WATER AUDIT REPORT

For

Centurion University of Technology & Management

Rajib Nagar, Balangir,

Odisha - 767001

Year 2022-23

CONSULTATION and REPORT by

FORCE

(Pandit Jagat Ram Memorial FORCE Trust)

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ACKNOWLEDGEMENT

FORCE (Pandit Jagat Ram Memorial FORCE Trust) takes this opportunity to appreciate & thank the management of **Centurion University Technology & Management, Rajib Nagar, Balangir, Odisha** for giving us an opportunity to conduct Water audit for the University.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

We are grateful also to the UNICEF led Youth4Water campaign for their support and for the opportunity to provide a learning by doing training in conducting Water Audits to 4 Youth4Water volunteers from Centurion University as a part of this initiative.

(signed)

Jyoti Sharma

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EXECUTIVE SUMMARY & RECOMMENDATIONS

The executive summary of the water audit report furnished in this section briefly gives the findings and recommendations of the Audit team.

WATER SOURCES, QUALITY AND USAGE

On the basis of water usage statistics shared by campus, the estimated water usage is 18 kilo litres per day. However, calculating using accepted benchmarks for usage types, the campus should be using approx. 19.57 kilo litres (kL) per day. The discrepancy is negligible and can be attributed to calculation method differences. The water used in the campus comes from borewells within the campus. They are sufficient to fulfil all its water requirements.

Usage of water is for drinking, domestic and greening purposes. Raw water is stored in 5 storage tanks of which 3 are overhead tanks, 2 on-ground for storage of water. The total storage capacity is 72kL. They are all filled once a day. A pipeline system takes water from these tanks to the water usage points. There are 187 taps and 64 cisterns that dispense water for various purposes. Most of the taps have a diameter of 1.5cm with a flow rate of 7-8 litres per minute.

Borewell water quality is as per potable water norms. The campus gets its water checked periodically. As per the reports, all major parameters are within the permissible norms

CONSERVATION INITIATIVES TAKEN BY THE CAMPUS

The campus has a well planned network of water storage tanks and distribution pipelines. Control valves and Float Valves used through the system enable the campus to minimize wastages through overflows. 3 out of 3 overhead tanks and all 2 on-ground tanks either have an auto-shutoff motor or float valve or indicator to prevent tank overflows. Regular inspections are done to check for leakages.

If spotted, they are repaired immediately. 42.85% of taps I.e 15 taps (handwash) have sensors or timers to help save water.

The campus has a sewage system which is distinct from storm water system. The sewage system collects water from toilets, bathrooms, kitchens and laboratories. Its outfall is in a sewage system to the municipal sewage trunkline outside the campus

The campus also has 1 rainwater harvesting systems with a cumulative capacity of approx. 42.5kL per hour. These are strategically placed at points of stormwater accumulation. They are efficient and maintained regularly.

A special effort is made by the university to create awareness about water conservation among students. Signages at drinking water points and in toilets remind students to switch off taps after use and not waste water. Regular awareness events are held and important dates such as World Water Day are celebrated to remind students of the need to conserve water. The students are also encouraged to come up with innovative ideas on water conservation. The campus has an Environmental policy of 'Recycle, Reuse, Reduce and Recover'. This is applied to its approach to water as well.

AREAS FOR IMPROVEMENT AND RECOMMENDATION

Fresh water monitoring system:

There is a need to quantify the amount of water being extracted from groundwater everyday. The quantification is easily done by counting for borewells, it would help to install IoT based ground water extraction monitoring system to quantify fresh water consumption per day in the University.

There is also a need to install water flow meters (Mechanical or Electronics) in distribution network, like University building, drinking, Gardening for quantity per day water consumption and waste

water generation in the University campus. This will not only help get exact quantities consumed but will also be a useful tool for planning conjunctive and efficient water use within the campus.

Automatic shutoff switches in overhead tanks

Though most storage tanks have indicators or float valves to alert people about overflows and prevent them, auto shutoff motors / switches for overhead tanks can make the task of preventing water overflows much easier. This should be done for all overhead tanks since they are very difficult to monitor.

Aerators / Atomizers / sensors / timers in taps

All the taps in toilets and kitchens were manual taps. These would be a source of over consumption of water especially because students might be careless about closing them post use or during non-essential periods of use. It is advised that aerators/atomizers be fitted in taps – especially those used primarily for handwashing such as in toilets. Also, sensors or timer taps can be installed wherever possible to prevent the possibility of water wastage due to tap being left on. Such taps are also drip resistant.

