QATAR UNIVERSITY

CARBON FOOTPRINT REPORT 2022

REPORT CONTENT

We are honoured to reveal the revised copy of the QU Carbon Footprint Report for the year 2022. This report covers the period from 2016 – 2022 with 2016 being the baseline year.

Qatar University is still monitoring and studying the ways of improvements, thus, with reference to the 2020 report, some areas are still excluded from the calculation process and in the plan to be included in the nearest future.

WHO WE ARE?

The Environment and Sustainability Section comes directly under the Facilities and General Services Department - Administration and Financial Affairs. We are here to design and build practical solutions and to assure that our operations are performed in a sustainable way. Conserving our natural resources, planning to decrease our campus carbon footprint, managing wastes, promoting recycling, and increasing the community awareness are all under our scope.

We are also monitoring the project performance to ensure that all operational work are done in environmentally friendly way.

REACH US

We are here to hear from you,

Environment and Sustainability Section: ess@qu.edu.qa

Prepared by: Mays Abdalla – Environmental and Sustainability Specialist

Reviewed by: Madawi Al-Shafi – Environment and Sustainability Section Head

MESSAGE FROM THE DIRECTOR

"The State shall preserve the environment and its natural balance in order to achieve comprehensive and sustainable development for all generations."
Permanent Constitution

Following what stated in our state constitution and the fourth pillar in Qatar's vision toward 2030 – Environmental Development -, we at Qatar University affirm our endeavour toward achieving the required balance between the development needs and protecting the environment, and this could not be done without the cooperation of all sectors in campus.

The sustainability model of Qatar University represents an opportunity to embody a more sustainable society by working on the application of various relevant research and academic outputs. This will enable the University to provide Qatari society with the nation's largest and oldest national businesses, which will equip qualified personnel to lead sustainable development through their future positions in various sectors of institutions and society.

With the global warming and climate change issues arising every day, it is very important to understand the environment around us and predict our contribution as Qatar University towards global climate change.

Thus, the Environment and Sustainability Section at Qatar University are calculating the QU carbon footprint on annual basis, and summarized all the measurements done in this report, which will enable us setting targets, and building strategies and programs.

Together for a green and sustainable campus,

Eng. Mai Hamad Fetais
Director of Facilities and General Services Department ,
Qatar University

ACKNOWLEDGMENT

In the very outset, we would like to express our gratitude to all people who put their efforts in this project directly or indirectly; including all professional engineers, administrative people, operators, and student trainees or part-time student employees provided by the university.

Our special thanks goes to Eng. Mai Hamad Fetais the Director of Facilities and General Services Department for her endless support and professional assistance given through this journey.

We also would like to thank the Institutional Research and Analytic Department represented by Ms. Fatima Shaaban Ali for providing us with the institutional data-population part, and the Finance Department represented by Ms. Mariam A-Shaabi for providing us with the budget data spent in all three sectors (operational, research, and energy budget).

Thanks to the Civil, Electrical, Mechanical, Agricultural, and Transportation teams from the Facilities and General Services Department for their professional and skilful help in calculating the core data required in this work.

Our sincere thanks goes to Ms. Madawi Al-Shafi, the Environment and Sustainability Section Head, for her continuous and dedicated support to accomplish this work.

We believe that without your efforts, this work would not have been possible.

Carbon Footprint Calculation Team,
Environment and Sustainability Section – FGSD,
Qatar University

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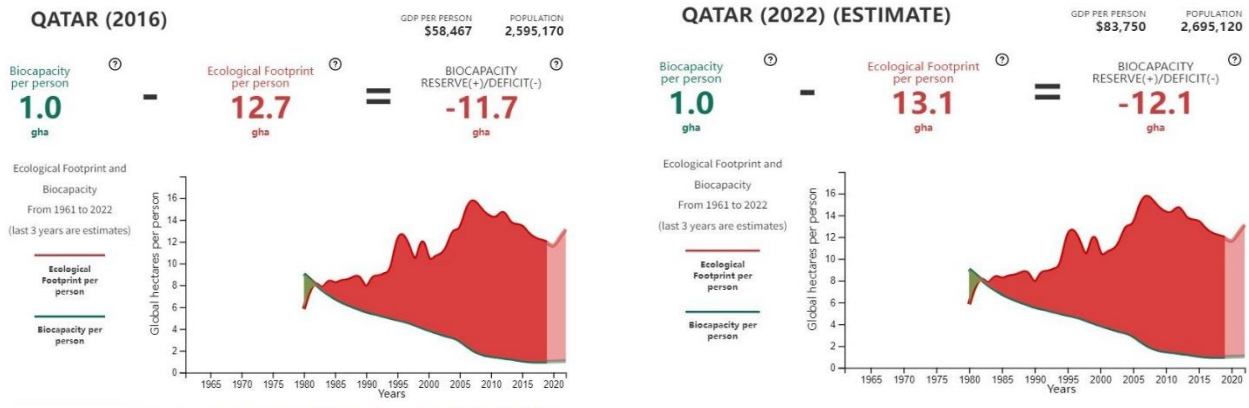
1. INTRODUCTION

