water consumed		0.75×200	
	> 75% treated water consumed		1.00×200	
	Total	1000		

No	Categories and Indicators	Points	Score	Weighting
5	Transportation (TR)			18%
TR 1	The total number of vehicles (cars and motorcycles) divided by total campus population	200		
	>= 1		0	
	< 1 – 0.5		0.25×200	
	< 0.5 – 0.125		0.50×200	
	< 0.125 – 0.045		0.75×200	
	< 0.045		1.00×200	
TR 2	Shuttle services	300		
	Shuttle service is possible but not provided by the university		0	
	Shuttle service is provided (by the university or other parties) and regular but not free		0.25×300	
	Shuttle service is provided (by the university or other parties) and the university contributes a part of the cost		0.50×300	
	Shuttle service is provided by the university, regular, and free		0.75×300	
	Shuttle service is provided by the university, regular, and zero emission. Or shuttle use is not possible (not applicable)		1.00×300	
TR 3	Zero Emission Vehicles (ZEV) policy on campus	200		
	Zero Emission Vehicles are not available		0	
	Zero Emission Vehicles use is not possible or practical		0.25×200	
	Zero Emission Vehicles are available, but not provided by the university		0.50×200	
	Zero Emission Vehicles are available, and provided by the university and charged		0.75×200	
	Zero Emission Vehicles are available and provided by the university for free		1.00×200	
TR 4	The total number of Zero Emission Vehicles (ZEV) divided by total campus population	200		
	<= 0.002		0	
	> 0.002 to <= 0.004		0.25×200	
	> 0.004 to <= 0.008		0.50×200	
	> 0.008 to <= 0.02		0.75×200	
	> 0.02		1.00×200	
TR 5	The ratio of the parking area to total campus area	200		
	> 11%		0	
	< 11 - 7%		0.25×200	
	< 7 - 4%		0.50×200	
	< 4 - 1%		0.75×200	
	< 1%		1.00×200	
TR 6	Transportation program designed to limit or decrease the parking area on campus for the last 3 years (from 2016 to 2018)	200		
	Not applicable		0	
	Program in preparation (e.g. feasibility study and promotion)		0.25×200	

No	Categories and Indicators	Points	Score	Weighting
	The program resulting in less than 10% decrease in the parking area		0.50×200	
	Program resulting in 10 - 30% decrease in the parking area		0.75×200	
	The program resulting in more than 30% decrease in the parking area or parking is restricted		1.00×200	
TR 7	Number of transportation initiatives to decrease private vehicles on campus	200		
	Not applicable		0	
	1 initiative		0.25×200	
	2 initiatives		0.50×200	
	3 initiatives		0.75×200	
	> 3 initiatives		1.00×200	
TR 8	Pedestrian path policy on campus	300		
	Pedestrian paths are not applicable		0	
	Pedestrian paths are available		0.25×300	
	Pedestrian paths are available, and design for safety		0.50×300	
	Pedestrian paths are available, designed for safety and convenience		0.75×300	
	Pedestrian paths are available, designed for safety, convenience, and in some parts provided with disabled-friendly features		1.00×300	
	Total	1800		
6	Education and Research (ED)			18%
ED 1	The ratio of sustainability courses to total courses/subjects	300		
	<= 1%		0	
	> 1 - 5%		0.25×300	
	> 5 - 10%		0.50×300	
	> 10 - 20%		0.75×300	
	> 20%		1.00×300	
ED 2	The ratio of sustainability research funding to total research funding	300		
	<= 1%		0	
	> 1 - 8%		0.25×300	
	> 8 - 20%		0.50×300	
	> 20 - 40%		0.75×300	
	> 40%		1.00×300	
ED 3	Number of scholarly publications on sustainability	300		
	0		0	
	1 - 20		0.25×300	
	21 - 83		0.50×300	
	84 - 300		0.75×300	
	> 300		1.00×300	

No	Categories and Indicators	Points	Score	Weighting
ED 4	Number of events related to sustainability	300		
	0		0	
	1 - 4		0.25×300	
	5 - 17		0.50×300	
	18 - 47		0.75×300	
	> 47		1.00×300	
ED 5	Number of student organizations related to sustainability	300		
	0		0	
	1 - 2		0.25×300	
	3 - 4		0.50×300	
	5 - 10		0.75×300	
	> 10		1.00×300	
ED 6	University-run sustainability website	200		
	Not available		0	
	Website in progress or under construction		0.25×200	
	Website is available and accessible		0.50×200	
	Website is available, accessible, and updated occasionally		0.75×200	
	Website is available, accessible, and updated regularly		1.00×200	
ED 7	Sustainability report	100		
	Not available		0	
	A sustainability report is in preparation		0.25×100	
	A sustainability report is available and accessible		0.50×100	
	A sustainability report is available, accessible and updated occasionally		0.75×100	
	A sustainability report is available, accessible and updated annually		1.00×100	
	Total	1800		
	TOTAL	10000		