Sprinklers and Drip water irrigation system for gardening.

Though sprinklers have been installed in some lawns, there is potential for more sprinklers and also for drip water irrigation.

Rainwater Harvesting

Though there is only one rainwater harvesting recharge pit, its capacity is less than the groundwater recharge potential of the campus. We strongly advise that a 'Zero Rainwater Flow-out plan' be prepared for the campus. This will recommend the number, types and location of groundwater recharge structures that can enable the campus to fully utilize its rainwater.

Given the high dependence of the campus on borewells, it is highly advisable that the campus do additional rainwater harvesting for sustainability of its water supply.

Other suggestions.

We also recommend that the Campus prepare a 'Water Management Policy', and make a multi-year blueprint to work towards making the campus water secure and with a zero waste water footprint.

Perhaps more training programs on water management can be done. University can also ensure participation of students and teachers in local water issues.

CHAPTER 1 – INTRODUCTION

1.1 About the University

Centurion University is duly recognized as a pioneer is 'Skill Integrated Higher Education". Its unique model lays specific emphasis on creating sustainable livelihoods on a national scale in challenging geographies through education that results in employability and sparks entrepreneurship. This model has been recognized by multiple Governments (Central and State), International Organizations such as UNESCO and the World Bank as well as Policy Think-tanks such as the Niti Ayog. Recently, Centurion University's School of Vocational Education and Training has been recognized as a Center of Excellence by Ministry of Skill Development and Entrepreneurship, Government of India. It is the only University in India to be recognized as such.

Centurion has continually strived to be a best in class human resource development hub that builds employable, enterprising and society centric youth through industry relevant education, skill development, new ventures, production, and technology development.

The founders, faculty and staff are fully committed to its credo: **Shaping Lives. Empowering Communities.** This credo is underpinned by a value system of Inclusivity, Integrity, Equity, Respect and Sustainability in everything they do.

Since its inception in 2005 and subsequent establishment as a University in 2010 (vide Odisha Act 4 of 2010), Centurion has created a unique environment that ensures a tailored learning and employability path for youth in some of the poorest and underserved geographies in Odisha and Andhra Pradesh.

Centurion has embraced the Agenda for Sustainable Development and the associated Sustainable Development Goals (SDGs) since being formally announced in 2015. SDGs have been both formally and informally used as a guiding framework and are now firmly embedded in the Centurion DNA.

Whilst having an indirect impact and contribution on almost all 17 SDGs, Centurion has specifically focused on 9 SDGs and embedded it in everything from its strategy, governance, institutional management and outcomes.

Vision

A globally accredited human resource center of excellence catalyzing "sustainable livelihoods" in the "less developed markets across the globe".

Mission

- Provision of quality, globally accredited academic programmes in technology and management .
- Provision of globally accredited employability training for less endowed segments of the population.
- Promotion of entrepreneurial culture and enterprise in the target areas.
- Facilitating improved market access to goods and financial services to the target population.
- Promotion of lighthouse project interventions in the target area .

The journey of Centurion University of Technology and Management (CUTM) began in the year 2005 by a group of ambitious academics with aspirations to provide high quality education both nationally and internationally. The first step in this direction was to take over an ailing engineering Institute, the Jagannath Institute for Technology and Management (JITM) in one of the most challenging tribal districts of Odisha and one which was considered to be a left-wing extremist affected area. Subsequently, JITM was transformed into Centurion University of Technology and Management in August 2010, through an act of Odisha Legislative Assembly. It became the First Multi-Sector State Private University in Odisha.

The founders during their earlier stint as teachers realized that education is one of the most powerful tool for empowerment, was in reality designed for the elite. In response, they embarked on this ambitious journey with the aim to bring employment-linked education within the reach of those who needed it the most. As a result, Centurion University has skilled, trained and linked 80,000+ "poor, more poor and ultra poor" youth to find gainful employment. Through five Social Enterprises established under the University, Teaching, Training, Production and Community engagement is

converged into mainstream education thus enabling the University to ensure hands-on knowledge, experiential learning and practice-linked pedagogy with the flexibility of horizontal and vertical mobility.