1.1. QATAR'S INFLUENCE ON GLOBAL CLIMATE CHANGE

Qatar is a small, arid subtropical desert country, heavily reliant on its petroleum and natural gas reserves, the oil and gas industry is the backbone of the economy, which accounts for over 61% of the government's revenue. The rapid population growth in Qatar was fueled by expatriates in preparations for FIFA World Cup 2022 which in turn caused rapid industrial growth where the population rose from 0.46 million in 1960 to 2.8 million in 2019. The projected 2030 population increase hints at a rise in fossil fuel utilization and is expected to increase by 1.5 times their 2020 values resulting increase in CO_2 emissions.

Qatar experiences an average annual maximum temperature of 31°C, with absolute maximum air temperatures surpassing 47°C. The average annual temperature in Qatar increased from 27.5°C in 1901 to 29.42°C in 2021, a 1.92°C rise.



In comparison with the global ecological footprint, Qatar has the highest ecological footprint in the world. This is linked to its oil and gas industry, comparatively smaller population, area, desalination plants, landfills, excessive consumption of water, energy, and goods, and the lack of robust environmental conservation initiatives. From 1980 to 2016, its footprint rose from 5.8 gha to 12.7 gha, reaching 13.1 gha presently (Climate Action Tracker, 2022). If global per capita footprints matched Qatar's, 4.8 planets would be needed to sustain the population

1.2. QATAR & IT'S CLIMATE COMMITMENT

Climate change is the most pressing issue of the century and is caused primarily by greenhouse gas (GHG) emissions, with CO_2 emissions from fossil fuel combustion being the main driver (IPCC 2022: Climate Change 2022: Mitigation of Climate Change). Climate change worsens

natural disasters like droughts, fires, and strong storms while raising sea levels. Addressing global climate change and promoting sustainable development are urgent matters requiring immediate action.

"We need to care for our natural environment for it was entrusted to us by God to use with responsibility and respect for the benefit of humankind. If we nurture our environment, it will nurture us." — Her Highness Sheikha Moza bint Nasser, Qatar

One of the drawbacks of fossil fuel extraction and processing is the resulting high CO_2 emissions per capita. Qatar acknowledges its role in climate change and is committed to various national and international treaties aimed at environmental protection and sustainable development. The Environmental Protection Law No. 30, as well as Qatar National Vision 2030, emphasizes sustainable development.

"Qatar National Strategy for Environment and Climate Change identifies environmental priorities, including reducing greenhouse gas emissions by 25% by 2030, as part of efforts to contribute to achieving the 1.5 degrees Celsius goal. Qatar's sovereign wealth fund is a key supporter of green investment. The country prioritizes technology and innovation to address climate change challenges, emphasizing global partnerships and backing technological research and development institutions to provide solutions for mitigation and adaptation across various sectors.

HE Sheikh Dr Faleh bin Nasser bin Ahmed Al Thani, Minister MoECC

1.3. IMPORTANCE OF CARBON FOOTPRINT CALCULATION

CARBON FOOTPRINT *"a representation of the effect on climate in terms of the total amount of greenhouse gases (GHG) that are produced, measured in units of CO2e as a result of the activities of an organization"*- IPCC Guidelines (2006)

The carbon footprint estimates the emissions of greenhouse gases an organization releases during its operational activities over a specified time, expressed in tones of CO_2eq. Global warming potential (GWP) measures how much the heat-trapping capacity of a greenhouse gas is relative to carbon dioxide over a fixed duration, typically 100 years. Each greenhouse gas holds a unique GWP, and the Kyoto Protocol, listed the following gases as GHG; CO_2 (carbon dioxide), CH_4 (methane) N_2O (nitrous oxide), HFCs (hydrofluorocarbons), PFCs (perfluorocarbons) & SF_6 (sulfur hexafluoride). There are two types of emission sources. Direct and Indirect GHG emissions sources: direct emissions are emissions from sources owned or controlled by the organization; for example, the fleet owned by Qatar University burns fuel. Indirect GHG emissions, on the other hand, are emissions that result from the activities of the organization but occur at sources owned or controlled by another entity; for instance, the consequences of using purchased electricity on campus, which was generated earlier by KAHRAMAA.

