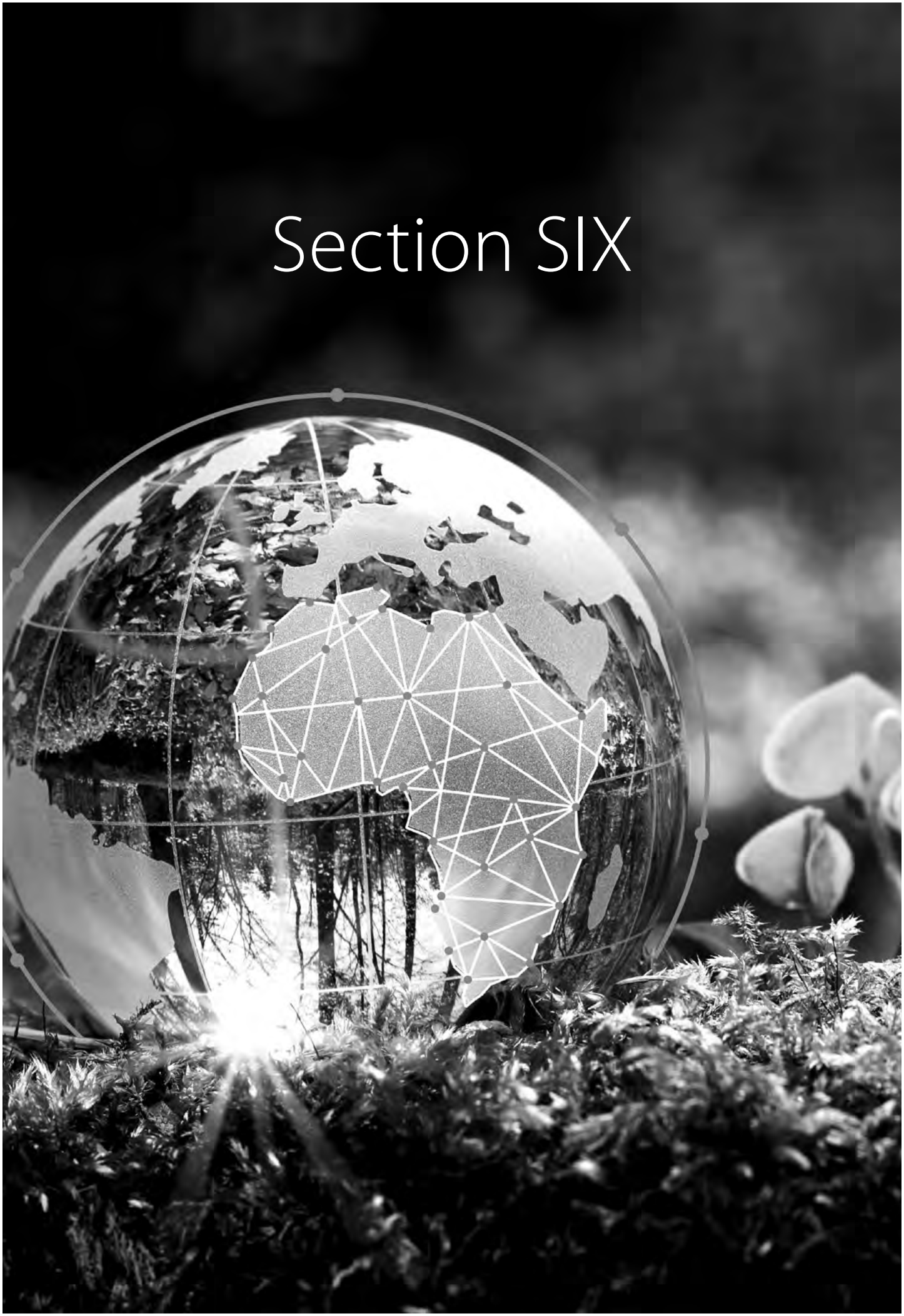
UNIVERSITY OF JOHANNESBURG

2022 ANNUAL REPORT

The Future Reimagined

Section SIX



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.

