

NELSON MANDELA UNIVERSITY



TOWARDS A
SUSTAINABLE UNIVERSITY

“A university that associates itself with Nelson Mandela ... must remain rooted in answering the challenges that confront our society in a global economy. This must be an African university that serves the continent and her people.”

— **CYRIL RAMAPHOSA** —
at the launch of Nelson Mandela University, 2017

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The Frame

Lebogang Hashatse: Deputy Vice-Chancellor: People and Operations

Nelson Mandela University was renamed in 2017 after South Africa's first democratically elected president, Nelson Rolihlahla Mandela. An internationally renowned statesman, Mandela fought valiantly as part of a collective to liberate the country and to set it on the path to a just, honourable and sustainable future for all.

Prior to its renaming in 2017, the University was known as Nelson Mandela Metropolitan University, and was formed through the merger of the University of Port Elizabeth, the Port Elizabeth Technikon, and the local campus of Vista University. The first two universities were for white students, well-resourced, and located in prosperous suburbs, whereas Vista University was designed for black students, and was under-resourced and located in a township.

Naming the University after Nelson Mandela was significant in many respects. It represented a break with an apartheid past – a past that divided people of the same country based on race, class, and geography – and it represented the creation of a renewed and inspiring future. It meant not only confronting and undoing a history of separate and unequal development, but also actively working to achieve Mandela's vision for an equitable, accessible and sustainable education for South Africa's youth.

Mandela University sees sustainability as having three primary dimensions: social sustainability, economic sustainability, and environmental sustainability. While these dimensions are often treated separately, with an emphasis on the economic and environmental aspects, the University has taken an integrated approach and makes a point of also emphasising the importance of social sustainability.

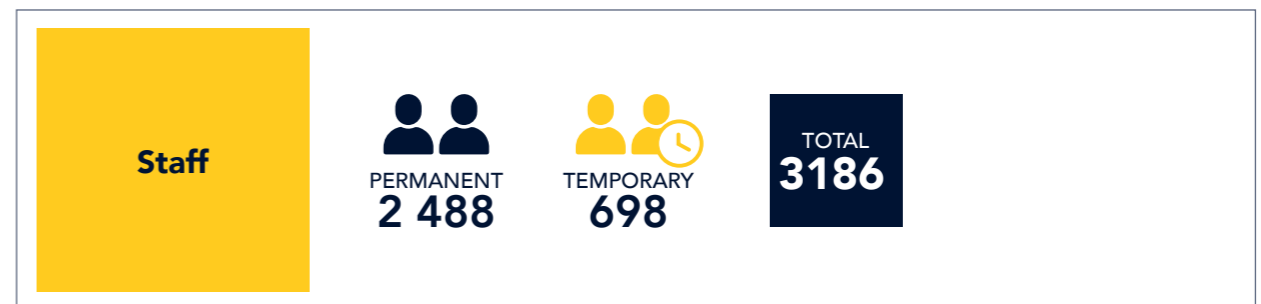
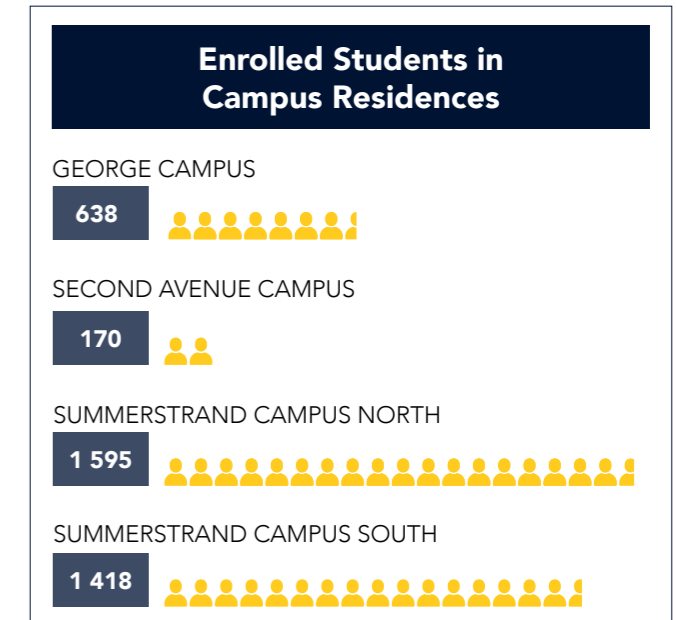
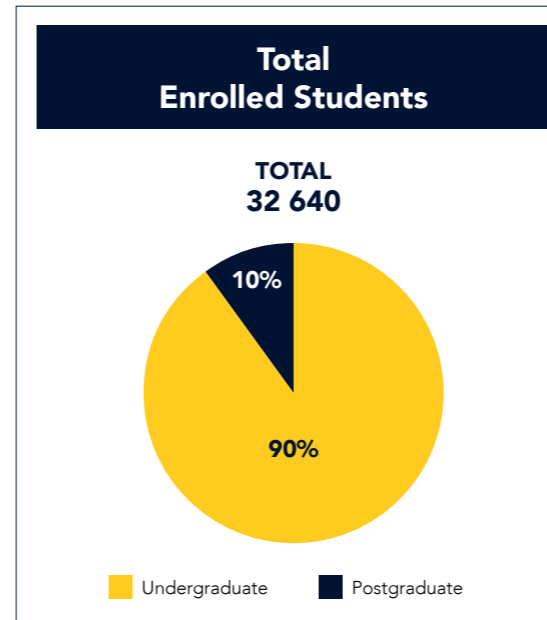
In turn, social sustainability underscores critically thinking about people and their agency, espousing

concepts such as "social equity, liveability, health equity, community development, social capital, social support, human rights, labour rights, place making, social responsibility, social justice, cultural competence, community resilience, and human adaptation." (Hussain & Velasco 2021:23)

From this perspective, the Mandela University sustainability goals are about working with students, staff, and neighbouring communities:

- responsibly integrating its respective campuses within their social, economic and environmental location and geography, respecting and enhancing the green belts, the waterways, and the ocean;
- equalising resource distribution across all campuses;
- greening and environmentally enhancing all campuses;
- making buildings and spaces purposeful, productive, and stimulating environments; and
- ensuring sustainable utilisation, deployment and management of resources and campuses.

Much has been done toward this end, some of which is described in this publication, but much more remains to be done.



Running a 'small municipality'

Melvin Syce: Senior Director: Infrastructure Services and Space Optimisation

Running an institution the size of Mandela University, with seven campuses and 30 000 registered students, is effectively running a small municipality. All the services, requirements, rules and regulations of a municipality apply to campus infrastructure, management and maintenance, and to running all our operations sustainably within budget.

The services we install, render and manage on our campuses in the many different building clusters must be compliant with city regulatory standards. This includes roads, roadside lighting, electricity, water, sewerage and refuse, planning, building and maintenance of infrastructure, sports grounds, campus grounds, the nature reserve in which our Summerstrand campuses are situated, safety and emergency standards and rules, and the regulations applying to the large numbers of students we have living in our campus residences.

Within our university boundaries, apart from major sewer lines and municipal infrastructure, we are responsible for the installation, running and management of everything else. It is a major undertaking, managed through the portfolio of the Deputy Vice-Chancellor: People and Operations, Lebogang Hashatse.

The People and Operations (P&O) team responds to each and every detail. Just as every citizen in a municipality needs to report problems, such as street lights not working or burst water pipes, so too does the University rely on all staff and students to be part of ensuring campus runs properly. Concerns should be reported to the appropriate division.

The users on campus are our eyes and ears and at the same time we are actively working on streamlining and improving the system through our Reimagined Infrastructure Strategy. This is all about how we sustainably bring together the services and uses of the



spaces and buildings, and respond to the myriad of related issues. These include unforeseen infrastructure problems that demand urgent attention.

Of the University's 30 000 students, 17 500 are beneficiaries of the National Student Financial Aid Scheme (NSFAS). Therefore, on-campus accommodation is a priority. The University has increased its on-campus accommodation from 3 870 beds at the start of 2020 to 5 868 by the end of 2022.

All new residences are designed with sustainability as a priority – from the brick and mortar to the split water system for potable water and non-potable water for toilet flushing. Toilet flushing accounts for one-third of the University's total water use and it is not sustainable to use potable, municipal water for this purpose.

Construction and maintenance budgets have to be meticulously managed with sustainability in mind. Further contributing to economic and social sustainability, it is a University requirement that local small, medium or micro enterprises (SMMEs) are hired and local artisans trained on the job as part of all building and installation processes.

