UNIVERSITY OF JOHANNESBURG

2022 ANNUAL REPORT

The Future Reimagined

Statement on Environmental Sustainability

OVERVIEW

UJ has committed itself to improving on its sustainable practices in all of its University activities. The development of the UJ Strategic Plan 2025, anchored in the overarching goal of global excellence and stature (GES), has placed a requirement on the institution to improve on its sustainability footprint.

Strategic Objective Six

Strategic Objective Six, fitness for global excellence and stature, states that "We will also minimise harmful impact on our environment through managing our carbon footprint, reducing energy and water wastage, encouraging paperless communication, and overall fostering of a culture of responsible stewardship".

UJ has seen a growing commitment towards the goal of being a sustainable institution that strives to implement improvements and actions across all spheres of its campus activities. UJ firmly believes that sustainable development is a long-term commitment and aims to contribute to sustainability by reducing its environmental footprint, while enhancing its contributions to the social and economic development of South Africa.

This report highlights some of the specific focus areas, as well as improvements achieved during 2022.

ENERGY MANAGEMENT

Carbon footprint

UJ's carbon footprint analysis was based on its actual 2022 energy consumption. The total carbon footprint for 2022, based on energy consumption from various sources, is approximately 44 986 tons of CO2 compared to the 38 196 tons reported during 2021 (refer to Tables 21 and 22, respectively). This indicates an increase of approximately 17,76%. This can be attributed almost entirely to the impact of a return to normality after the extended two years of reduced campus attendance during the COVID-19 lockdown levels that were applied at various times during 2020-2021. In a sense this is a return to the more normal carbon footprint figures of 2019 (54 642 tons) and, from that perspective, UJ is still showing a substantial reduction in carbon generation (a reduction from 2019 to 2022 of 25,28%).

In considering this figure, the following should be noted:

- UJ has increased its built area footprint by 13,43% since 2013 and a further 2,52% in 2022.
- The Auckland Park Kingsway Campus continued to contribute significantly to the overall carbon footprint with a net 24 731 tons of CO_2 compared to the overall University footprint of 44 986 tons.
- The methodology of measuring the carbon footprint is based on absolute consumption on main campus areas, and now also includes UJ-owned properties such as off-campus residences, but still excludes JBS Park and UJ on Empire, as these facilities are still being upgraded in terms of measurement equipment.
- While the reported solar photovoltaic power generation has led to a measurable decrease in the carbon generated by UJ – the decrease is approximately 5,53% – a reduction in the savings from the 6,501% saved in 2021 – this must be seen against the overall increase in electricity consumption experienced in 2022.

Table 21: Carbon footprint based on 2022 actual consumption

Emission Source	Kingsway Campus (APK)	Bunting Road Campus (APB)	Doorn-fontein Campus (DFC)	Soweto Campus (SWC)	Total CO_2	TOTAL tons of CO_2
Electricity (kWh)	22 585 453	6 187 774	8 145 035	4 018 067	40 936 329	**40 936**
Natural gas (GJ)	1 008 634	414 773	163 847	0	1 587 254	**1 587**
Catbot	0	0	0	0	0	**0**
Petrol (fleet)	185 489	64 417	108 452	89 484	447 842	**448**
Diesel (fleet)	119 498	58 049	64 026	96 963	338 536	**339**
Diesel generators	308 809	236 643	161 542	323 459	1 030 453	**1 030**
Intercampus bus and staff flights	1 054 371	218 832	477 451	238 726	1 989 379	**1 989**
Paper used by UJ / KMSA sites	504 232	98 242	216 080	101 938	920 493	**920**
TOTAL kg of CO_2	**25 766 486**	**7 278 731**	**9 336 433**	**4 868 636**	**47 250 286**	**47 250**
TOTAL tons of CO_2	**25 766**	**7 279**	**9 336**	**4 869**	**47 250**	**Reduction of electrical power**
Solar PV generation (tons CO_2)	**1 035**	**406**	**427**	**396**	**2 264**	**5,53%**
					Total tons of CO_2	**44 986**

This highlights an increase of 17,76% as compared to the usage in 2021.

The 2022 carbon footprint breakdown is as per Figures 1 and 2.

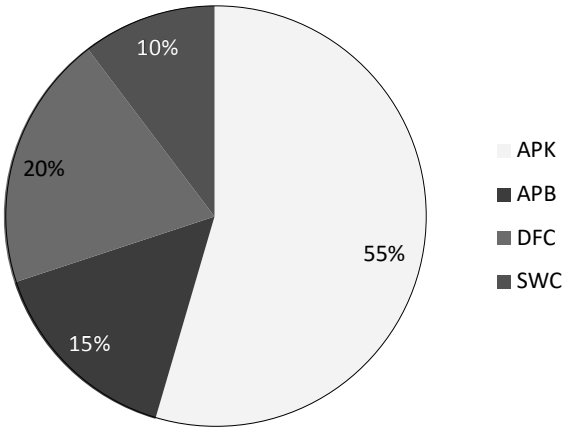

Figure 1: Tons of CO_2 production per campus

Table 22: Carbon footprint based on 2021 actual consumption (revised)

