
UNIVERSITY
OF
JOHANNESBURG
2021
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 2021.

ENERGY MANAGEMENT

Carbon footprint

UJ's carbon footprint analysis was based on its actual 2021 energy consumption. The total carbon footprint for 2021, based on energy consumption from various sources, is approximately 37 692 tons of CO_2 compared to the 41 403 tons reported during 2020 (refer to Tables 17 and 18, respectively). This indicates a decrease of approximately 8,96%. This can be attributed almost entirely to the continued effect of the various COVID-19 lockdown levels that were applied at various times during 2021 with the consequent reduction in foot traffic on all UJ campuses and off-campus facilities.

In considering this figure, the following should be noted:

- UJ has increased its built area footprint by 10,65% as from 2013.
- The Auckland Park Kingsway Campus continued to contribute significantly to the overall carbon footprint with 22 865 tons of CO_2 compared to the overall University footprint of 37 692.
- Infrastructure on the campuses is included in the consumption figures.
- The methodology of measuring the carbon footprint is based on absolute consumption on main campus areas, excluding UJ owned properties that are not designated as part of the campuses.
- It is the first time that reporting on power generation has led to a measurable decrease in the carbon generated by UJ – the decrease of carbon generated must also be seen against the 6,501% electricity generated by the solar PV plants. This must also be seen against the fact that at times the solar PV plant was not operating optimally because of the lighter foot traffic on the campuses – this will certainly not be the case in 2022.

Table 17: Carbon footprint based on 2021 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)	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**
Inter-campus bus and staff flights	980 083	203 413	443 811	221 906	1 849 213	**1 849**
Paper used by UJ/ KMSA sites	277	54	119	56	505	**1**
Total kg of CO_2	**22 864 745**	**5 505 859**	**7 274 381**	**4 396 339**	**40 041 325**	**40 041**
Total Tons of CO_2	22 865	5 506	7 274	4 396	40 041	**Reduction of Electrical Power**
Solar PV generation (tons CO_2)	**1 028**	**501**	**411**	**410**	**2 349**	**6,5%**
					Total tons of CO_2	**37 692**

This highlights a decrease of 8,96% as compared to the usage in 2020.

The 2021 carbon footprint breakdown is as per Figures 1 and 2 depicted.

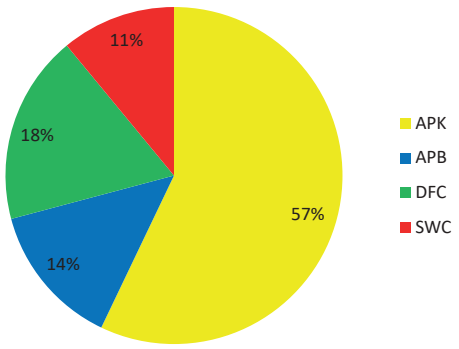


Figure 1: CO_2 production per campus

Table 18: Carbon footprint based on 2020 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)	20 708 411	5 845 577	7 988 701	3 457 593	38 000 280	**38 000**
Natural Gas (GJ)	923 004	334 099	281 928	0	1 539 030	**2 416**
Catbot	38 581	0	0	0	38 581	**39**
Petrol (fleet)	163 373	30 746	71 159	61 342	326 620	**327**
Diesel (fleet)	229 424	23 325	54 062	51 435	358 246	**358**
Diesel generators	62 102	0	2 353	47 565	112 020	**112**
Inter-campus bus and staff flights	520 376	147 276	206 187	108 003	981 842	**982**
Paper used by UJ/ KMSA sites	831 905	162 085	356 499	168 182	1 518 671	**1 519**
Total kg of CO_2	**23 477 176**	**6 543 107**	**8 960 889**	**3 894 118**	**42 875 291**	**43 753**
Total Tons of CO_2	23 477.18	6 543.11	8 960.89	3 894.12	42 875.29	**Reduction**
Solar PV generation (tons CO_2)	**1 027.59**	**500.92**	**410.69**	**410.30**	**2 349.50**	**6,18%**
					Total tons of CO_2	**41 403**