Many of the campus buildings are decades old, and this requires budgeting for the unforeseen. For example, the water piping is ageing and pipes frequently break; they need to be refurbished and replaced, which is costly. The electrical substations on campus are another major issue: when South Africa started with load-shedding a few years back, several of the University's substations blew up as they were unable to sustain the constant switching on and off. As a result, a R32-million refurbishment project is still ongoing, at a cost of R6-million a year.

We remain reliant on municipal services to a high degree, such as for electricity, potable water and wastewater treatment, but wherever possible, we are working on becoming self-reliant to enhance our sustainability. Examples include our significant solar photovoltaic (PV) energy rollout plan, the use of alternative sources of water, such as from boreholes, our research into underground reservoir sources, the reservoir constructed on George Campus dedicated to firefighting and our campus-wide rainwater tank installations, as a short-term backup to the ongoing water shortage crisis.

Sustainability encompasses every aspect of the University's ecosystem, going back many years, but with acute focus in the current strategy. More than a decade ago in 2011, the University commissioned the Urban Design Framework. In the preparation of the framework

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“Running an institution the size of Mandela University, with seven campuses and 30 000 registered students, is effectively running a small municipality.”

An Approach to Campus Planning and Design, the consultants, DLMM Urban Design Association, wrote:

It is essential for every university in Southern Africa to have a well-thought-through spatial plan. There are a number of reasons for this:

- Universities are amongst the most important institutions of society
- Universities are like metabolisms in their own right, in that they have inputs, throughputs and outputs. Sustainability requires that inputs are drawn over as small an area as possible and, wherever possible, are renewable; that throughputs are resource-efficient (land, water, energy, finance); and that, in terms of outputs, recycling is encouraged to the greatest degree possible; where this is not possible, wastes should be disposed of in an ecologically responsible way;



A secure and sustainable water resource

Dr Andre Hefer, Sustainability Engineer: Infrastructure Services and Sustainability Department

At full capacity, the University's total water usage across all its campuses is 1.5 megalitres (ML), or 1.5 million litres, per day during peak periods. Up to 70% of this usage is on the largest of its seven campuses, South Campus in Summerstrand, Gqeberha.

Nelson Mandela University is on a water emergency and sustainability drive to address the ongoing water crisis in the Metro, which includes the ever-present

reality of Day Zero, when sections of the Metro would run out of water. The projections in 2021 were that the University's four campuses in Summerstrand and the Bird Street Campus in Central could be without water from the end of September 2021 or earlier and that certain areas in the Metro would have water outages as early as July 2021. This all happened to a greater or lesser extent, and in 2022 the University is facing the same crisis again.

and local, on-site, resource capture (for example, energy and water) should be maximised.

In a situation of increasing budgetary constraints, it is essential to ensure that all investments, including historical investments in infrastructure and space, are used as efficiently as possible.

Integration, both between and within campuses, is an essential part of efficiency. It will not come about automatically: it must be carefully designed. Universities have a responsibility to be role models in terms of environmental

sustainability and appropriate responses to place, as well as in their approach to inputs, throughputs and outputs. This has significant implications for the form of the plan.

Responsible university planning is based on a number of central realisations. Campus design is not unlike designing a small town: it needs to take into account all dimensions of life (teaching, learning, research, recreation, sport, housing, ceremony, social life, and so on). The appropriate approach, therefore, is that of urban design.

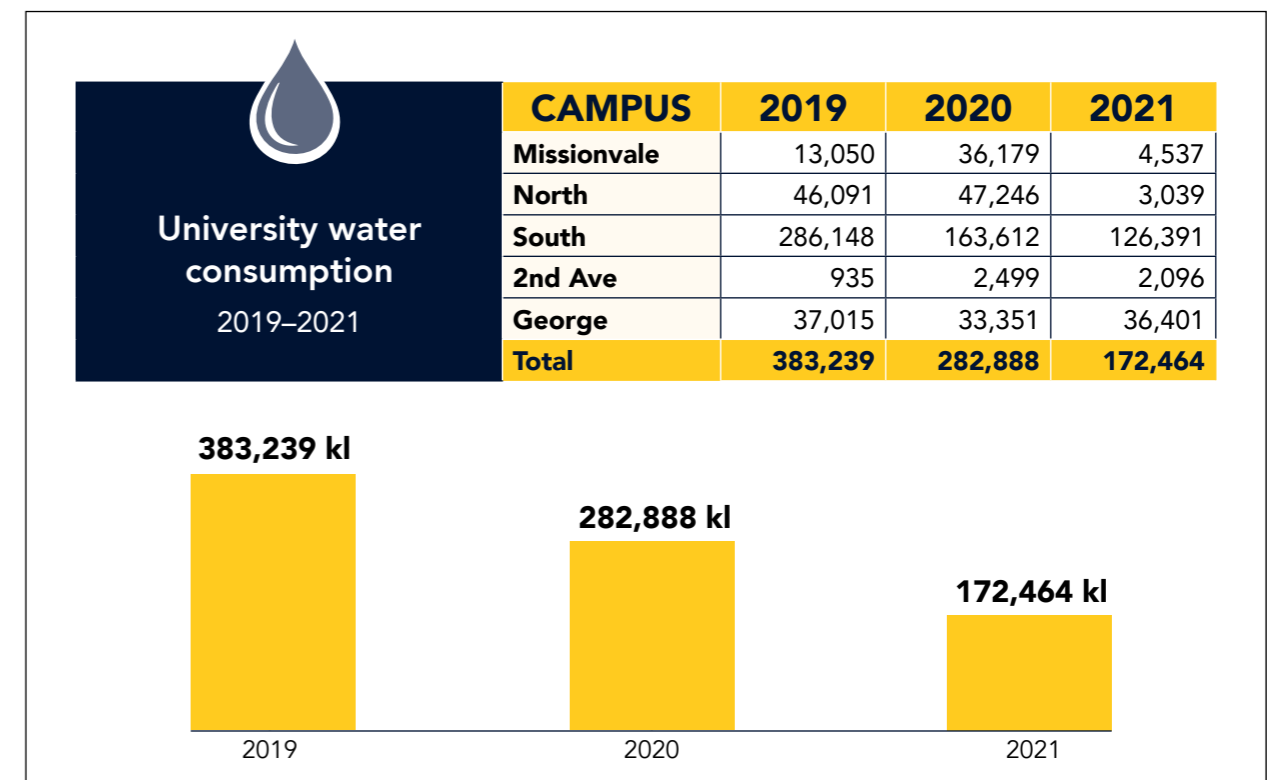


Figure 1: University water consumption 2019-2021

Water and the Metro

Nelson Mandela Metro, on average, uses 300 megalitres (ML) (over 300 million litres in a normal period but down to 280 million litres in the water crisis period) per day for its population of approximately 1.3 million people. Of this, an average of 210ML per day comes from the Nooitgedacht Scheme, which receives water from the Gariiep Dam scheme and supplies most of the Metro's water, notably to the northern & western suburbs.

The Metro is facing a shortage of an average of 70ML per day and there are no cross-linkages between the Nooitgedacht Scheme and the southern part of the Metro.

On 29 June 2022 the four feeder dams to the Metro – the Kouga, Impofu, Churchill and Groendal – were down to an average of 13.9% capacity. The overall average for 2021 was 19% and for 2022, 13% up to the end of April. The Churchill dam in June 2022 was at 15%, with 25ML being extracted from the Churchill per day, down from a normal extraction volume of 60ML. The Impofu in June 2022 was at 10% and no extraction is possible at this level. The Churchill and Impofu dams specifically feed the southern areas of the Metro, which includes five out of the six of Mandela University's Gqeberha campuses. The problem is that the dam systems feed specific areas in the Metro and don't effectively interlink. And due to excessive usage of more than 50 litres per person per day, even if the NMBM did interlink there is simply not enough water coming in. In short, demand is significantly outstripping the supply.