Emission Source	Kingsway Campus (APK)	Bunting Road Campus (APB)	Doorn-fontein Campus (DFC)	Soweto Campus (SWC)	Total CO_2	TOTAL tons of CO_2
Electricity (kWh)	20 593 152	4 984 176	6 487 456	4 074 804	36 139 587	**36 140**
Natural gas (GJ)	1 005 967	255 567	234 048	0	1 495 582	**1 496**
Catbot	0	0	0	0	0	**0**
Petrol (fleet)	159 627	40 060	66 651	41 286	307 624	**308**
Diesel (fleet)	90 423	11 919	36 205	52 383	190 930	**191**
Diesel generators	35 217	10 670	6 091	5 905	57 882	**58**
Intercampus bus and staff flights	980 083	203 413	443 811	221 906	1 849 213	**1 849**
Paper used by UJ / KMSA sites	276 617	53 895	118 540	55 922	504 974	**505**
TOTAL kg of CO_2	**23 141 086**	**5 559 700**	**7 392 802**	**4 452 206**	**40 545 794**	**40 546**
TOTAL tons of CO_2	**23 141**	**5 560**	**7 393**	**4 452**	**40 546**	**Reduction of electrical power**
Solar PV generation (tons CO_2)	**1 028**	**501**	**411**	**410**	**2 349**	**6,5%**
					Total tons of CO_2	**38 196**

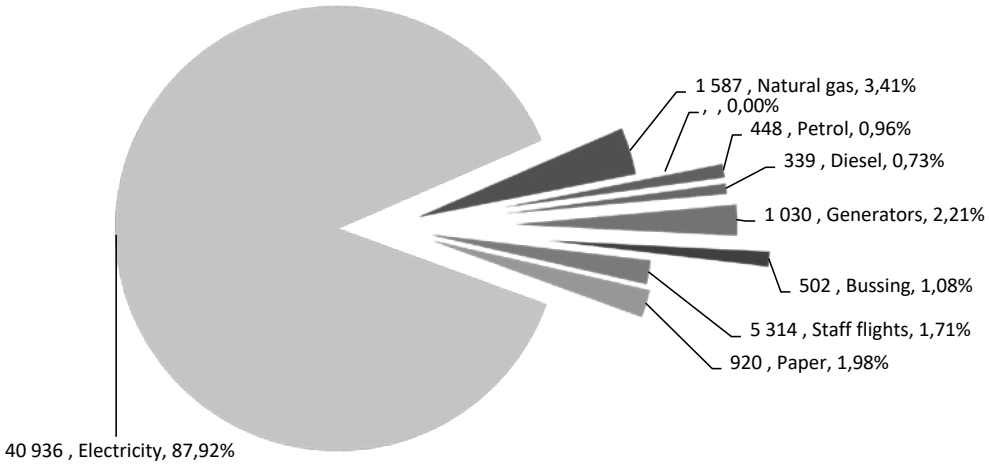

Figure 2: January to December 2022 YTD tons of CO_2 per emission source

Electricity

For January to December 2022, the University of Johannesburg achieved an electrical energy savings of 29,42%, compared to the 2015 baseline (which is the initial value against which we are required to report going forward) for all properties, based on an absolute measurement methodology. The measurement methodology makes no allowance for infrastructure changes or fluctuations in student or staff numbers. This saving was achieved notwithstanding the 13,37% increase in consumption from the 2021 figure.

The various energy savings initiatives that have started showing positive results are the following:

- The own generation of power through the solar photovoltaic (PV) plants now operating on all four campuses.
- The implementation of energy saving lights (LEDs).
- Occupancy sensors (implementation still ongoing).
- The increased use of gas for water heating at residences on the APB and DFC Campuses.
- The further installation of heat pumps, especially in new and refurbished residences.
- The installation of energy efficient showerheads.
- The installation of load control ripple relays.

Continuing with these types of initiatives, including the introduction of further photovoltaic (PV) systems, together with awareness campaigns, will further improve on savings. Since 2018, savings have been lowest on APK overall, due to increased HVAC and the growth in specialist research equipment on the campus. In 2023, a new main chiller installation on the APK Campus with substantially better energy efficiency and no water use will change the energy and water figures there substantially. Table 22 identifies the 2022 energy savings expressed as a percentage. Savings compared to the last normal year (2019) and the reporting year (2022) show how dramatic the impact of the low attendance numbers was on the campuses in terms of energy consumption. As more staff and students return full time to the campus we can expect growing consumption requirements but will hopefully offset this with increasing use of solar PV and other renewables.

