



2022/2023 AASTMT Insights for Energy Consumption and Carbon Emissions

To assess AASTMT's progress in energy efficiency and carbon emissions reductions, it is essential to establish a baseline using data from 2018 to 2021. This period serves as a foundation for future energy consumption and emissions and allows for a clear comparison with data from 2022 and 2023.

1. Energy Consumption

AASTMT Energy Research Unit and Energy Management Committee put forward several strategies for regular online monitoring of energy consumption in all AASTMT campuses. Insights of energy consumption was prepared by the head of the Energy Research Unit and the Academy's Energy Management Committee based on the activities of the Maintenance and Electrical Facilities Department and Project Management in Abu Qir and the rationalization plans that were studied with the administration as well as the mechanism for follow-up and measurement of performance indicators (KPI).

➤ Energy consumption in all Alexandria campuses

First, AASTMT energy consumption in Alexandria is analyzed since AASTMT experiences the highest consumption in Alexandria due to its multiple branches and largest number of staff and students. Figure 1 shows the energy consumption in the entire Alexandria Campus within the period (2018-2023).

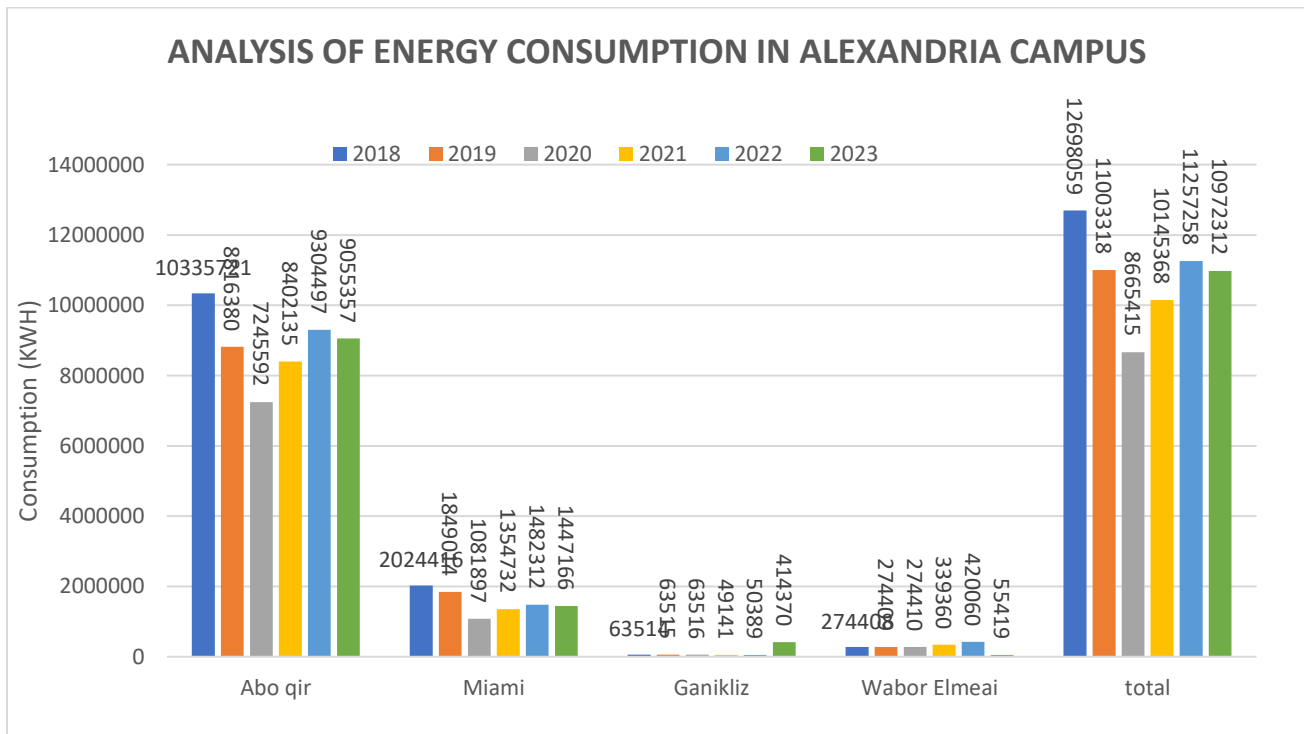


Figure 1. Energy consumption of AASTMT Alexandria campus (2018-2023)

It is clear that the maximum consumption was in 2018 with a full load of 12,698,059 kWh before Covid19, then the lowest load in 2020 during Covid 19, then it gradually increased until all the branches returned to their full load in 2022 with a value 11,257,258 kWh, as well as 2023, with a value of 10,972,312 kWh. Note that despite the return of total operation and the increase in expansions and new buildings, there is a decrease in the total load by 13.59%, in 2023 compared to 2018. Moreover, compared to consumption in 2022, a decrease in energy consumption in 2023 is evident by about 2.5% as shown in Figure 2.