Their vision was to build Centurion University brick by brick not only as a home for research and education but as an institution which provides opportunities for growth to all students from across the social canvas and they have succeeded in consolidating Centurion University as a truly remarkable place, with expertise across a wide range of disciplines and a superb academic atmosphere.

Figure: 1.1 - Image of Centurion University, Balangir Campus from Google map.

1.2 About Water Audit

A water audit is a study of the water use of an entity. It starts at the point where water enters the premises and goes up to the point where the wastewater is discharged, critically examining all aspects of use. The audit establishes the quantity/volume of water being used, wastage if any, leakages existing, excess use etc., and identifies areas where consumption can be reduced. It critically examines existing treatment systems and practices and recommends changes to improve efficiency and reduce usage. Based on this detailed study and observations, an audit gives recommendations on how to reduce wastage as well as consumption of water, improvements in treatment practices and methods along with cost benefit analyses. It also recommends the setting up of a system to maintain a record of the amount of water entering a system and to keep track of how this water is used.

Water audit is a systematic process of objectively obtaining a water balance by measuring flow of water from the site of water withdrawal or treatment, through the distribution system, and into areas where it is used and finally discharged. Conducting a water audit involves calculating water balance, water use and identifying ways for saving water.

Water audit involves preliminary water survey and detailed water audit. Preliminary water survey is conducted to collect background information regarding institution activities, water consumption and water discharge pattern and water billing, rates and water cess.

The detailed water audit report contains the following:

- Water consumption and wastewater generation pattern
- Specific water use and conservation
- Water saving opportunities
- Method of implementing the proposals

It is essential that any environmentally responsible institution should examine its water use practices.

CHAPTER 2

2.1 Water Audit Team

The Audit team of FORCE constituted of the following:

Name	Role	Designation	Profile
Jyoti Sharma	Convenor & Guide	President & Chief Functionary FORCE	18 year experience as Head of FORCE in Water conservation.
Ankit Kumar Singh	Audit team member	Engineer in charge- Water	Civil Engineer with 5 years experience.
Subrat Sabyasachi Mishra	Audit team member	Agriculture Engineer	Agriculture Engineer with 1 year experience in water conservation
Smrutirupa Swain	Audit team member	Climate Change Expert	Masters in Environment with 1 year experience.

All team members have significant experience in water conservation in different areas. They have done Water Audits of village and urban community habitations from the point of view of doing Need and Sustainability Assessments for water i.e. evaluated the existing need vis a vis the existing supply and analysed the data to design the plan and details for new interventions needed to fulfil that demand in a sustainable manner. They have led teams for construction of multiple water conservation structures .

2.2 About Centurion University Balangir Campus:

Spread over 15 acres of land is located in the heart of the city, which is well connected by rails and roadways. The territory comprising the district of Balangir was part of the erstwhile Patna State. The Patna State was an important State in western Odisha under the Chauhans since 14th century AD. 1st November 1949 the ex-States of Patna and Sonepur were separated and they together formed a new district called Balangir district.The name Balangir is said to have been derived from Balaramgarh, a fort built here in the 16th Century by Balram Deo, the 19th Raja of Balangir and founder of Sambalpur kingdom.The Campus has several buildings housing different learning streams:

1) School of Applied Science
2) School of Pharmacy
3) School of Computer Application.

2.3 Area under different catchments in campus

The Campus plays host to almost 450 people every day. This includes day students, faculty, staff and visitors. Adequate water needs to be provided for each of these people and for maintaining the campus suitably. A breakup of people is given below.

		Non-residential	Residential individuals	Residential with families
1	Total number of students on campus	349	0	0
2	Total number of faculty / staff on campus	77		0
3	Average visitors per day	12		

The University is spread over 34802.965(sq. M) beautiful land with plenty of open space interspersed within academic buildings. Some of the open space is planted with trees, some of it is grassy lawns, some is used for agriculture and the rest is paved or road area.

A breakup of the total area under each of these catchment types is given in the table below:

Catchment Type	Area in campus	Used for
Building	3353.15 sqm	Teaching, administration
Paved	1858 sqm	Walking tracks, open event spaces
Lawn	139.3 sqm	Aesthetics, games, gatherings
Forested	5574.1 sqm	Tree cover for greening, shade & environment
Agriculture	2443.3 sqm	Demo/ practice plots for students
Kuchcha, unplanted area	21435.9 sqm	
TOTAL AREA	**34802.965 sq.m.**	

Each of these surfaces and uses have a different water need and hence knowing this breakup of area is important for the water audit.