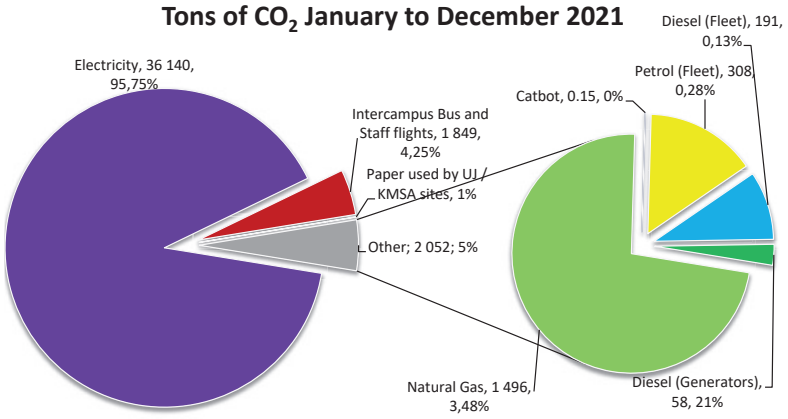


Figure 2: January to December 2021 YTD tons of CO_2 per emission source

Electricity

For January to December 2021, the University of Johannesburg achieved an electrical energy savings of 37,69%, 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 against an adjusted additional savings from 2020 of the 5,75% target set for the 2021 year, which was not met by the actual savings of 4,9% of Eskom purchased power; however, this must be seen against the context of the 2020 consumption being off a very low base.

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, due to increased HVAC and the growth in specialist research equipment on the campus. Table 19 identifies the 2021 energy savings expressed as a percentage – note that the first three months of 2021 are being compared against a pre-pandemic period in 2020 and therefore show dramatic reductions – after this, slight increases reflect the difference between hard lockdown 2020 consumption and the more relaxed lockdowns and partial return to campuses from June 2021.

Table 19: Electrical energy savings (2021) based on 2020 consumption (includes own generation)

Month	APK	APB	DFC	SWC	Total
Jan-21	-34,99%	-23,55%	-35,77%	-29,74%	**-33,19%**
Feb-21	-36,92%	-39,14%	-42,49%	-36,61%	**-38,26%**
Mar-21	-19,15%	-35,36%	-28,52%	19,5%	**-20,7%**
Apr-21	25,56%	-16,95%	1,44%	47,87%	**15,64%**
May-21	39,16%	-2,45%	16,45%	74,33%	**30,93%**
Jun-21	22,51%	-12,99%	10,69%	65,03%	**17,73%**
Jul-21	2,18%	-19,07%	-12,96%	25,29%	**-2,23%**
Aug-21	21,75%	14,64%	-0,48%	37,44%	**17,52%**
Sep-21	5,33%	-2,85%	-9,63%	23,34%	**2,55%**
Oct-21	0,57%	-7,66%	-13,42%	20,17%	**-1,6%**
Nov-21	-1,97%	-11,41%	-14,09%	3,18%	**-5,27%**
Dec-21	5,35%	-10,47%	-0,52%	0,05%	**1,37%**
Totals	**-0,56%**	**-14,74%**	**-12,41%**	**17,85%**	**-3,42%**

The 2021 YTD total electricity consumption is highlighted in Table 20.

Table 20: 2021 YTD total electricity consumption

Month	APK	APB	DFC	SWC	Total
Jan-21	1 284 546	327 663	396 980	207 366	**2 216 555**
Feb-21	1 369 668	348 379	407 268	232 426	**2 357 741**
Mar-21	1 674 106	376 240	494 959	319 051	**2 864 356**
Apr-21	1 687 001	343 917	497 586	327 651	**2 856 155**
May-21	1 960 426	414 246	584 452	395 405	**3 354 529**
Jun-21	1 926 328	426 521	626 125	402 263	**3 381 237**
Jul-21	1 815 066	431 489	589 461	383 437	**3 219 453**
Aug-21	2 045 929	583 244	658 207	432 926	**3 720 306**
Sep-21	1 671 462	458 463	584 079	357 089	**3 071 093**
Oct-21	1 804 003	475 225	557 316	377 689	**3 214 233**
Nov-21	1 556 271	390 243	497 245	314 425	**2 758 184**
Dec-21	1 198 545	263 376	404 824	206 392	**2 073 137**
Totals	**19 993 351**	**4 839 006**	**6 298 501**	**3 956 120**	**35 086 978**

Natural gas

Sasol natural gas (Egoli gas) now contributes 3,97% 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 2021 compared to 2015 is 49,3% (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) power 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 84 generators installed at various points within the UJ infrastructure. Petrol and diesel contribute a small amount to the total carbon footprint, namely 1,48%. It must be noted that increasing occurrence of Eskom load shedding has already produced an 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 2021, but there was a halving of diesel used for backup generators as well as diesel for maintenance vehicles used as standby vehicles during the lockdown periods.

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 2021, the renewal of staff flights as well as a subdued return to a more normal student bussing situation resulted in a doubling of carbon generation. For 2021, this carbon generation source was 4,91% of the total UJ generation.

Catbot fuel

Catbot fuel is used for the purposes of generating hot water for the central air conditioning plant on APK during the five winter months. 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 2021 at all.