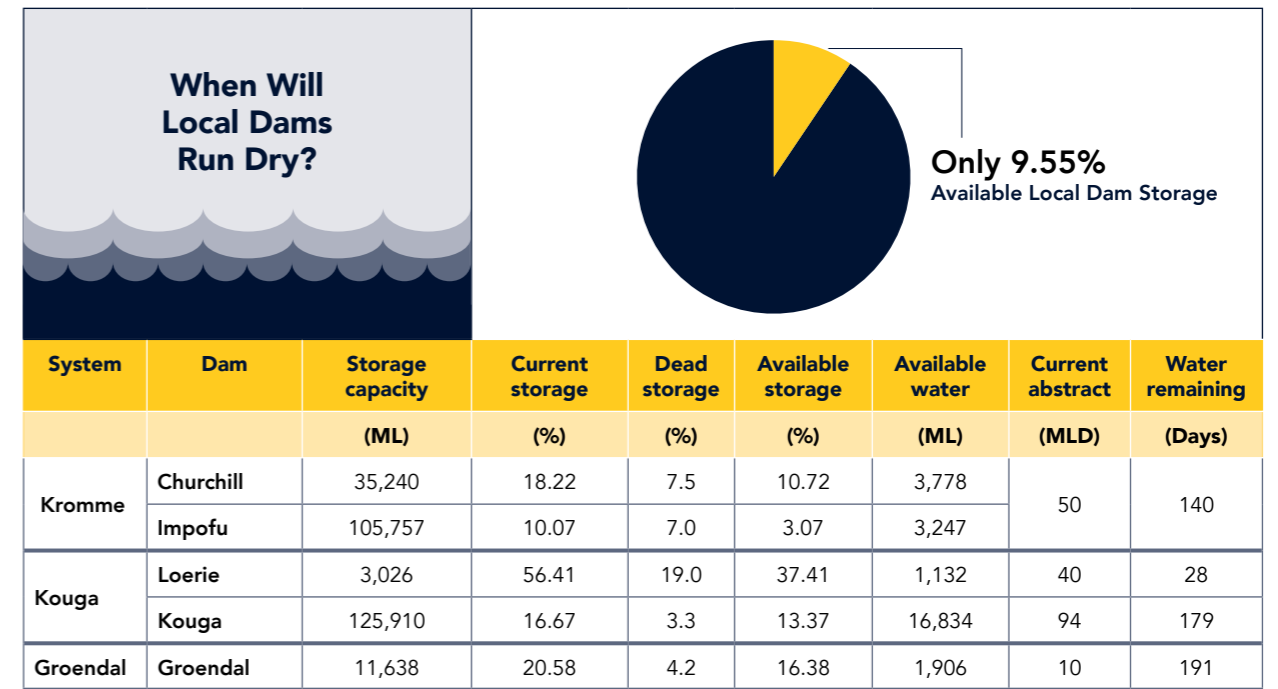
The Nooitgedacht Scheme supply has been maximised, with the completion of Phase III which increased the supply from 170ML to the current 210ML per day. In the future there are plans to add additional phases, but there is a risk in relying too heavily on its source – the Gariiep Dam – which is several hundred kilometres away and also subject to periodic droughts.

Relevant solutions are being addressed within the Metro.

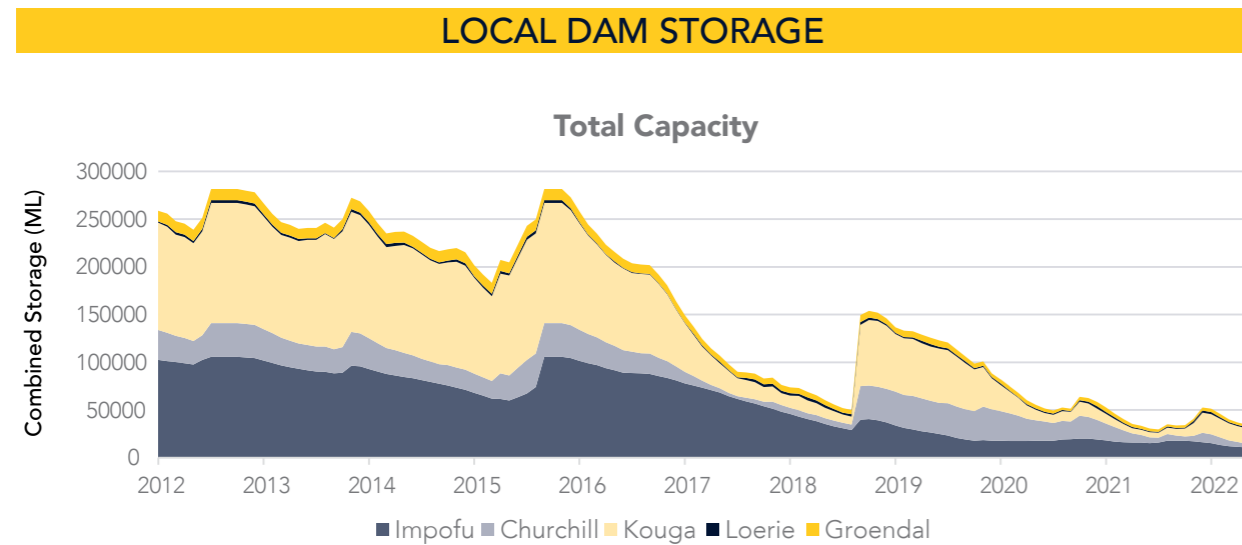
Since July 2020 over 31 000 leaks have been repaired by the municipality as it was calculated that as much as 37% of the Metro's water was unaccounted for. Leak repairs are ongoing. Losses in massive supply reticulation systems like this are common in all cities, but not at this percentage.

Additional boreholes have been drilled, adding 15ML to the supply, water restrictions continue, with 50L per person per day or 500L per household per day.

The installation of water restrictors, flow limiters and water meters has been significantly stepped up, as has the number of water tanks installed throughout the Metro and the number of water supply trucks in the areas affected by the water outages from July 2021, including KwaNobuhle, Seaview, Beachview and the North End Lake industrial area, and Central and Summerstrand, where five Mandela University campuses are situated.



Source: Nelson Mandela Bay Municipality Water Supply and Usage Statistics, 8 August 2022. The Nelson Mandela Bay Municipality provides stakeholders across the Metro with regular updates on the status of the dams.



Source: Nelson Mandela Bay Municipality Water Supply and Usage Statistics, 8 August 2022.

“The University is doing everything it can to ensure that students and staff continue to enjoy a sustainable water supply.”

Water management and risk mitigation plan

At great but necessary cost to the University, the institutional water management and risk mitigation plan has been accelerated. The plans, upscaled from June 2020, are well into the implementation phase. They focus predominantly on the Summerstrand campuses (Ocean Sciences, North, South and Second Avenue) as these are situated in an area classified as a red zone for municipal water supply during the peaks of the water crisis.

During the COVID-19 period, there were as many as 18 000 students and approximately 2 500 staff members on the North and South campuses. This includes 3 500 students living in campus residences. The residences remain full, as many of the students who live in circumstances that are not conducive to online learning, applied to return to campus.

The University is doing everything it can to ensure that students and staff continue to enjoy a sustainable water supply. A water emergency management team has been constituted, comprising water scientists and technical support staff. This team works closely with the municipality's disaster management command centre, and the Business Chamber's water task team.

Emergency management measures are being implemented along with a comprehensive water awareness campaign to bring students and staff on



Technology and the implementation of water saving systems
Increased water storage

The University's technical team is working hard to increase the storage capacity of buildings and residences that do not have emergency water reserves. The water storage strategy is a buffer when the municipal system fails as the stored water sustains the institution for one to three days.

Most buildings already have storage tanks. In 2021, an additional 94 x 5000L water tanks were purchased and installed at critical areas on the South and Missionvale campuses as part of the Water Risk Mitigation Plan Phase 3. The goal is to have sufficient water storage for all the residences. In 2021 (September–December), an additional 74 x 5000L water tanks were installed at South Campus residences, and 20 x 5000L on the Missionvale Campus.

In 2022, 8 x 5000L additional water storage tanks will be installed on the Second Avenue Campus residences and at the High Performance Complex (HPC) building on South Campus, which also houses the Dietetics Department. The HPC facility receives high numbers

“Since 2018, 69 meters with remote electronic readers have been installed at student residences on the North, South and the 2nd Avenue campuses.”

of external visitors, such as athletes coming there for testing. A technical review of the water requirements for the Ocean Sciences Campus and Sanlam Student Village is currently underway to determine the number and volume of water tank installations required.

Water meters and electronic readers

Since 2018, 69 meters with remote electronic readers have been installed at student residences on the North, South and the Second Avenue campuses. Three bulk meters have been installed on South Campus, as well as electronic remote readers. An additional 25 meters with remote electronic readers are currently being scheduled and reviewed for installation on the North, Second Avenue and Missionvale Campuses.

Water pressure readers

The University is looking into the procurement of water pressure readers to monitor and manage water pressure on all its campuses in the Metro (one per campus) through ITD, the company engaged by the University to assist with and maintain its Building Management System (BMS).

One of the reasons for this system is that the municipality drops the water pressure at certain times to contain usage. This pressure management by the municipality creates periods of low pressure on campus, with the consequence that some of the support tank systems do not fill up, and, when the system is fully pressurised again, the change from low to high pressure is too rapid, and can result in large water pipes bursting.



“Most buildings already have storage tanks. In 2021, an additional 94 x 5000L water tanks were purchased and installed at critical areas ...”

board to ensure they actively assist in reducing water consumption on campus and curtail any wastage of water.