There are various international standards for calculating the carbon footprint of organizations. The regulatory frameworks to name a few include GHG Protocol (2004), ISO 14064–1 (2006), ISO/TR 14069 (2013).

Qatar is a leading supplier of Liquefied Natural Gas (LNG) but still has the highest CO_2 emissions per capita, making it unattractive for investors because of the perception that their investment would not be 'green' or environmentally friendly. It is imperative for countries like Qatar, committed to numerous environmental treaties and high environmental standards, to calculate their carbon footprint (CF).

"You can't manage what you don't measure." Qatar aims to reduce its greenhouse gas emissions (GHG) by 25% by 2030. Measurement and reporting of organizations' CF are vital for identifying major sources within the organization. This clarity aids decision-making, planning, and implementation of new techniques and significantly reduces GHG emissions.

1.4. INSIGHT INTO QATAR UNIVERSITY

Qatar University, established in 1977, is the first national educational institution for higher education in the State of Qatar. The campus is located on the northern outskirts of Doha, about 16 kilometers from the city center, offering picturesque views of the coast.

The university commenced its operations in 1977 and at present it consists of 11 colleges and 15 distinct research centers; the College of Education- CED (1973), College of Sharia and Islamic Studies - CSIS (1974), College of Engineering- CENG (1980), Collage of Business & Economics -CBE (1985), College of Arts & Science (CAS) and College of Law- LAWC (2004) College of Pharmacy- CPH (2006), College of Medicine- CMED (2015), College of Health Sciences- CHS (2016), College of Dental Medicine- CDM (2019) and College of Nursing (2022). QU offers the widest range of academic programs 45 Undergraduate-level programs, 28 Masters, eight Ph.D. programs, four Diplomas, and a Doctor of Pharmacy. The core values of Qatar University include excellence, integrity, academic freedom, diversity, innovation, and social responsibility. Currently, a total of 22,461 students, along with 1,054 faculty and staff members, are enrolled and engaged across the diverse courses and departments within Qatar University.

QU hosts students from around the world, drawn by its commitment to diversity, equity, and inclusion, enriching both the learning and working environments in line with its core values and mission. The university is partitioned into distinct male and female areas, each equipped with its own lecture halls, laboratories, learning-support units, as well as sports and cafeteria facilities, to enhance and accommodate the educational experience.

The university hostel is located inside the campus with an area of almost 106,910 m^2, and it hosts mostly international students with some local students who are living in a bit far away areas in Qatar, and accommodation for staff. Moreover, the university opened an early childhood center to help working parents focus on their work, boost their productivity, and promote a healthy work-life balance. In terms of sports, the university hosts a quite big area for sports facilities that is almost 28,000 m^2, and two activity centers on both male and female campuses where they can take their breaks between lectures. It also has a standalone sport activity building in the female campus with an average area of 6255 m^2.

1.5. Qatar University's Commitments and Sustainable Development Initiatives"

QU has made big steps in being more sustainable by collaborating with other universities like University of Oxford for United Nations' ecosystem restoration program (UNEP), and “Zero

> *"QU, in its role as Qatar's most prominent and sole national institution of higher education, holds a hefty responsibility in achieving comprehensive development and environmental sustainability, spreading and promoting this culture. The University also feels a great responsibility to help various institutions avoid outdated technologies, which can be environmentally harmful and do not make sense in the digital age."*
>
> - *Dr. Hitmi Al Hitmi (Director of Communications and Public Relations at Qatar University)*

Higher Educational Institutions like QU operates on large amounts of energy as they host thousands of students and staff, and it has significant negative effect on climate change. As centers for education and research, QU is accountable in shaping responsible graduates for sustainable development. To set an example for its students and staff and society, calculating, tracking, and reporting their carbon footprint (CF) is the first step towards sustainability.

Carbon footprint (CF) is a valuable tool for monitoring activities that are associated to CO2 emissions and it serves as a baseline to check the effectiveness of future efforts to reduce impacts on campus. Once the carbon emissions are calculated, we can assess the impact and can implement reduction strategies, and also target the most problematic or high carbon emission source.