Natural gas

Sasol natural gas (Egoli gas) now contributes 3,53% to UJ's total carbon footprint. Natural gas is used mainly in student centres for the purposes of food preparation, as well as in residences for the generation of hot water, and in small quantities at the laboratories for experiments. The saving achieved on gas reduction for 2022 compared to 2015 is 53,8% (again reiterating that the baseline is the 2015 figure for gas consumption). Note that the annual savings – even in the reduced COVID-19 lockdowns in 2020 – have increased further.

Egoli natural gas has a lower CO_2 footprint per gigajoule (GJ) of energy when compared to coal and is therefore a cleaner source of energy. Egoli natural gas will in future be used at a number of residences for heating water and cooking. Since a great deal of gas is used for heating on the APB Campus, there is a plan to trial a 500kW combined heat and power (CHP) generation facility to simultaneously reduce dependence on Eskom power and to reduce the campus carbon footprint further. The continuing diversification of energy sources, from 2019 onwards, will result in a small but measurable continual reduction in the carbon footprint, especially at the residences.

Petrol, diesel and travel related usage

Petrol and diesel fuels are primarily consumed as fuel sources for UJ's vehicle fleet as well as for diesel generators across its main campuses. There are currently 86 generators installed at various points within the UJ infrastructure. Petrol and diesel contribute a small amount to the total carbon footprint, namely 4,04%. It must be noted that increasing occurrence of Eskom load shedding has already produced a substantial increase in diesel usage, and this may result in further substantial CO_2 generation in future, since liquid fuels have a higher CO_2 generation per GJ of energy consumed. There was a small increase in local travel during 2022. But the diesel used for backup generators as well as diesel for maintenance vehicles used as standby vehicles increased from 2021 by 58,22%, directly as a result of the increase in load shedding leading to an increase of more than 500% in 2022.

Since 2019, UJ has also started reporting energy consumption and CO_2 generation resulting from the extensive student bus service operated between campuses, as well as the effective CO_2 generation due to staff related national and international flights. In 2022, the further increase in staff flights as well as a full return to the normal student bussing situation resulted in a more than doubling of carbon generation. For 2022, this carbon generation source was now 6,17% of the total UJ generation.

Table 23: Electrical energy savings (2022) based on 2019 consumption (includes own generation)

MONTH	APK	APB	DFC	SWC	TOTAL
Jan 22	-36%	-38,48%	-21,58%	-22,78%	**-32,6%**
Feb 22	-27,34%	-32,18%	-19,58%	-12,33%	**-25,41%**
Mar 22	-13,39%	-16,26%	-4,95%	-11,48%	**-12,14%**
Apr 22	-24,91%	-25,91%	-14,91%	-75,13%	**-28,13%**
May 22	-13,81%	-15,45%	-8,98%	-37,58%	**-15,64%**
Jun 22	0,63%	-2,96%	-0,98%	4,54%	**0,1%**
Jul 22	-21,03%	-20,36%	-17,01%	-2,37%	**-18,22%**
Aug 22	-8,86%	-21,23%	-4,21%	-9,67%	**-9,98%**
Sep 22	-18,88%	-28,72%	-33,35%	-6,69%	**-22,25%**
Oct 22	-21,8%	-30,92%	-36,62%	-12,43%	**-25,31%**
Nov 22	-29,05%	-22,31%	-32,97%	-25,49%	**-28,48%**
Dec 22	-18,84%	-22,31%	-37,6%	-27,7%	**-23,66%**
TOTALS	**-19,35%**	**-22,67%**	**-18,59%**	**-20,22%**	**-19,81%**

Table 24: Electrical energy savings (2022) based on 2021 consumption (includes own generation)

MONTH	APK	APB	DFC	SWC	TOTAL
Jan 22	-1,19%	-2,75%	22,43%	12,41%	**4,08%**
Feb 22	11,87%	18,15%	32,64%	22,55%	**17,44%**
Mar 22	16,24%	44,3%	38,4%	14,34%	**23,54%**
Apr 22	14,25%	60,54%	47,68%	-65,58%	**16,49%**
May 22	11,52%	57,77%	45,1%	-20,81%	**19,27%**
Jun 22	14,89%	51,98%	39,95%	6,45%	**23,21%**
Jul 22	6,5%	40,06%	39,1%	17,42%	**18,27%**
Aug 22	5,99%	0,02%	38,66%	0,57%	**10,21%**
Sep 22	7,79%	2,11%	0,43%	9,67%	**5,76%**
Oct 22	6,39%	0,53%	3,35%	-0,55%	**4,18%**
Nov 22	12,74%	18,32%	6,5%	0,55%	**11,01%**
Dec 22	6,51%	8,26%	-22,78%	-5,45%	**-0,18%**
TOTALS	**9,67%**	**24,15%**	**25,55%**	**-1,39%**	**13,37%**

Catbot fuel

Catbot fuel is used for the purposes of generating hot water during the five winter months for the central air conditioning plant on APK. Catbot fuel is used to run two hot water generators for the generation of hot water, which is distributed and circulated through the air conditioning system on APK. At present, the catbot fuelled boilers are being repaired and no catbot fuel was used in 2022 at all.