In anticipation of the progressive and drastic reduction of water supply, a three-pronged water emergency management and sustainability strategy has been implemented on the campuses since June 2021. It includes:

- Technology and the implementation of water saving systems;
- Reducing the use of potable municipal water by finding and using other sources of water, such as boreholes and reclaimed effluent (RE) water; and
- Promoting behavioural change to get people to use less water.

The strategy is intended not only to mitigate negative impacts of the ongoing water shortages and drought, but also to advance the ongoing institutional sustainability drive.

Flush valves

It bears repeating that toilet flushing accounts for approximately one-third of all water usage on campus per day. The University is aiming to replace the flushing mechanisms of all toilets with a cistern-less system using flush valves.

These valves are expensive to install at R2000 per unit, but they are exceptionally hard-wearing and long-lasting. They flush directly from the water supply, using up to half the water of a cistern system. Standard toilet systems tend to leak, resulting in a considerable amount of water wastage. Flush valves require very little maintenance and are tried and tested. The first ones were installed in residences in the 1970s, and have given hardly any trouble.

Planning was in place to install 150 flush valves on South Campus, but due to the reallocation of funding for water augmentation and storage, this was delayed. They will be installed in 2022 in four residences (Solomon Mahlangu, Postgraduate Village, Lilian Ngoyi and Claude Qavane), as well as on the first to the fourth floors of the main administration building.

Water saving and cleaning

The application of a range of water-saving products is being researched by the University, such as flow restrictors or aerators on taps, water-saving shower heads and waterless urinals. Once installed, the associated savings will be monitored.

Grey water treatment pilot plant

A modular system of localised small-scale wastewater treatment plants is currently being researched by the University. These treatment plants use an anaerobic process on grey/wastewater, which emits a good quality of water for non-potable use such as for irrigation. These would potentially be used on the Second Avenue and George campuses.

Reducing the use of potable municipal water using other sources of water

Return effluent water

Return Effluent (RE) water is a massive sustainability solution for universities, big businesses and operations in the Metro and beyond. The University is working on issues of supply and quality with the municipality and monitors the quality of RE on an ongoing basis to make sure it is fit for use.

In addition the University is considering investing in its own strainer system, which would bypass the municipal system and reduce reliance on it. A weekly backwash would be done, similar to in a swimming pool, to ensure the RE is cleaned.

Sports fields and toilets

On the Summerstrand campuses, sports fields historically accounted for about 20% of total water use. The University is now buying water for its sports fields, gardens and an increasing number of its toilets from the Cape Recife Waste Water Treatment Works which



generates return effluent (RE) water to a treatment standard that is safe for irrigation. At a purchase price of R2.20 per kilolitre (kl) as opposed to R17 per kl for potable municipal water, this represents a major saving. Some 1.7MI of RE water per day can be extracted and stored in a recently built 1.3MI holding dam.

The University's recently completed new residences on North Campus have been designed with a dual system so that toilets can be flushed with RE, borehole water or any alternative source.

The goal is to convert four more residences on South Campus to RE in 2023: Solomon Mahlangu, the Postgraduate Student Village, Lilian Ngoyi and Claude Qavane.

Boreholes

Two boreholes were drilled in 2019 to serve the two new residences on North Campus. They are achieving a good yield of 80 000 to 100 000 litres per day. The University is also exploring the use of boreholes on the Missionvale and Second Avenue Campuses. Both had boreholes drilled ten years ago but there were, respectively, contaminant and salt water issues. To avoid a repeat, a chemical analysis and sustainable yield test will be conducted in 2022. The cost per test is ±R40 000 and to drill each borehole is ±R250 000.

In 2022 the University is looking at drilling a borehole on South Campus because of the volume of people on this campus, and extending the use of the North Campus supply.

However, with approximately 200 boreholes drilled in 2020 and 2021 across the Metro by the municipality, the institution is keenly mindful of the negative impact these can have on groundwater reserves.

Managed Aquifer Recharge

Dr Gaathier Mahed, a geoscientist from the Faculty of Science, has proposed Managed Aquifer Recharge (MAR) as a supplementary, sustainable water source. Water is extracted from a deep underground aquifer when required, such as during a water crisis, and then recharged as water availability increases.

The municipality in the Nelson Mandela Bay Metro has also done research on this and further reports are awaited. MAR is treated as a very sensitive sustainable resource only for use when urgently required so as not to deplete the aquifers. The University will ensure the science of this approach is well established before going ahead with it as it is expensive and it impacts the environment.



Return effluent retention pond and pump station

Water economics research report and recommendations

Professor Syden Mishi: Department of Economics, Water Economics Research Group



In March 2022, the Water Economics Research Group presented a research report to the Eastern Cape's water crisis war room, chaired by the Eastern Cape Department of Water and Sanitation, and including the Nelson Mandela Bay Municipality, the South African Local Government Association (SALGA) and the 13 water authorities.

Points raised in the report with regard to the Metro and Province's water crisis and issues that are affecting water and sustainability include:

1. Water infrastructure theft – this is a huge problem. Criminal syndicates, poverty and unemployment are the main drivers of copper theft from water infrastructure. There are syndicates operating nationally and many millions of rand are being lost this way.
2. Vandalism, which is traced to various sources, including, for example, stock herders who are reported to be damaging water pipes so that their animals have access to water.
3. Business and investors are reluctant to further invest in the Metro without a sustainable, reliable water supply.

The report from the Water Economics Research Group recommended that there should be a Memorandum of Understanding between Nelson Mandela University, SALGA, the Department of Water and Sanitation and the City Support Programme under National Treasury to inform how to address and manage the water issue.

Report recommendations:

The Second-Hand Goods Act should be reviewed, as it is not serving its purpose in curbing the sale of stolen copper and other metals and materials.

1. Safe, confidential reporting channels are put in place for members of communities who are witnessing the theft. People are afraid of reporting as these are international criminal syndicates.
2. The University and business should research materials that have no value in the second-hand goods market, including those created by 3D manufacturing. Municipalities have already started doing this, such as using new materials for manhole covers that are not of interest to second-hand metal dealers.
3. Future water demand should be estimated and aligned funding and collective pre-planning measures established.



“

The next task is to look at the relevant qualifications of the individuals involved in water supply, maintenance and management in order to do a much-needed skills gap analysis. ”

4. The significant number of water leakages should be fixed, illegal water connections stopped and water meters accurately and regularly read so that what is accounted for in terms of the demand side can be accurately estimated.
5. A budget should be allocated to tighten up on security, policing and water meter readers to ensure water security.

The next task is to look at the relevant qualifications of the individuals involved in water supply, maintenance and management in order to do a much-needed skills gap analysis. The different directorates and departments involved also need to start collaborating as they tend to act separately, and municipal structures need to bring them together.

Communities need to be educated about the importance of water and that it is a scarce commodity that everyone needs to use it sustainably. Water-saving campaigns need to be effective. For this to happen the municipalities need to be seen to be effectively addressing the water issue at all levels. The citizen who is saving water but sees others who are using beyond the limit, or the municipality failing to address water leakages or burst pipes, becomes demotivated and disillusioned. Municipalities need to proactively partner with all citizens and stakeholders to tackle the water crisis together.

Promoting behavioural change

Chantal Janneker, Senior Director: Department of Communication and Marketing

Every single member of the University community needs to play their part in water conservation as a key factor in the University's sustainability journey. This is especially given the prolonged water crisis the Metro is facing, and with the threat of Day Zero imminent. If the University runs out of water, only basic emergency support will be available to ensure that the academic project can continue. On-campus numbers would need to be drastically reduced.

It is generally accepted that user adaptation is one of the highest impacts and cheapest approaches, in this case, to water conservation. Sustainability is all about encouraging lifelong behaviour change. With this in mind, the University significantly stepped up its water awareness efforts, with the Save Water Now Campaign, led by the Communication and Marketing Department.

The awareness campaign includes close consultation with students and staff on water conservation solutions. The message was more than an immediate call to action to the students, staff and Metro communities. Its intention was to inculcate behavioural change, to get people to think about how they use this precious resource. To achieve this, the form of communication uses a positive approach, rather than a punitive one.

There is still very little general understanding of what sustainability means, and a lot of work needs to be done on this before people buy into it, and play their part in advancing sustainable communities wherever they are.

Sustainability is a core University value

As a value, sustainability underpins and guides everything we say and do. Our South Campus is situated in a nature reserve and we need to get the message across that we are all environmental stewards. Not because it's a buzz phrase but because life on earth and in the oceans depends on it. The planet is at a

tipping point and we have to understand this and get the message out there.

According to widespread communication research, it takes seven times for a message to land, and the message and medium needs to be adapted to reach different audiences, whether they are academics or students or community members.



Through our media communications the University is raising its profile nationally and internationally on all aspects of sustainability, including earth sciences, freshwater and ocean sciences, and food security. On campus our goal is for our students to graduate as conscious, compassionate, sustainably minded citizens.