2. Methodology

The methodology employed in this report follows the same approach as outlined in the previous year's report [Carbon Footprint Report 2021 and 2020]. This ensures consistency and allows for a direct comparison of results between the two reporting periods.

3. Data Identification

3.1.Institutional Data

The first step in collecting and measuring GHGs is to collect the institutional data, which is divided into three categories, they are:

A) University population,

B) Budget, and

C) Area Size.

3.2.Population at Qatar University

The number of both full-time and part-time students in campus increased gradually from 2016 to 2022 and is expected to keep increasing on lower rates in the coming years. On the other hand, the number of both admin and academic staff working at the university had a minor increase through the five years starting with almost 2500 employee in 2016 until it slightly exceeded 3000 in 2022.

All student-related statistics were obtained from the Office of Institutional Planning & Development by the end of the academic year, which usually start by August and last for September, while the calculation done in this report were based on the fascial year that start annually by January in which our institution rely on budgeting and reporting. We did put in our considerations the consistency, thus the number of students were taken for each semester in order to ease the conversion between the academic year and our fascial year, as illustrated in the table below.

Table 1: Detailed student population in campus from 2016-2022

Semester	Full-time Students	Part-time Students	Total
Spring 16	14,599	1,761	16,360
Summer 16			6,422
Fall 16	16,133	1,773	17,906
Spring 17	15,459	2,099	17,558
Summer 17			6,611
Fall 17	17,060	2,092	19,152

Spring 18	16,085	2,378	18463
Summer 18			6685
Fall 2018	17,309	2,429	19,738
Spring 19	16,413	2,567	18,980
Summer 19			7,427
Fall 19	17,676	2,879	20,555
Spring 20	16,711	2,940	19,651
Summer 20			9,018
Fall 20	19,645	2,190	21,835
Spring 21	17,930	3,098	21,028
Summer 21	9,476		9,476
Fall 21	18,723	3,384	22,107
Spring 22	17,292	4,538	21,830
Summer 22	8,469		8,469
Fall 22	18,594	3,662	22,256

In contrast, the employees' statistic were obtained at the end of the calendar year from the Human Resources Department - Strategy and Development Office, and the detailed information are listed in the table below.

Table 2: Detailed employee population in campus from 2016-2022

Year	Academic Full Time	Admin Full time	Total New Hired	Total Employees
2016	1,361	1,132	165	2,493
2017	1,356	1,189	177	2,545
2018	1,513	1,260	131	2,773
2019	1,396	1,331	121	2,727

2020	1,641	1,363	171	3,004
2021	1,768	1,368	241	3,136
2022	1,847	1,403	113	3,250

3.3.Budget

The total amount of expenditures in operation, research, and energy sectors were obtained from the Financial Planning and Control Section - Finance Department, and the use of it was limited only to the calculation of the QU Carbon Footprint and not for publishing.

3.4.Area Size

The calculated area was divided into two categories, Research and Building area size, based on the nature of work executed in the selected areas. The total area, type of location, calculation, and needed AutoCAD drawings were obtained from the Civil Team – Facilities and General Services Department. This step took more time because the function in some locations of the old campus buildings needed to be updated before measuring the areas. This was done by checking all laboratories in campus and measuring their areas using AutoCAD. The total building area data was already available with the AutoCAD team. The detailed information about the physical size are given in appendix.

Table 3: Calculated total building and research building areas for the years 2016-2022

Year	Category	Total Building Space (ft^2)	Total Research Building Space (ft^2)
2016	Physical Size	3,641,373.55	239391
2017		6,542,186.04	239391
2018		6,565,565.88	239391
2019		6,883,117.08	239391
2020		6,887,697.98	239,391
2021		8,954,637.01	239,391
2022		9,777,279.62	239,391

3.5.Scope 1– Data:

3.5.1. Refrigerants

The refrigerant data was obtained from the Mechanical Team – Facilities and General Services Department.

The main two refrigerants used at Qatar University for air conditioning and refrigerators are HFC-134a and HCFC-22, while other three types are being used in minimal amount, they are, R-404a, R-410a, and R-407c. The table below shows the amount used from each type per year.