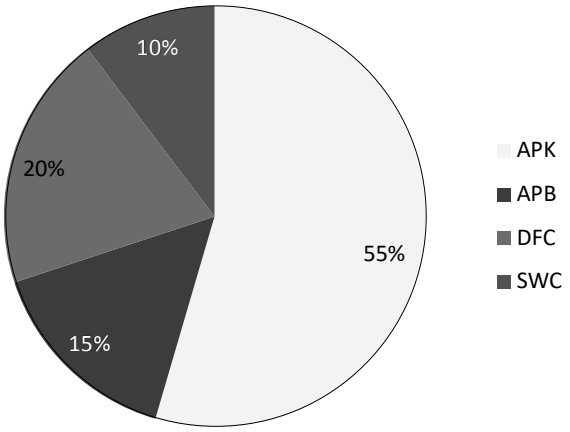


Figure 1: Tons of CO_2 production per campus

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**

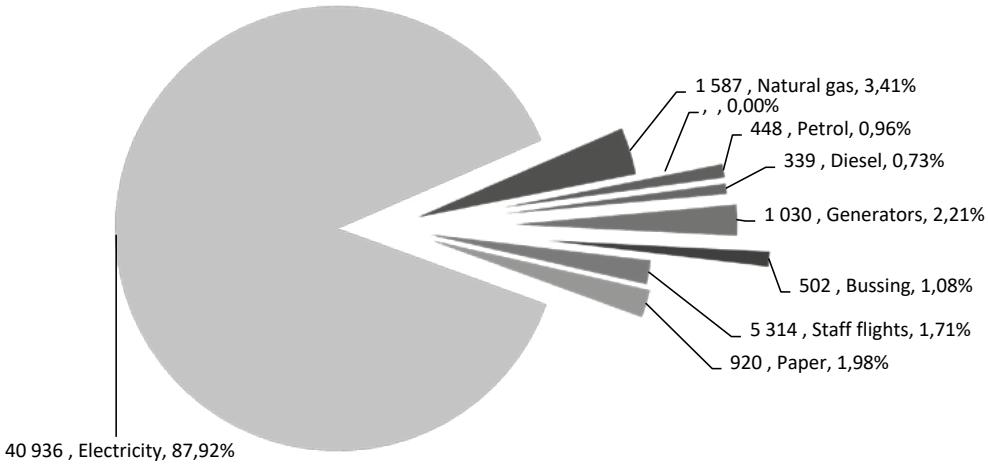


Figure 2: January to December 2022 YTD tons of CO_2 per emission source

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.

WATER MANAGEMENT

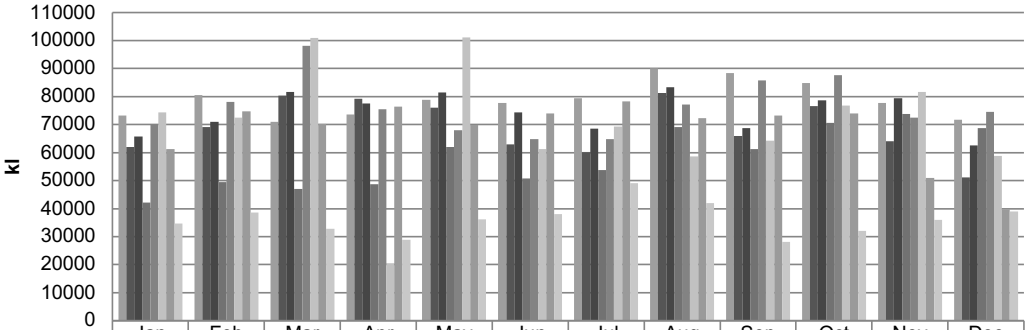
Using water sparingly has become a necessity at UJ. A water savings was achieved for 2022, and compared to 2015, there has been an overall decrease of 46,58% against the very high value of 2021. The APK water consumption in 2022 showed a 54,78% decrease from the 2020 data, a direct result of fixing of a major pipe leak on campus in 2022. As far as possible, borehole water is now being used on all campuses, and the four new boreholes for supply subvention from 2022 are now in operation.