Water conservation campaign

The ongoing water conservation campaign on campus, in the Metro and in the city of George includes numerous features, messages, posters and posts. Media and communication is across the full range of platforms – from social media to mainstream media – to reach the widest audience.

Four of the many social media and residence posts are featured above.

“The ongoing water conservation campaign ... includes numerous features, messages, posters and posts.”

Energy security and sustainability

Dr Andre Hefer, Sustainability Engineer: Infrastructure Services and Sustainability Department



Renewable energy strategy

Immediate objectives of the Energy Management Strategy

- To gain control over the University's energy usage by comprehensively and continuously auditing and reducing energy consumption and costs and in so doing, establish accountability for energy management;
- To instil a culture of energy awareness through continuously making staff and students conscious of energy efficiency and conservation opportunities.
- To initially focus on energy consumption and cost and urge the University community to switch off, inter alia, their computers, air-conditioning units and lights when they do not occupy space;
- The continuous installation of energy saving technology and equipment and also the application of energy efficient construction techniques.
- In addition, to further make a statement regarding the application of alternative energy by setting up visible and operational pilot sites; and
- Establish an Energy Management Committee to oversee the Energy Management Strategy.

Energy management for sustainability attempts to minimise the consumption, costs and environmental impact of energy use through suitable design, maintenance and operations of facilities and services. Energy management requires the use of action plans that focus on two distinct strategies:

- **energy conservation** – reduction in wasteful use and demand for energy-related services (which implies: if you don't need it, turn it off); and
- **energy efficiency** – reduction in the consumption of energy for current operations (which implies: if you need it, do it more efficiently).

Nelson Mandela University is committed to responsible energy management in order to meet its commitment to reducing CO₂ emissions, increasing energy efficiency, energy conservation, and renewable energy supply.

The University's Renewable Energy Strategy has approved the installation of solar-photovoltaic (PV) panels on all seven campuses over and above the existing 1 megawatt (MW) solar plant on South Campus, completed in 2019 at a cost of R16.5 million. High quality, imported Tier 1/A-grade panels, which are durable for 20 to 25 years are used. Lower quality panels risk delaminating after three to four years.

South Campus's total energy/electricity requirement is 2.5MW; 30% of its energy use during the day is now

“The University's Renewable Energy Strategy has approved the installation of solar-photovoltaic (PV) panels on all seven campuses ... ”

CAMPUS	2018/2019		2019/2020		2020/2021	
	Consumption	%	Consumption	%	Consumption	%
Missionvale	1,728,433	6%	1,613,003	8%	1,584,325	8%
North	9,261,230	35%	7,138,364	34%	7,352,817	38%
South	13,496,242	50%	10,600,838	50%	9,182,660	47%
2nd Ave	1,564,071	6%	1,259,943	6%	1,054,161	5%
George	781,788	3%	577,806	3%	205,814	1%
TOTAL	26,831,764	100%	21,189,954	100%	19,379,777	100%

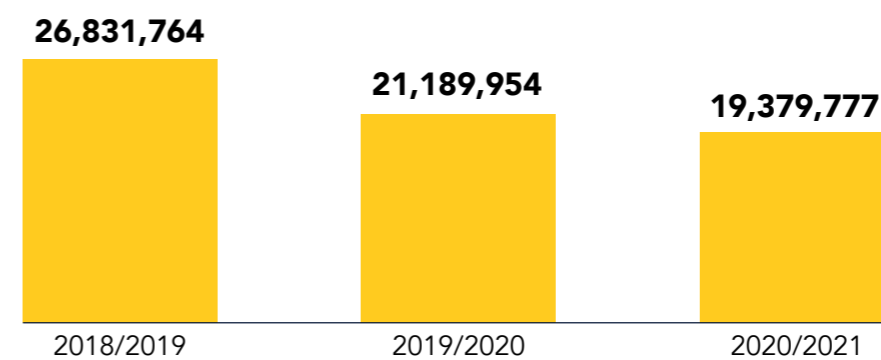


Figure 3: Campus energy consumption

solar generated. The goal is for the entire daytime consumption of each campus's total energy/electricity use to be solar generated. At this stage, all solar energy plants will be grid-tied systems as there are no back-up battery installations.

The solar installations are a partnership between the University, industry and government. The University's photovoltaic research group, headed by Professor Ernest van Dyk, is constantly looking at new ways to improve and advance this sustainable renewable energy, which is experiencing exponential global growth.

In addition to solar-PV, over the past few years, the University has considerably stepped up its energy saving initiatives, keeping pace with technology changes, such as LED lighting, which is 60% more efficient than traditional lighting.

Geysers have been replaced with heat pumps in 90% of the residences, and, budget permitting, 100% will

have heat pumps or solar geysers within the 2023 year. The residences still requiring heat pumps are: Hector Petersen (338 students), Ikamva (162 students), Indwe (312 students) and Yolanda Guma (112 students).

Heat pumps in the residences contribute an energy saving of 66%. The George Campus has a lot of smaller houses that form student accommodation and it was more energy-efficient to use solar geysers for some of these.

Prudent management of Eskom bills has been another contributing factor to financial sustainability. In 2010, the George Campus, for example, had 26 electricity accounts per month because the campus was created out of small, standalone farms. Working with the municipality, these were combined into one account with a cost saving of R100 000 per annum. Over the years, several energy-saving pilots have been conducted on the George Campus, and successful initiatives have then been introduced to the other six campuses.



Energy tariff management

Dr Peter Peters, Deputy Director: Maintenance Services

To implement energy saving strategies specifically as it relates to electricity, it is important to understand the energy tariff used to determine the electricity account. Over and above certain fixed costs, the main cost determining criteria are:

- Maximum Demand (kVA – kilo Volts Ampere) measured in half-hourly intervals and applied individually to the various campuses;
- energy consumption units used as measured in kWh (kilo Watt hours). The kWh used is multiplied with a fixed consumption usage charge rate as applied per site (and not per institution), in order to calculate the consumption cost.

The Maximum Demand Tariff is calculated from a zero base each month by the energy supplier – the municipality. This tariff calculation uses the highest energy demand (over a period of a half-hour) during the month as the basis for calculating the maximum demand cost. An additional problem for a multi-campus environment is that of multiple maximum demand accounts as opposed to a single campus environment generating only one maximum demand account/cost. Obviously, this equates to a substantial cost differentiation. The Maximum Demand Tariff is ±R159.82 per kVA versus R1.54 per kilowatt hour (kWh) for below maximum demand use.

Because the energy supplier needs to provide this maximum amount of energy on demand, it impacts negatively on the supplier's costing model. The user is therefore charged a premium for the peak kVA generated. For this reason the University's multiple maximum demand accounts have resulted in this component being roughly one third of the University's total electricity bill.

Given that the actual electricity spend for 2021 was R45M, with one third being R15M, a key energy saving

strategy must be to manage the Maximum Demand Tariff in real time.

Demand-side management can be achieved by the use of Ripple Control Switching Relays and real-time evaluation that can be controlled via the Building Management System (BMS). Essentially, before the maximum demand is reached with its associated high tariff, the BMS remotely and automatically switches off heat pumps or heaters or air conditioners to reduce demand. Or, as is done in the Lebombo Residence, heaters are only switched on from 17:00 to 22:00.

In doing this, the peak power consumption is minimised by ensuring optimal energy usage wherever possible and enforcing energy factor correction options. This strategy will significantly reduce the energy consumption cost as well. Since 2013, an average of R3-million per annum has



“The Maximum Demand Tariff is calculated from a zero base each month by the energy supplier – the municipality.”

been saved with the use of demand-side management, and with the change to heat pumps and more control of these and air conditioners in offices (there are 850 air conditioners in offices across the seven campuses), as well as the large chiller units for lecture halls (which can be switched off for 30 minutes without negative impact as the ventilation continues running), a projected saving of R5-million per annum is possible.

Thirty Ripple Control Switching Relays have been installed to manage the University's power consumption. However, these relays are controlled from the Nelson Mandela Bay Municipality's Chetty substation and switched off by the municipality via these relays when it becomes necessary to decrease demand. The University is investigating the switching off of these relays via the BMS.

Energy saving initiatives Photovoltaics installation

Photovoltaic (PV) devices convert sunlight into electrical energy via solar modules, each comprising a number of solar cells. The installation capacity can vary but it is necessary to determine the most feasible amount of solar panels to instal to derive the most benefit. On average the payback period of an ideal system is five years with an approximate saving of 30% on the electricity bill.

LED lamps

A light-emitting diode (LED) (a semiconductor diode) is a lamp that glows when a voltage is applied. Replacing normal incandescent bulbs, fluorescent lamps, compact fluorescent lamps and halogen lamps with LED lamps can reduce electricity consumption by 60%.