Table 4: Detailed amount and type of refrigerants consumed 2016-2022

Year	Category	Type	Consumption Quantity (pound)
2016	Refrigerants & Chemicals	HFC-134a	297.00
		HCFC-22	400 (estimation)
2017		HFC-134a	327.00
		HCFC-22	400 (estimation)
2018		R-404a	9
		R-407c	64
		HFC-134a	207
		HCFC-22	653
2019		R-404a	2
		R-410a	11
		R-407c	7
		HFC-134a	450
		HCFC-22	414
2020		R-407c	26
		HFC-134a	31
		HCFC-22	282

2021		R-410a	2
		R-407c	7
		HFC-134a	44
		HCFC-22	194
2022		R-407c	4.4
		HFC-134a	40
		HCFC-22	150

3.5.2. Transportation

There are several types of vehicles used in our campus, including in-campus bus fleet used to travel the students between the buildings, in-campus special needs vehicles, home-campus bus fleet, and transportation cars to travel admin/academic staff from and to the campus in special occasions. However, the only type that is fully under the campus control is the in-campus bus fleet. Therefore, the amount of fuel measured in this report is for the in-campus bus fleet, and it was obtained from the Transportation Section at the Facilities and General Services Department as illustrated below.

Table 5: Detailed amount of fuel consumed in campus from 2016-2022

Year	Category	Consumption Quantity (gallons)
2016	University Fleet	23,009
2017		20,007
2018		21,320
2019		21,271
2020		11,844
2021		15,297
2022		15,843

3.5.3. Fertilization

In order to feed the landscape plants with the needed nutrients, two types of fertilizers are being used at Qatar University, they are Pasteurized Compost and Peat Moss (organic type) with 1.5% of nitrogen content, and Urea (synthetic type) with 46% of nitrogen content. The amount and nitrogen content of those fertilizers were obtained from the Civil and Landscape team – Facilities and General Services Department.

Table 6: Detailed amount of fertilizers from agriculture source consumed in campus landscapes from 2016-2022

Year	Category	Type	Consumption Quantity (gallons)
2016	Fertilizer	Synthetic	16,535.00
		Organic	672,630.00
2017		Synthetic	16,535.00
		Organic	140,999.00
2018		Synthetic	16,535.00
		Organic	132,277.00
2019		Synthetic	16,535.00
		Organic	195,660.00
2020		Synthetic	13,228.00
		Organic	26,455.00
2021		Synthetic	18,188
		Organic	32,463.07
2022		Synthetic	24,802.00
		Organic	44,092.45

3.6.Scope 2 – Data

3.6.1. Power Consumption

i. Data Source

The power consumption readings are collected through the buildings meters and then the consumption are being calculated. Since the electricity is supplied by KAHRAMAA, we are usually double check the readings with them to ensure that they are correct. All needed data related to power consumption are obtained from the Electrical Team – Facilities and General Services Department and the data for the years 2016-2022 are listed in the table below:

Table 7: Total amount of power consumption in campus from 2016-2022

Year	Category	Scope	Consumption Quantity (kWh)
2016	Electricity, Steam, and Chilled Water	2	99,332,278
2017			103,441,292
2018			113,341,805
2019			110,677,819
2020			123,723,808
2021			168,214,142
2022			161,851,210

ii. Methodology:

Since the used tool is not designed for the MENA region, we had to customize our fuel mix that was used by KAHRAMAA to generate electricity, which was found to be 100% natural gas (3). The fuel mix percentage was then added to the tool to generate the function and find the emissions released as a result of the electrical consumption in campus.

3.7.Scope 3

As mentioned earlier, scope 3 is excluded from the calculation and planned to be included in the coming years.

4. Total footprint results

As shown in Chapter 3, all required data were obtained and manually entered into the SIMAP tool. The emission factors and related equations were generated by SIMAP, whereas only the fuel mix was entered manually to generate its emission factor as discussed earlier in the previous chapter. The start of fascial year was selected to be January, and the accuracy of the data is moderate. The tool then was able to calculate the carbon footprint and show how each source and scope is contributing in the footprint as summarized in the table below.