Appendix 2

List and Description of Smart Building Requirements

Field		Requirement		Description
B	Automation	B1	BMS	Presence of Building Management System (BMS) / Building Information Modelling (BIM) / Building Automation System (BAS) / Facility Management System (FMS) (recommended requirement)
		B2	APP	Interactive support for users via APP or online service
S	Safety	S1	Intruder Alarm System	Intruder alarm system (recommended: interfaced with BMS)
		S2	Fire-fighting	Fire-fighting system (recommended: interfaced with BMS)
		S3	Video surveillance	Video surveillance system (recommended: interfaced with BMS)
		S4	Anti-flooding	Anti-flooding system (recommended: interfaced with BMS)
E	Energy	E1	Monitoring	Automatic acquisition and logging system of energy consumption (recommended: interfaced with BMS)
		E2	Management	Automatic management system for energy supplies and production (recommended: interfaced with BMS)
A	Water	A1	Monitoring	Automatic acquisition and logging system of water consumption (recommended: interfaced with BMS)
		A2	Recovery	Rainwater recovery system for covering the flushing and irrigation
I	Indoor environment	I1	Thermal comfort	Monitoring (recommended: interfaced with BMS) of environmental parameters related to thermo-hygrometric comfort (e.g. air temperature, relative humidity, air velocity, etc.)
		I2	Air quality	Monitoring (recommended: interfaced with BMS) of pollutants (e.g. VOC, PM, CO2 ...)
		I3	Real-time	Programming and management in real time according to the occupancy profile of the premises (recommended: interfaced with BMS)
		I4	Passive system	Passive cooling and/or exploitation/limitation systems for free supplies
L	Lighting	L1	LEDs	High-efficiency luminaires (LEDs)
		L2	Sensors	Automatic lighting control (recommended: presence/illuminance sensors interfaced with BMS)
		L3	Shielding	Shielding adjustment and solar control
		L4	Natural light	Passive systems for natural light exploitation

Note:

Please state the Building Management System (BMS) / Building Information Modelling (BIM) / Building Automation System (BAS) / Facility Management System (FMS) used in your university

Adapted from 'UI GreenMetric 2018: Energy and Climate Change Guidelines for Compilation', by RUS Energia, 2019.

Appendix 3

Calculation of Carbon Footprint Per Year

The Carbon footprint calculation can be conducted based on the stage of calculation as stated in www.carbonfootprint.com, which is the sum of electricity usage per year and transportation per year.

a. Electricity Usage Per Year

The CO₂ emission from electricity
= (electricity usage per year in kWh/1000) x 0.84
= (1633286 kWh/1000) x 0.84
= 1371.96 metric tons

Notes:

Electricity usage per year= 1633286 kWh

0.84 is the coefficient to convert kWh to metric tons (source: www.carbonfootprint.com)

b. Transportation Per Year (Bus)

= (Number of the shuttle bus in your university x total trips for shuttle bus service each day x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 240/100) x 0.01
= ((15 x 150 x 5 x 240)/100)) x 0.01
= 270 metric tons

Notes:

240 is the number of working days per year

0.01 is the coefficient (source: www.carbonfootprint.com) to calculate the emission in metric tons per 100 km for bus

c. Transportation Per Year (Car)

= (Number of cars entering your university x 2 x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 240/100) x 0.02
= ((2000 x 2 x 5 x 240)/100)) x 0.02
= 960 metric tons

Notes:

240 is the number of working days per year

0.02 is the coefficient (source: www.carbonfootprint.com) to calculate the emission in metric tons per 100 km car

d. Transportation Per Year (Motorcycle)

= (Number of motorcycle entering your university x 2 x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 240/100) x 0.01
= ((4000 x 2 x 5 x 240)/100)) x 0.01
= 960 metric tons

Notes:

240 is the number of working days per year

0.01 is the coefficient (source: www.carbonfootprint.com) to calculate the emission in metric tons per 100 km for motorcycle

e. Total Emission Per Year

= total emission from electricity usage + transportation (bus, car, motorcycle)
= 1371.96 + (270 + 960 + 960)
= 3561.96 metric tons

Note: You can use your own method and put it in evidence (e.g. figure, link, etc.)



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