Sensors

A sensor is a device that detects and responds to input from the physical environment. The specific input could be light, heat, motion, for example. The installation of motion sensors in buildings will ensure that lights are switched off when the space is unoccupied, thus reducing electricity costs.

Remote switching

To complement the BMS with load shedding, the installation of ripple control switching relays on numerous geysers and small air-conditioning units will be investigated. The remote switching off of non-essential loads will not only reduce the kVA but kWh consumption as well.



Timers

A timer is an automatic mechanism for activating or deactivating a device at a pre-set time. The installation of timers on air conditioners installed in large venues will ensure that air conditioners are deactivated after a pre-set time, which can be adjusted remotely via the BMS.

Heat Pumps

Heat pumps transfer heat from the outside ambient air to the water in the storage vessel. The installation of heat pumps reduces the electricity consumption by approximately 66% to 75%. It is thus feasible to replace all geysers and boilers with heat pumps.

Waste reduction and management

In accordance with the need for sustainability and stewardship of the environment, social impact and economic growth, the University has initiated a sustainable Waste Management Strategy (WMS). This requires:

- The optimisation of the current waste management operations taking place at the University;
- Ensuring that our in-house waste management and

engagement work is developed and refined to serve as a blueprint for similar projects in our city and region; and

- Identifying new areas of focus combined with possible projects to lead the University's waste management and recycling path.

All require accelerated action.

Recycling project in the Department of Human Nutrition

Led by Tracey Hutton, the Department of Human Nutrition and Dietetics has, since 2019 (with a break during the pandemic) and starting again in 2022, introduced and practised an efficient and self-driven recycling system. Recycling is also part of the curriculum. They have engaged with ReTrade, an external recycling non-profit partner in Gqerberha, for the recycling programme within the High Performance Complex (HPC).

Cleaning staff have been trained on best practice and ReTrade and Behr Paperless collect all recyclables when 60kg is reached. ReTrade receives the rebate from recyclables, which currently include plastic, paper, mixed paper, tins, milk cartons and cardboard. Glass

is yet to be recycled but the department does not have a high volume of this. Organic waste cannot be composted because of the monkeys in the area, but kitchen staff make good use of peels for stock.

Signage in the building and email communication encourage all students within the HPC to practise recycling, which has proven to be effective.

The plan is to roll this out to other buildings and departments. The Departments of Nursing and Environmental Health will be coming on board. The space currently being used for recycling is too small and needs to be expanded. More recycling bins outside the buildings are also required to increase participation.



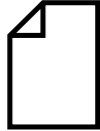




RECYCLING BY CATEGORY JAN – OCT 2021		
		
WHITE PAPER HL1/Wit	CARDBOARD BOX K4 – C/Box	SOFT MIX (MIXED PAPER) S/mix
3,515 kg	30,573 kg	5,285 kg
		
MAGAZINE Mag	GLASS	POLYETHYLENE TEREPHTHALATE PET
467 kg	1,288 kg	298 kg
		
CANS	HIGH-DENSITY POLYETHYLENE HDPE	LOW-DENSITY POLYETHYLENE LDPE
230 kg	1,507 kg	748 kg

Figure 4: Recycling Jan–Oct 2021

Community clean-ups and baseline pollution assessments

Professor Lorien Pichegru, Institute for Coastal and Marine Research, Department of Zoology

We have to reduce the levels of pollution and the carbon footprint at every level. If we don't do this, we are going straight to the wall, yet even informed people are still not taking it very seriously. There is still no wake-up call.

I work with the Sustainable Seas Trust, a non-profit organisation that leads education programmes on plastic pollution and recycling in schools and communities, and works to stop plastic waste at source. It encourages all citizens to do what they can where they live, and has led Operation Clean Spot – ongoing clean-ups in 25 areas in the Metro – as part of a strategy to encourage all citizens to take care of the environment and reduce the amount of pollution and waste in the streets. Collection points for plastic have been established in some of the Metro's townships, such as Motherwell. Local women then sell the plastic to recycling companies.

From April 2022 we started scientifically measuring the impact of the interventions. Before the interventions we conduct baseline studies of litter in the streets and schools in four higher and four lower income areas, and we then measure the impact after the interventions.

We are also scientifically measuring the amount and type of litter washing up on four beaches in Algoa Bay. We established the baseline over two years and now continue our monitoring, hoping to see a decrease in the amount of litter as a result of various interventions. These include engaging the waste management portfolio

“ ... we need far more recycling stations, coupled with a strong educational programme and large explanatory signboards next to the different bins ... ”

in the municipality to reduce the amount of waste going to landfills as a lot of the waste gets spread by the wind and lands up in the sea. We are also engaging the waste management portfolio to address open-air landfills.

Around the city and on our campuses, we need far more recycling stations, coupled with a strong educational programme and large explanatory signboards next to the different bins to encourage as many people as possible to include recycling and pollution-wise behaviour in their lives.

Digitalisation for sustainability

Dr Sam Bosire, Chief Information Officer, ICT Services Department



The scale and speed at which the higher education sector had to digitally transform to online and hybrid models of teaching and learning (a combination of online and face-to-face) as a result of the COVID-19 pandemic, was an unintended turbo boost to the trajectory of digital transformation on which Mandela University had already embarked.

This has become an essential function for the sustainability of the University, and a task team, chaired by Lebogang Hashatse, the Deputy Vice-Chancellor: People and Operations, brought together coordinating groups from throughout the University to collaborate in its ongoing and upscaled shift to digital, online and automated platforms. It has become a critical forum for ICT to collaborate with University-wide colleagues in identifying the needs and challenges, tapping into the spirit of innovation, and coming up with transformational and sustainable technology solutions.

The ICT division has transformed from an enabler of academic and institutional planning to the heartbeat of the institution and the creation of a smart campus that integrates technology and bricks and mortar to achieve optimal use of space for growth and development.

The Department of Higher Education and Training (DHET) has reviewed its infrastructure funding priorities and has foregrounded digital transformation, including enriching and augmenting classroom experiences through the use of technology.

As with many a good thing, digital transformation is a double-edged sword, as there are also serious challenges that constantly need to be mitigated, such as cyber security threats. This has assumed high priority to ensure that the information resources of the University and the user community are secure and protected.

On the upside, the digital transformation journey towards a sustainable University has many positive spinoffs. For example, the University can grow and enhance the institution and extend the Mandela University name on an unprecedented global scale. Research and engagement has greatly benefited from the growth of its national and international partnerships.

At the same time it is only a partial solution for South Africa where many students live in the townships, informal settlements and rural areas where they do not have online access or a private space to study.

Since 2020, the University has facilitated the procurement and distribution of laptops to thousands of students, and every student receives 30GB of data per month. A number of sites with learning information resources are zero rated and all the campuses are Wi-Fi zones.

Students living in circumstances that are not conducive to learning, are given the opportunity to live in residences on campus. Given the range of students and their backgrounds, a “one-size-fits-all” approach to learning is not suitable or sustainable. Emanating from the University’s strong commitment to social justice and equality, it has developed a range of learning and teaching pathways to facilitate access and success for all students. The pathways range from digital to face-to-face, to a blended approach.

The University has 24-hour computer labs with free Wi-Fi, such as at the Bird Street Campus in the city suburb of Central, as many students stay in Central. The University also has an extended digital literacy footprint in working class and disadvantaged areas in the Nelson Mandela Metro and the rural areas of the Eastern Cape, such as the programmes led by its Centre for Community Technologies (CCT).

“Since 2020, the University has facilitated the procurement and distribution of laptops to thousands of students, and every student receives 30GB of data per month.”



Hubs of Convergence (HoC)

Dr Bruce Damons, Director of Engagement and Ntombovuyo Linda, HoC Project Manager

Aligned to the University's Vision 2030 Strategic Intention, to achieve "transformative engagement", the Hubs of Convergence (HoC) comprise a range of community engagement projects, located within the Engagement and Transformation Portfolio (ETP) that are all about "sustainability in service of society".

In the words of Vice-Chancellor Professor Sibongile Muthwa, the HoC endeavours to co-create "physical spaces where the University meets the community to engage on common platforms to find solutions to problems that affect our immediate communities".

The hubs include the following projects: food sovereignty, combatting gender-based violence, community-based economic initiatives, community-

driven projects, knowledge communication and application, and individual and collective well-being. For all the projects, the HoC collaborates with University departments and centres, such as engineering, IT, agriculture and the social sciences. For example, the HoC collaborated with the University's engineering innovation hub, eNtsa, in developing 'Fire Killa' – an affordable, lightweight, highly effective fire extinguisher for informal settlements.