Table 8: Total Greenhouse Gas Amounts per Source 2016-2022

Year	Direct Transportation GHG (MTCDE)	Refrigerants & Chemicals GHG (MTCDE)	Fertilizer & Animals GHG (MTCDE)	Purchased Electricity GHG (MTCDE)	T&D Losses GHG (MTCDE)	Net GHG MTCDE
2016	200	494	64	38,506	3122	42,387
2017	174	512	29	40,099	3251	44,064
2018	185	707	28	43,937	3,562	48,419
2019	185	614	32	42,904	3,479	47,214
2020	103	263	17	47,961	3,889	52,232
2021	131	188	23	65,207	5,258	70,807
2022	136	147	32	62,741	5,060	68,116

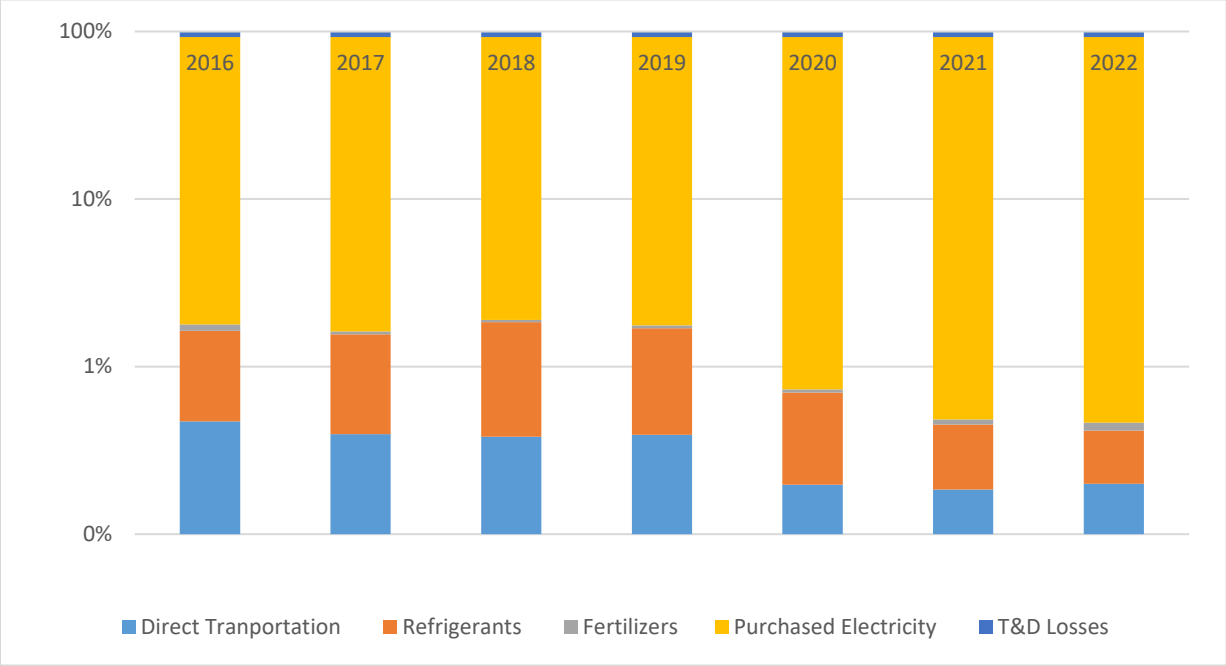


Figure 1: Graphic representation of the total carbon footprint results per category 2016-2022

As it is clearly seen from figure number 6 the purchased electricity owns the most contribution in the carbon footprint. It is almost contributing with average of 90% of the total carbon footprint for the five years 2016-2019. Around 7% of the total footprint goes to the transmission and distribution losses of the purchased electricity, which occurs because of the wires resistance and equipment efficiency. The least contribution goes for scope 1 (Direct transportation, Refrigerants, and Fertilizers), though, it might not be as low as it is now because our input in transportation is only for one type of fleet (in-campus bus fleet) as mentioned earlier in Chapter 3 that is the only type we have a control over it. Generally, the net metric tons of equivalent carbon dioxide shows an almost steady state range from 2016-2022 and this is mainly because we were monitoring without putting control measures to lower the emissions yet.

Since electricity contributes with the higher percentage in the emission of greenhouse gases, there is a need to figure out the main causes and start implementing some measures to reduce it, such as (but not limited to):

- Switching off/ increase the AC temperatures,
- Replacing old lighting fixtures with electrically efficient ones,
- Installing occupancy sensors whenever is applicable,
- Increasing awareness among campus society to reduce the electrical consumption.

4.1.Positive insights

A policy for power reduction was developed by the systems and electrical sections under the facilities and general services department. The policy is to reduce the power consumption during night shift by turning off the lights and some machines to proof the practicality of the practice on power consumption reduction and its reflection on QU purchased electricity bills. The team started to implement the policy on selected buildings on the first trial, more buildings to be added gradually.