This verifies the effectiveness of AASTMT plan and measures towards energy efficiency and saving in AASTMT entire Alexandria campus in 2022/2023.

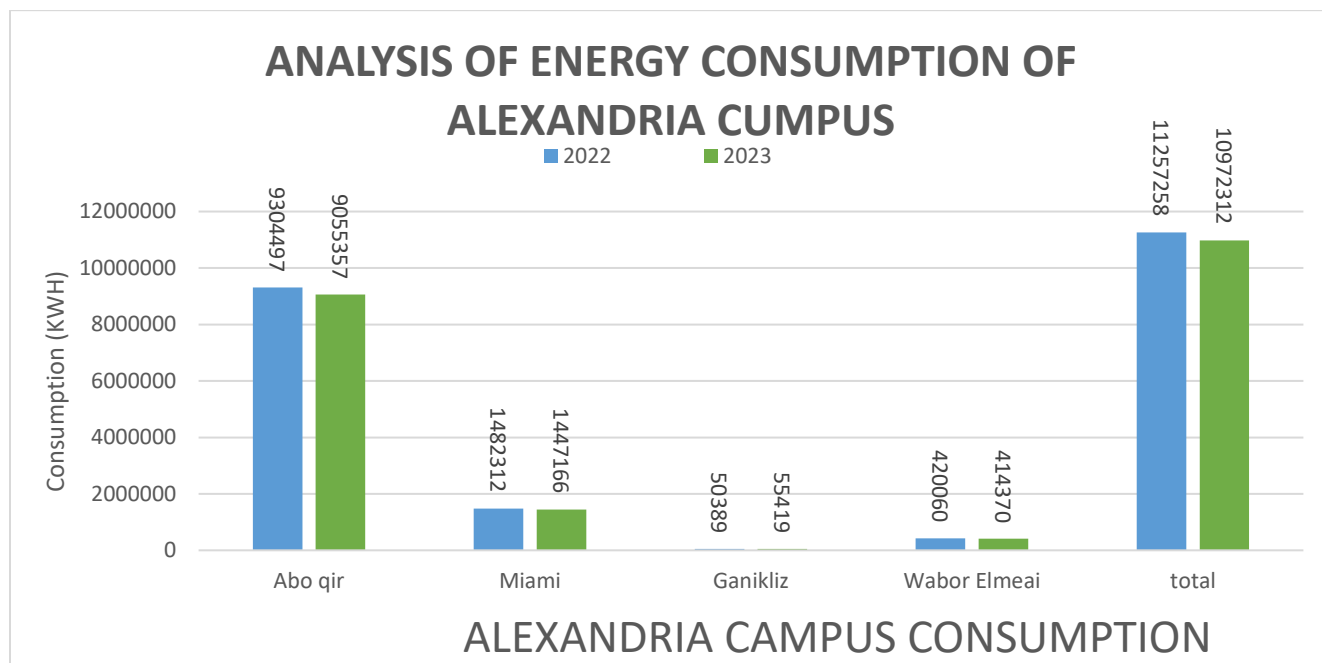


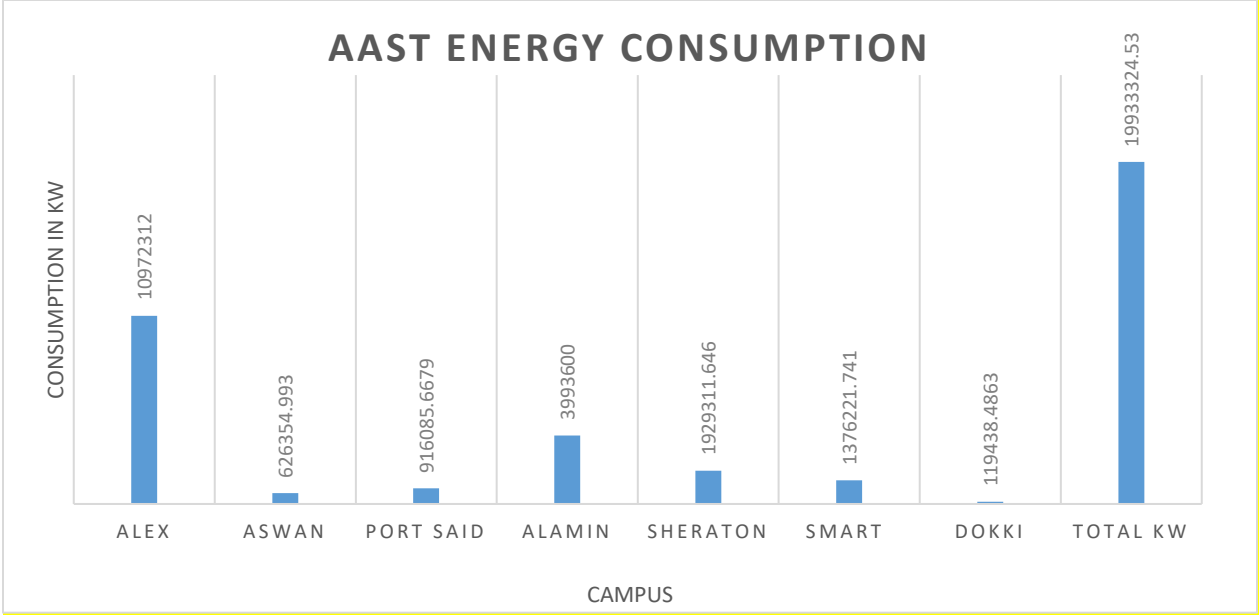
Figure 2. Zoom in energy consumption of AASTMT Alexandria campus (2022-2023)

Thus; summarizing insights of Alexandria campuses in 2022/2023

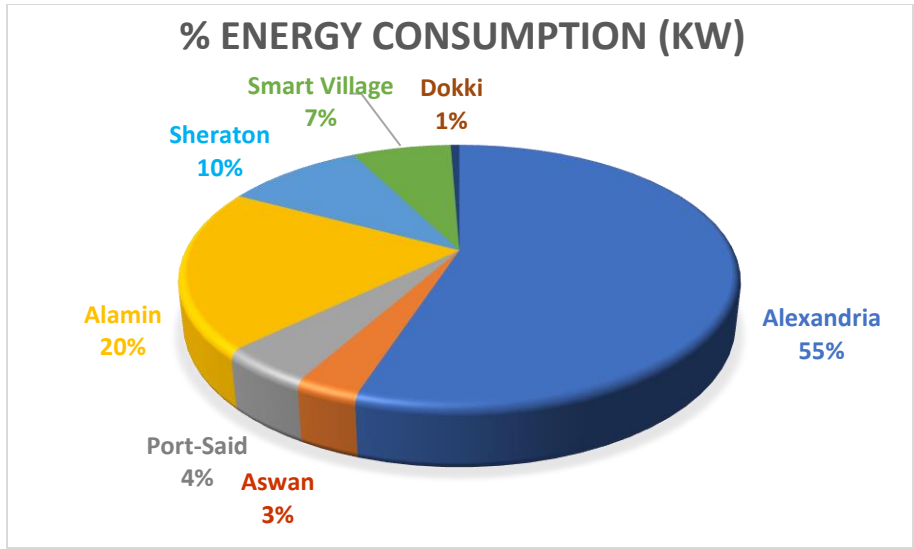
- **Reduction between 2018 and 2023=13.6 %**
- **Total energy used (2022) = 11257258 kwh=40526.137 GJ/2022**
- **Total energy used (2023) = 10972312 kwh=39500.32 GJ/2023**
- **% reduction (2023/2022) = 2.513% reduction**

➤ **Energy consumption in all AAST campuses**

Regarding Energy consumption in all AAST campuses all over Egypt (Alexandria, Aswan, Port-Said, Alamin, Sheraton, Smart village and Dokki), Figure 3 demonstrates the consumption and its % in all AAST campuses respectively for the year 2023.



(a)



(b)

Figure 3. 2023 Energy Consumption in all AAST campuses (a) in kW, (b) in %

Comparing the energy consumption of all AAST campuses for the years 2022 and 2023, as illustrated in Figure 4, it is noted that the average reduction in the all campuses except Alamin Campus is 2.5% while the average reduction all over the campuses including Alamin is around 2%. This is related to the fact that Alamin is a new campus whose capacity increases regularly each year until the full occupation.