The University's Deputy Vice-Chancellor of Engagement and Transformation, Professor Andre Keet, puts the value of the scheme into context: "The University has 250 engagement projects, many of which are directed towards areas such as poverty, unemployment and inequality, and channelled through its Hubs of Convergence (HoC)."



Food sovereignty and sustainability

Food Systems project lead, Amy De Raedt

The pandemic shifted the University into high engagement gear, and it established the Food Systems project as an institutional response to the crisis around food. Food is one of the key areas of the pandemic that affected society at large, and thus it is important as a social community to come together and advocate strategic pathways that offer engagement and transformation for the development of sustainable livelihoods in the context of food and food systems. The need to upscale and coordinate interventions on food is therefore a key priority for the Food Systems project.

From January 2021, the University's Director of Engagement, Dr Bruce Damons, worked with the Food Systems project lead, master's graduate Amy De Raedt, whose thesis was on food security, and master's graduate Ntombovuyo Linda, the project manager of the Hubs of Convergence (HoC), to start exploring



an internal and external stakeholder collaboration to respond to the food crisis.

The Food Systems project collaborates with multiple stakeholder communities, both internal and external, that are food systems oriented. It works with students and staff in University and community members in the urban, township and rural areas.

The project's focus is to understand, clarify and map the various existing food systems projects and programmes active in the University and broader community space, and to strengthen, complement, and support food and food systems-related work in the Metro and Eastern Cape.

In 2022 the University will partner with the Nelson Mandela Foundation in hosting the international Mandela Day in Gqeberha with a focus on food, indigenous trees, and climate change.

“

“The Food Systems project collaborates with multiple stakeholder communities, both internal and external, that are food systems oriented.”

A reimagined institutional catering solution and staff empowerment

Lutho Nduvane, Senior Director: Support Services

The call for a new business model for catering was first mooted at the University in 2017, following the historic incorporation of employees from the outsourced support services of catering, cleaning, security, and horticulture.

It gained momentum in 2020 with the implementation of the newly configured People and Operations Division, previously called Institutional Support.

With sustainability as a strategic priority of the University, the catering model, along with other business models like safety and security, is prefaced by the overriding needs of efficiency, effectiveness, and empowerment of staff.

Careful consideration of catering, including an in-depth survey conducted with students, showed there was

much room for improvement to achieve the objectives of the new business model. This necessitated an expedited transformation of the “business of food” at the University to offer staff, students, and visitors a better all-round food experience.

Issues that required addressing included: the lack of variety and catering for dietary preferences, including healthier, halal and vegan meals; the packaging of meals into reusable or biodegradable containers; the price of meals, given that a large number of students eat at least one meal a day on campus, mainly lunch; and the request for a competitive grocery store on campus to purchase basic food and toiletry products.

Staff empowerment (skills development initiatives)

The integrated business models adopted by the institution to transform the Support Services division includes the multi-skilling of staff to perform different functions and roles. This is also based on the view that successful institutions in the 21st century are those that develop and train their human talent to be agile members of the organisational value chain and its interconnectedness.

The University identified 50 Support Services staff members without a matric qualification, and supported them to enrol in its matric programme, offered in collaboration with the Northern Areas People Development Initiative, an NPO that helps community members to continue with their education. The University's learning and development unit has also identified other training and development opportunities for the insourced units in People and Operations to ensure that all skills gaps are ultimately closed.

In 2021 the Education, Training and Development Practices Sector Education and Training Authority's





A University in tune with its unique land and ocean environment

Elana Storm, Manager: Horticulture, Department of Maintenance Services

The nature reserve

The University makes a significant contribution to environmental sustainability through the management of the nature reserve and the University's extensive grounds. This includes the Nelson Mandela University private nature reserve, which wraps around the Summerstrand Campus and extends to the first row of dunes above the ocean's high water mark. At 640 ha, it is the largest nature reserve of all the tertiary institutions in South Africa.

In the reserve, considerable effort is made to conserve its very rare coastal fynbos and the indigenous animals that were reintroduced here and which historically occurred in the area. It is open to the public and to mountain bikers at no charge, seven days a week during daylight hours, which contributes to social sustainability and wellness. A significant amount of local and international research is conducted in the reserve, including botany, microbiology, geology, chemistry, nature conservation and game ranch management. The University also hosts school environmental education groups here.

As part of its open space management, Horticulture partners with a range of sustainable wildlife initiatives, such as the Urban Raptor Project. Injured owls that are rehabilitated are released in the reserve to naturally control vermin.

Sustainability philosophy

The work of the horticulture division is broad, and includes nature conservation and open space management. From a grounds management perspective, the sustainability objective is to use as few resources as possible. The biggest draw on natural resources for horticulture is water.

To mitigate this, the University's irrigation philosophy is to use non-potable, return effluent (RE) water, and



Rock monitor release

the sustainability committees have worked hard to find alternative water sources for all the campuses. The Bird Street Campus is the exception, as it is not irrigated at all. It enjoys the benefit of being situated in a natural draining point towards the Baakens River.

With regard to plant waste, the Horticulture team does its own composting and produces a phenomenal 300 cubic metres per annum, which is used in the gardens.

(ETDP-SETA) funded a short learning programme, completed by 20 staff members.

The following training initiatives took place during May 2022:

1. Supervisory skills for cleaning supervisors
2. Compliance training for horticulture supervisors and team leaders
3. Driver Training for the protection services response team
4. Customer service and business etiquette training for Support Services.

There has also been progress with the People and Operations' Frontline Leadership Development Programme, with two managers from Catering Services completing the Intermediate Leadership Programme, which qualified them to register for the National Diploma in Management in 2022. Two more participants are currently enrolled in the Intermediate Leadership Programme.

Overall, the empowerment of staff is a continuous transformation project and an important part of the University's Vision 2030.



Selected campuses: sustainability summary

The campus-wide sustainability strategy is demonstrated in a wide range of ways, and is intrinsic to all new builds and extensions. Some of the initiatives are showcased here.



Horticulture has its own wood chipper which makes bark mulch that is also used in the gardens to retard weeding cycles, creating a nice, closed loop.

Alien invasive plants and trees such as the Port Jackson, Rooikrans and Black Wattle are cut down and the seedlings sprayed with herbicide.

Landscape philosophy

The South Campus landscape philosophy is a natural one, an extension of the nature reserve, creating spaces for small mammals and birds to flourish. The focus is on the conservation of the natural fynbos vegetation and hardy, good fruiting, indigenous plants with a low water requirement, such as indigenous succulents and aloes. Formal landscaping is limited to the entrances of certain buildings.

South and North Campus have a good underground irrigation infrastructure established decades back, fed by non-potable water from the Cape Recife RE plant and a borehole respectively. Strict management and maintenance of the irrigation structure is continuously conducted.

The University inherited different landscape philosophies for each campus and decided to retain this. North Campus, for example, has a Mediterranean theme, with lots of palms and formal plants. There are quite a few pepper trees, which are on the alien invasive trees list but they have a limited lifespan and Horticulture does active seeding control. Once they die off indigenous trees that suit the sandy soil content are planted, such as the milkwood, which is the highest protected tree in South Africa, along with the Outeniqua yellowwood. Succulents are planted wherever possible. On the Second Avenue Campus, the Business School's grounds do not require any irrigation as part of its green status. It has milkwoods, indigenous rosemary and the peacock flower. The Business School's courtyard has five circular flower boxes each depicting a different biome in the Eastern Cape.

Bird Street is the smallest campus, graced with a number of large, old trees, including erythrinias, figs and palms. Horticulture is applying for one of the fig trees, dating back to the 1800s, to be categorised as a champion tree – the highest accolade awarded to trees by the Department of Forestry, Fisheries and the Environment (DFFE).



South Campus

Residence water
 South Campus has 2 500 students in its residences. In 2021, 74 x 5000L water storage tanks were installed across the South Campus residences to give them a buffer in anticipation of Day Zero. The tanks are consistently in use, as the municipal water goes through the tanks and is then reticulated into the buildings. Residences can be supported with water for two to three days if the municipal water system fails. The water tanks can further be filled from other sources, such as boreholes.

As mentioned before, South Campus consumes about 70% of the University's total water usage, and 2022 will be a research and development year to look at additional water supply and water-saving options, including refining the RE scheme and managed aquifer recharge.



North Campus

New residences
 Since October 2021, an additional 800 beds in new residences on North Campus have been completed.

Mandela is primarily a non-residential university, but investment in new residences on our George and Gqeberha campuses is adding an additional 1 744 student beds. This increases the current availability of 3 870 beds at the start of 2020 to 5 614 by the end of 2022. The bed increase will assist with rising student numbers, such as in the Faculty of Law, which opened a new building on South Campus in 2022, due to increasing student numbers in this faculty.