A number of initiatives implemented in 2022 contributed to some water savings. The key focus areas in the reduction of water consumption for 2022 were as follows:

- Achieving 95% installation of water restricting showerheads in residences and installing 100% of new residences with low flow showerheads.
- Reducing water usage due to reduced supply by the CoJ as a direct result of the Eskom load shedding processes.

The key focus areas in the reduction of water consumption for 2023 are as follows:

- As far as possible replacing existing taps with push-taps at kitchen hand basins and bathrooms, and further trialling push-taps in shower cubicles to reduce water loss due to inadvertent open tap losses after water supply cuts.
- Additional drilling for water on other UJ properties.
- Conducting further awareness campaigns on campuses and in residences to achieve water savings.
- Continuing with the ongoing installation of water restricting showerheads and extending the retro-fitting of push-taps in residences and ablution facilities as funds and technological factors permit.
- Considering the use of waterless urinals to reduce water consumption and investigating a waste concentration system on the APK Campus to reduce sewage costs and allow for substantial water recovery for irrigation purposes.
- Installing the first functioning grey water trial on the APB Campus for two large residences – this is expected to save more than 4 million liters of water per annnum.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015	73158	80544	70927	73669	78822	77771	79440	90022	88473	84743	77708	71791
2016	61918	69125	80266	79138	75987	62988	60147	81248	65956	76664	64064	51098
2017	65786	70927	81654	77476	81403	74447	68537	83248	68746	78597	79358	62587
2018	42141	49537	47030	48802	61999	50861	53777	69197	61327	70617	73860	68653
2019	70094	78093	98118	75430	68003	64769	64862	77256	85798	87729	72424	74550
2020	74413	72395	100929	20310	101147	61281	69309	58591	64269	76802	81562	58781
2021	61316	74745	70154	76470	69898	73921	78271	72378	73155	74038	50912	39746
2022	34588	38559	32824	28822	36229	38063	49060	42029	28137	32011	35993	39077

Figure 3: UJ total water consumption comparison from 2015 to 2022

WASTE MANAGEMENT

An analysis of the different types of waste generated in the reporting year is depicted below, while Table xx provides an overview of total waste generation compared to recycled waste. Interestingly, Table xx makes it clear that, in 2022, UJ recycled a substantially larger quantum of waste, which is admirable, but it must be

noted that although the absolute amount of waste generated increased after the very reduced values in 2020 and 2021, it has not yet reached the pre-pandemic levels of 2019. As the total waste generated returns to pre-pandemic levels, the percentage of recycled waste is reducing to be in line with the pre-pandemic levels as well. In terms of a comparison with the 2019 recycling, we are still improving from 33,65% to the 2022 level of 40,25%.