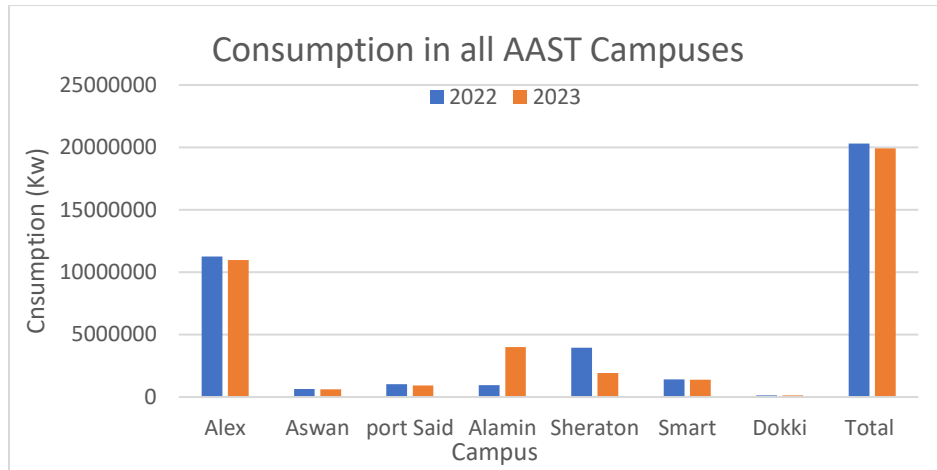


Figure 4. Comparison between 2022 and 2023 energy consumption in all AASTMT campuses

Regarding 2022/2023 AAST energy density, Table1 shows consumption analysis for all AAST campuses all over Egypt and gives the energy density in kWh/m² while Table2 shows the entire AAST energy density in GJ/m². It is worth noting that 270 GJ were supplied from renewable energy resources which reflects AASTMT efforts to divert to clean energy, increase energy efficiency, reduce emissions and sustain serving the Environment.

Table 1. Analysis of Energy for all AAST campuses in 2023

	Alex	Aswan	Port Said	Alamin	Sheraton	Smart	Dokki	Total
Plan (m²)	3033.3	100000	100000	260000	4571.429	1750	3033.3	
Floor Area (m²)	14500	42000	42000	208000	32000	1750	14500	735569.7
Consumption (kWh)	10972312	610500.6	916085.7	3993600	1929312	1376222	119438.5	19917470
Energy Density (kWh/m²)	27.96188	43.1969	21.81156	19.2	42.87359	43.00693	68.25056	27.09612

Table 2. Energy Density in GJ/m² for the entire AAST in 2023

Total Floor Area (m ²)	Consumption from grid (kW)	Consumption from grid (GJ)	Total energy (GJ) (Grid + Renewables)	Density (GJ/m ²)
735569.7	19917470	71702.89	(71702.89+270) 71972.892	0.09784

➤ Renewable Energy Employment in AAST

AAST energy consumption is supplied mainly from the national grid in addition to solar energy in average 214 kW installed on AASTMT campuses buildings.

Noting that the national grid has 20% renewable energy according to National renewable energy Authority (NREA report 2022), as illustrated in **Error! Reference source not found.** Figure 5(a) , and the national renewable energy share increased by almost 6.3% in 2023 as illustrated in Figure 5 (b). Hence, the renewable energy share in the national grid has increased to more than 21% in 2023. Thus, this contributed, besides the already installed 214 kW solar energy, to increase AASTMT average renewable energy share in supplying its total energy demand to around 24% in 2022/2023 which is more than the 21% in 2021/2022.

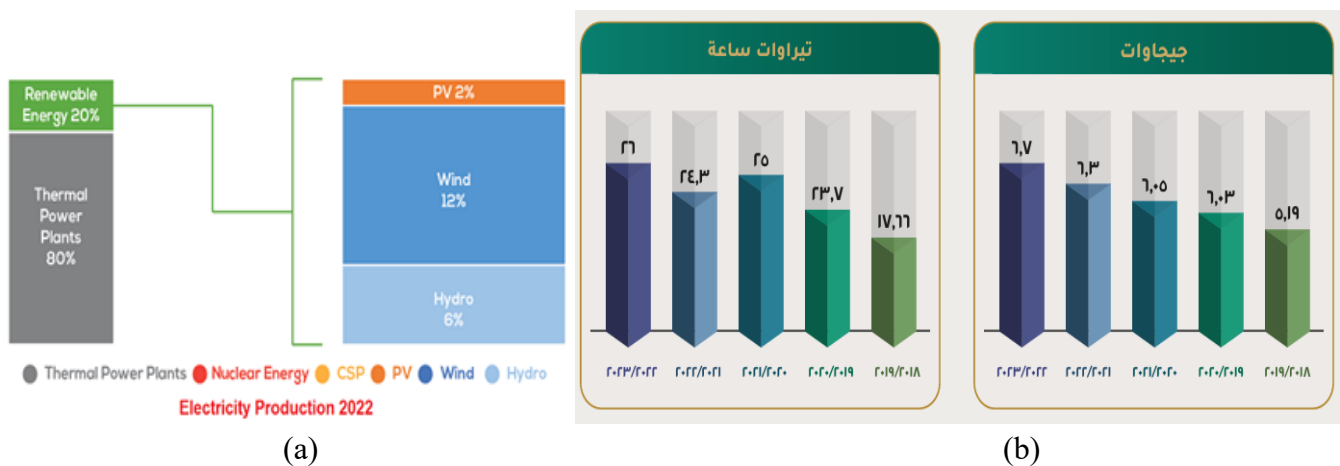


Figure 5. Renewable energy in national grid (a) in 2022 (b) Progress from 2018 to 2023 [NREA Report 2023]