All the new residences have been designed with a sustainability and green focus to comfortably accommodate a high number of people in a smaller area, and including energy- and water-efficiency systems. It required finding a balance between hardy systems that can withstand use over time, cost and sustainability. University-wide engagement was sought to arrive at the best design, structure and usability.



In line with the University's renewable energy strategy, solar-PV installation for these residences is included. All the new residences are solar-PV ready, and designed to have solar panels installed on their roofs; the required conduits have already been installed. Energy-efficiency LED lighting has also been installed in all the residences.

Car park turned solar bank

A solar-PV system was approved by the University in March 2022 for North Campus as part of the renewable energy strategy. It includes installations on the carport roofs in the large parking area on North Campus. This will amount to 30 to 40% of North Campus's overall use.

Borehole water, return effluent and water storage

Borehole water from two boreholes is available for ablutions via the installed split water system to serve 1 800 beds on North Campus.

Split systems for potable and non-potable water are included in all new builds on campus; however, it is technically far more challenging to convert existing buildings to this system.

Water from a third borehole is used by the horticulture department for irrigation.

Plans are in place for the return effluent (RE) scheme linked the sports campus to be extended around the campus all the way to the Ocean Sciences Campus and Sanlam Student Village to irrigate the grounds, and, down the line to use RE for the flushing of toilets.

An additional 30 000L of water in storage tanks was installed in 2021 at the two clinics on North Campus, the COVID vaccination clinic and the student clinic – and at the Lebombo Residence's kitchen.

Food Gardens

As part of food security and sustainability, the University encourages food garden projects in the broader communities and on the campuses, where staff and students volunteer in organic vegetable and aquaponics projects. One of the projects, led by Sol Plaatje Residence Manager, Thando Rubusana, is situated on North Campus. The harvest from the food garden supplies students with nutritious vegetables through the Food Parcel Programme at the Campus Health Clinic. The organic gardens also empower staff and students with food and gardening skills. The project has been supported by Tiger Brands, Siyakhana Gardens, Urban Gardens and Campus Health Clinic. Residence construction on North Campus disrupted the project, which will be up and running again in 2022.



George Campus

With input from George Campus Principal, Dr Kaluke Mawila

The George Campus is the University's living and learning sustainability futures hub, situated on 85 ha of forestry plantations at the foot of the Outeniqua Mountains. The principal's reception area displays the energy and sustainability drive on campus, including the harvesting of rainwater and recycling of organic plant waste for the gardens. As described in the Renewable Energy Strategy section, a solar-PV plant of ± 280 kW was approved in March 2022 for the George Campus. This will be installed in 2023/4 at a cost of R3.8 million.



The 198-bed residence on the George Campus, completed in April 2020, was designed with sustainability principles front of mind, including split water reticulation, with a borehole providing water for the toilets, energy-efficient lighting and low maintenance. The residence consists of a series of pods where eight students share a kitchen and ablution facility. It's a striking departure from the original dormitory-style accommodation.

Former staff houses have been converted to provide additional student accommodation, with electric geysers replaced with solar geysers and heat pumps. Given its rural location, baboons are a regular feature on campus, and special consideration had to be applied to primate-proof the windows and dustbins.

Another risk is fire from the surrounding plantations. The campus was lucky to escape the runaway fire that destroyed large tracts of the Garden Route in 2018. A one megalitre water storage facility has been installed specifically for firefighting.

From 2022, campus staff and students from a range of disciplines are participating in a "hacking programme" coordinated by the Director of the School of Natural Resource Management, Professor Josua Louw, in collaboration with the Department of Horticulture. They are tackling the alien tree invasion and regrowth on the campus grounds as part of a landscape-wide programme to reduce alien tree infestation, which is a major environmental and fire hazard for the Garden Route. Alien trees also take up vast amounts of water, which South Africa cannot afford.

Prof Louw says: "It is essential that all our staff and students across all disciplines understand the importance of contributing to a sustainable environment and ecosystem resilience. The reality is that environmental degradation affects everyone and manifests as economic problems that impact all communities in a variety of negative ways."

The staff and students engage schools, businesses, citizens, government and conservation organisations in a range of sustainability initiatives, such as the food, clothing and blanket drive for Phambili Women's Shelter, and the food garden project at the prison in George, enabled by the Department of Correctional Services.

All students are encouraged to participate in the food gardens on campus, which help supply the dining rooms and educate students in self-sustainability. They take back the skills they learn to their communities and the knowledge network grows.



Bird Street Campus

Situated in the historic inner city precinct of Central, the Bird Street Campus is where a high number of students stay off-campus in apartments and houses. The campus plays a key role in precinct management initiatives for social and economic sustainability.

The Central SRA has a five-year improvement plan for which they are working closely with the Mandela Bay Development Agency (MBDA), the municipality, Metro Police, the South African Police Service (SAPS), property owners, businesses and the University. Local security company, Citywide Security, manages security in Central, and the SRA has employed two full-time block marshals.

The whole idea is that Central should be to Nelson Mandela University what Braamfontein is to Wits University, Greenwich Village is to New York University, and Bloomsbury and Camden are to the University of London.

Over 50 cameras have been installed on the neighbourhood's boundaries, including Automatic Number Recognition Cameras (ANRC) at all the entrance points. In addition, 35 Artificial Intelligence (AI) cameras have been installed throughout Central. All the cameras are linked to the security company's control room which alerts the patrol cars.

Central has all the ingredients to be a place of vibrant student and business activity, but in past years there was no coordination to address its obvious decline, decay and criminality.

Waste management is another ongoing problem, and the SRA is tackling this, along with drugs and prostitution. As part of the sustainable waste management drive, a waste trade company is bringing in a mobile recycling plant with an onboard scale. Residents or street pickers who separate their waste into bottles and tins, and plastic and cardboard, can take it to the recycling plant and be paid for it.

To address this, a neighbourhood improvement drive was initiated through the establishment of the Central Special Ratings Area (SRA), which started addressing the safety, security and cleanliness issues from August 2020. The University is a board member of the Central SRA, alongside local business people, landlords and residents. To improve the neighbourhood, ratepayers in Central pay an extra amount on their rates and taxes, managed by the Central SRA non-profit company.

The overall aim is to encourage everyone in Central to play their part in the look and feel of their area.



Missionvale Campus

With input from Senior Director: Missionvale, Bird Street and Second Avenue Campuses, Sharon Masiza

Waste management is one of the key priorities on these campuses, as part of the University's zero-landfill strategy, which is still in the planning stage. This would require stopping all use of non-recyclable plastics on campus.

The 2022/23 installation of the solar-PV plant for Missionvale, discussed in the Renewable Energy Strategy section, will include five to ten on-site learnerships to upskill students and community members in the Missionvale area in solar-PV installation and maintenance.

Missionvale requires additional water capacity as, on average, it experiences municipal water outages every two weeks for half a day to a day. Water tank capacity of 100 000L have been installed on



campus, which creates a three-day buffer. Missionvale has a borehole that requires re-testing and a system needs to be put in place to clear any contaminants in the water. The borehole water would be used to irrigate the grounds and for on-site food projects.

Agriculture and aquaponics project

Funded by the University, in partnership with the Mondelez International Foundation, and run in partnership with INMED SA, the agriculture and aquaponics project on Missionvale Campus produces several tonnes of fish and fresh vegetables each year.

The project brings together aquaculture (fish farming) and hydroponics (soilless crop production) in a closed system that uses 90% less water than traditional agriculture.

From 2022, aquaponics as a subject has become part of the school curriculum. Project beneficiary Nomonde Ntsundwana, a teacher at Seyisi Primary School in nearby Kwazakhele, said the scheme not only exposed the pupils to the practice of aquaponics, but also supplemented the school's nutrition programme.

Greenhouse Project

Also on the Missionvale Campus is the Greenhouse Project, coordinated by Irna Senekal, a researcher

in the Centre for Integrated Post School Education and Training (CIPSET). The goal is to grow vegetable seedlings for the many community vegetable garden projects in the Metro with which CIPSET is engaged.

Called the Green Technologies Engineering Cooperative or GREENTEC, it is a partnership with the Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA) and unemployed civil and electrical engineering technical and vocational training students in the Metro. The cooperative is one of the responses to CIPSET's youth participatory action research around unemployment and the ways in which these students can, in the interim, engage in work that is meaningful to themselves and to society. The students need work experience in the field to complete their N6 diploma.

Two of the group members who studied electrical engineering have since been placed in the University to support the electrical team. Another two, who studied civil engineering, have been placed in the WBHO construction company, which building the new residences on North and South Campus. All members of the group will assist in the construction and maintenance of the greenhouse tunnels and associated irrigation systems.

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