WATER MANAGEMENT

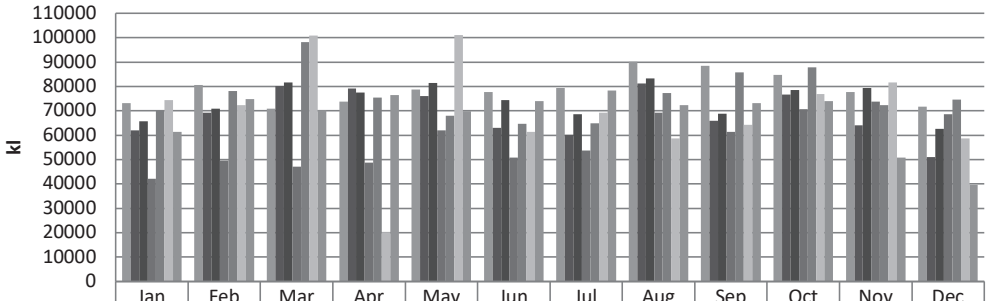
Using water sparingly has become a necessity at UJ. A small water savings was achieved for 2021, and compared to 2015 there has been an overall decrease of only 1,88% against the very low values of 2020. The APK water consumption in 2021 showed only a 2,95% decrease from the 2019 and 2020 data, even after a major pipe leak had been identified and repaired. As far as possible, borehole water is now used on all campuses, and the four new boreholes for supply subvention from 2019 are now in operation.

A number of initiatives implemented in 2021 contributed to some water savings. The key focus areas in the reduction of water consumption for 2019 were as follows:

- Harvesting rainwater for the purpose of irrigation.
- Achieving 95% installation of water restricting showerheads in residences and installing 100% of new residences with low flow showerheads.

The key focus areas in the reduction of water consumption for 2022 are as follows:

- Ensuring that all new student residences make use of push-taps at kitchen hand basins and bathrooms, and trialling push-taps in shower cubicles to reduce water loss due to inadvertent open tap losses after water supply cuts.
- Completing the drilling programmes for an additional new borehole on each of the campuses, for the purpose of using the water for irrigation.
- Benchmarking water usage against other universities and using this as an incentive to increase savings at UJ.
- 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.
- Another grey water trial is expected to be developed in 2022, which, if more successful than in the past, will be extended to other residences and high-traffic ablution facilities.



	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

Figure 3: UJ total water consumption comparison from 2015 to 2021

WASTE MANAGEMENT

An analysis of the different types of waste generated in the reporting year is depicted below, while Table 21 provides an overview of total waste generation compared to recycled waste. Interestingly, Table 22 makes it clear that, in 2021, UJ recycled a substantially larger percentage of its total waste generated – which is admirable, but it must be noted that the absolute amount of waste increased after the very reduced value in 2020 but has not yet reached the pre-pandemic levels of 2019.

Table 21: Different types of waste recycled from January 2011 to December 2021

Month	Com Paper	White Paper	Plastic	Cans	E-Waste/ F-tubes	Card Boxes	Glass	Scrap Metal	Wet Waste	Garden Refuse	TOTAL	%
Total 2011	22.452T	26.934T	26.689T	13.742T	0.14T	37.427T	28.74T	29.803T	0	0	**188.71T**	3,9%
Total 2012	42.385T	41.505T	18.797T	9.45T	1.7T	56.417T	30.38T	11.108T	7.671T	0	**288.27T**	8,1%
Total 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%
Total 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%
Total 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%
Total 2016	53.681T	21.877T	34.056T	6.347T	0.11T	52.574T	16.218T	17.048T	18.68T	293T	**513.6T**	28,89%
Total 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%
Total 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%
Total 2019	32.614T	43.121T	25.062T	5.908T	3.385T	41.16T	47.057T	4.051T	15.23T	407T	**625.33T**	33,65%
Total 2020	21.63T	17.98T	12.68T	2.58T	2.72T	31.58T	19.77T	10.26T	30.66T	524T	**673.86T**	47,81%
Total 2021	**13.952T**	**17.34T**	**6.31T**	**1.408T**	**3.112T**	**23.877T**	**22.317T**	**14.194T**	**12.506T**	**780T**	**895.016T**	**51,16%**

Table 22: Waste generated versus waste recycled – 2011 to 2021

Year	Generated	Recycled	Percentage recycled
2011	4 838.48	188.71	3,9%
2012	3 559.19	288.27	8,1%
2013	2 361.88	416.64	17,64%
2014	1 551.27	539.71	34,79%
2015	1 773.81	506.52	28,56%
2016	1 818.89	513.60	28,24%
2017	2 333.52	456.66	19,57%
2018	2 312.87	521.48	22,55%
2019	1 858.48	625.33	33,65%
2020	1 409.30	673.86	47,82%
2021	1 749.37	895.02	51,16%

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 2022, 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). The previously reported 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 2022 will be to expedite further sustainability projects, such as the third phase of solar photovoltaic installations on the APK, 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 will be launched in 2022 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.

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