Table 25: Different types of waste recycled from January 2011 to December 2022

YEAR	COM PAPER	WHITE PAPER	PLASTIC	CANS	E WASTE F TUBES	CARDBOAR BOXES	GLASS	SCRAP METAL	WET WASTE	GARDEN REFUSE	TOTAL	%
2011	22.452T	26.934T	26.689T	13.742T	0.14T	37.427T	28.74T	29.803T	0	0	**188.71T**	3,9
2012	42.385T	41.505T	18.797T	9.45T	1.7T	56.417T	30.38T	11.108T	7.671T	0	**288.27T**	8,1
2013	39.46T	40.142T	18.028T	10.005T	1.21T	37.805T	18.793T	7.364T	14.2T	136.5T	**416.63T**	17,64
2014	40.088T	36.855T	19.615T	9.964T	1.44T	48.274T	13.93T	6.768T	36.22T	325.5T	**538.7T**	34,75
2015	31.579T	51.725T	20.335T	7.117T	0.17T	63.932T	31.521T	4.071T	15.16T	329.14T	**506.51T**	28,55
2016	53.681T	21.877T	34.056T	6.347T	0.11T	52.574T	16.218T	17.048T	18.68T	293T	**513.6T**	28,89
2017	40.667T	17.526T	42.149T	8.189T	6.08T	59.824T	27.062T	0.552T	4.61T	250.98T	**456.66T**	19,56
2018	37.016T	45.997T	44.592T	5.5515T	1.91T	40.346T	5.102T	1.34T	8.82T	263.14T	**521.48T**	22,54
2019	32.614T	43.121T	25.062T	5.908T	3.385T	41.16T	47.057T	4.051T	15.23T	407T	**625.33T**	33,65
2020	21.63T	17.98T	12.68T	2.58T	2.72T	31.58T	19.77T	10.26T	30.66T	524T	**673.86T**	47,81
2021	13.952T	17.34T	6.31T	1.408T	3.112T	23.877T	22.317T	14.194T	12.506T	780T	**895.016T**	51,16
2022	32.158T	16.746T	13.811T	2.728T	2.862T	29.423T	19.771T	5.03T	2.629T	719.2T	**844.33T**	40,25

Table 26: Waste generated versus waste recycled – 2011 to 2022

YEAR	GENERATED	RECYCLED	PERCENTAGE RECYCLED
2011	4 838.48T	188.71T	3,9%
2012	3 559.19T	288.27T	8,1%
2013	2 361.88T	416.64T	17,64%
2014	1 551.27T	539.71T	34,79%
2015	1 773.81T	506.52T	28,56%
2016	1 818.89T	513.6T	28,24%
2017	2 333.52T	456.66T	19,57%
2018	2 312.87T	521.48T	22,55%
2019	1 858.48T	625.33T	33,65%
2020	1 409.3T	673.86T	47,82%
2021	1 749.37T	895.02T	51,16%
2022	2 097.93T	844.33T	40,25%

CONCLUSION AND WAY FORWARD

As mentioned at the outset of this report, the development of the UJ Strategic Plan 2025, anchored in the single strategic goal of global excellence and stature (GES), has placed a requirement on the institution to improve on its sustainability footprint.

The expanding nature of the campuses, increasing student numbers as well as cost containment pressures will create a challenging environment for the institution to meet its sustainability goals. However, a good foundation has been established to measure and manage our sustainability goals into the future.

During 2023, the first UJ Sustainability Report using the methodology for environmental reporting (specifically the G4 sustainability reporting Guidelines of the Global Reporting Initiative) will be published, and this will allow a more complete review of environmental impacts of areas sometimes invisible to sustainability reporting (such as excessive paper usage). An initiative will be implemented to report via an effective tenant model for energy and resource usage, and unit-based reporting will become the standard reporting tool in the medium term. This will normalise results for the changing demographics of UJ in terms of the growing residential student population and the increased tenancy of the energy intensive STEM faculties.

The focus areas for 2023 will be to expedite further sustainability projects, such as the fourth wave of solar photovoltaic installations on JBS Park, UJ on Empire and smaller installations on DFC and SWC Campuses, as well as the replacement of geysers with more efficient reverse heat pump solutions in the larger residences. An electric bus initiative started in 2022 will be fully operational and this will affect some of the performance figures positively. Specific additional areas of focus will also include stakeholder engagement, especially with students, the diversification of energy sources with emphasis on renewables, including solar and natural gas, and further technology advancements within sustainability in terms of the new building programmes.

Abraham Snyders (Mr)
Executive Director:
Facilities Management
(Acting)

Mpoti Ralephata (Dr)
Chief Operating Officer

Lethlokwa Mpedi (Prof)
Vice-Chancellor and Principal

Xoliswa Kakana (Ms)
Chairperson of Council

www.uj.ac.za

Design & layout: UJ Graphic Design Studio