2. Carbon Footprint

As per Carbon Emissions, calculations were made to evaluate carbon emissions (kg CO²-e) in Alexandria campus for the years 2018 to 2023 as discussed in details in 2022/2023 AASTMT Carbon Emissions Progress Report.

[AASTMT Carbon Emissions Progress Report 2022/2023](#)

Table 3: AASTMT-Alexandria campus- Carbon Emissions from 2018 to 2023 (kg CO²-e)

Year	Scope 1 (kg CO ² -e)	Scope 2 (kg CO ² -e)	Scope 3 (kg CO ² -e)	Total Emissions (kg CO ² -e)
2018	1,244,230.50	1,240,286.52	98,997,739.78	101,482,256.80
2019	1,374,252.42	1,151,281.20	152,068,847.38	154,594,380.99
2020	972,551.04	869,471.36	87,130,328.87	88,972,351.27
2021	1,561,942.92	1,008,256.20	112,858,633.63	115,428,832.75
2022	1,300,000.00	950,000.00	110,000,000.00	112,250,000.00
2023	1,150,000.00	925,000.00	105,000,000.00	107,075,000.00

Table 3 presents the emissions across Scope 1, Scope 2, and Scope 3, using the Greenhouse Gas Protocol's framework, providing insights into direct and indirect emissions, to identify key areas for improvement.

Scope 1 emissions, which encompass direct emissions from university-controlled sources, include fuel usage for the campus transport fleet and emissions from refrigerant leaks in air conditioning and refrigeration systems. In 2022, AASTMT recorded 1,300,000 kg CO²-e in Scope 1 emissions, which represents a modest reduction from previous years. This reduction was primarily driven by the electrification of a portion of the university's vehicle fleet, reducing reliance on fossil fuels. Scope 1 emissions decreased further to 1,150,000 kg CO²-e in 2023 due to continuous efforts to replace fuel-dependent vehicles and improvements in refrigerant management.

Scope 2 emissions arise from indirect emissions due to purchased electricity. In 2022, Scope 2 emissions were 950,000 kg CO²-e, reflecting a substantial decrease from previous years due to the installation of solar panels and photovoltaics. By 2023, the university reduced Scope 2 emissions further to 925,000 kg CO²-e.

Scope 3 emissions account for indirect emissions from activities as waste disposal, water usage, and paper consumption. These emissions represented the largest share of AASTMT's carbon footprint, but significant reductions were achieved, with Scope 3 emissions totaling 110,000,000 kg CO²-e in 2022 decreasing more to 105,000,000 kg CO²-e in 2023 due to improved waste management and reduced paper consumption.

In summary, the total emissions for 2023 reflect a steady decrease by 4.6% from 2022 emissions and 7.2% from 2021 emissions, while a notable reduction of 30% from 2019 which witnessed the highest emissions rate since 2018. (Note that 2020 was the Covid year, that's why emissions were the lowest). These reductions demonstrate AASTMT's commitment to its long-term goal of 50% carbon reduction by 2040.

Conclusion

AASTMT 2022/2023 measures towards energy efficiency, saving and renewable energy employment, besides efforts towards Zero-Waste, in Alexandria campus, have effectively resulted in total carbon emissions reduction in 2023 by 4.6% from 2022, 7.2% from 2021 and notably by 30% from 2019 emissions. Moreover, AASTMT efforts contributed, in Alexandria campus, to the overall 13.6% reduction in energy consumption in 2023 compared to 2018 levels and 2.5% reduction compared to 2022. Broadly, among AASTMT campuses all over Egypt, there was a 2% reduction in energy usage which reflect AASTMT effective efforts towards energy conservation and higher energy efficiency. All this reflects AASTMT progress towards Clean Sustainable Energy and its capability of keeping in track with its long-term goal; "By 2040, Increase renewables share in energy supply by 40% and Reduce Emissions by 50%"

Prepared by;

AASTMT Energy Research Unit

AASTMT Sustainability Team