2.4 Methodology followed for water audit

A four-step process was designed for the water audit.

Step 1: Discussion with University, faculty member in-charge of co-ordinating the Water Audit.

The objective of this step was to get an overview about the university and expectation setting between FORCE and the university. The FORCE Water Audit Convenor shared about the need for and benefits of doing a water audit. She also shared the process the team would follow and the type of analysis that the water audit would do. The University faculty in-charge also shared about their expectations.

Following the introductory discussion, FORCE shared a questionnaire with the university campus co-ordinator. It had questions regarding number of students and staff on campus, water sources, consumption patterns, wastages and water conservation methods. The data was to be compiled by the university team and shared with FORCE prior to the Audit Team's visit to the campus. This would enable to Audit team to do pre-visit analysis that would help them make the physical audit more efficient and effective. A cohort of seven youth volunteers assisted in the process of data collection.

Step 2: Visit and Walk through the campus by Audit team

The Audit team visited the campus and walked all around it along with the youth volunteers and college staff. The objective to get a holistic view of the water management system in the campus and to see the different uses the water was being put to. While walking the audit team members discussed issues faced by the campus in water management, plans for the future, and historical water management experiences of the campus.

Step 3: Verifying and supplementing the data submitted in step 1

During and after the campus walk through, the audit team also used their own observations and expertise to fill gaps in data as shared in step 1. They also validated the data shared by the youth volunteers. In this step the following were done by the team:

a) Analyse historic water use and wastewater generation
b) Field measurements for estimating current water use

c) Whether supply is metered or unmetered. In case the campus has both, which supplies are metered and which are unmetered.
d) In case it is metered, then collect some sample bills
e) In case water quality is tested then collect sample results
f) Wastewater treatment planning.
g) Rainwater harvesting and other water conservation methods adopted.
h) Detection of potential leaks & water losses in the system
i) Assessment of productive and unproductive usage of water
j) Determine key opportunities for water consumption reduction, reuse & recycle.

Step 4: Preparation of Water Audit report

With all data and observations collected, the team then prepares the Water Audit report. The report gives the cumulative water consumption of the camps, the attempts of campus to create a water balance by also adopting some wastage control or water conservation practices.

CHAPTER 3 – FINDINGS

3.1 Fresh water sources

The main & only source of freshwater is Borewell. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of Fresh water sources are in the table below:

Sr.no	Water Source	Location	Quantity
1	Borewell	In campus different locations	4 nos

Further, a break-up of borewells based on the use that they primarily put to is as below:

5	Borewells on campus	Irrigation	Drinking & domestic	Construction
	Number	2	2	0
	Dia and depth	1ft & 300ft	1ft & 400ft	0
	flow rate	1500L/Hr	3000L/Hr	0
	Quality of water	good	good	
	Number of hours running per day	2Hr	5 Hr	0

The quantity of water yielded by each water source is listed in the table below:

	Type of supply	Quality (Potable/ Non-potable)	Quantity used per day. (In Kilo litre)	Purposes for which it is used
1)	Municipal water supply	NA	NA	NA
2)	Own tubewells(4NOS)	Non-potable	72KL	domestic
3)	Stored rainwater (15x10x10)feet	non potable	15512.5 KL/Annum	ground water recharge
4)	Recycled waste water	NA	NA	NA
5)	Reuse of untreated waste water	NA	NA	NA
6)	Private Tankers	NA	NA	NA
7)	Other sources if any Please specify	NA	NA	NA

3.2 Water Storage Capacity on Campus

The campus has distributed storage tanks. Water pumped out from borewells is first stored in ground level tanks. Then it is pumped up to overhead tanks kept over all buildings which then supply water to the building water usage points by gravity.

The total water storage capacity , built into the 5 nos water tanks is 60,50,30,25,10KL. The breakup of water storage capacities in tanks is as given in the table below:

Storage Tanks				
	Number	Capacity	Refills per day	Nos with Float valve/ auto shut/indicator
Overhead	3	30,25,10KL	ALL 3, 4 TO 5 Hr	3
On ground	2	50,60KL	All 2 , 5 to 6 Hr	2

3.3 Fresh Water Distribution mechanism

There is a well-planned and well managed pipeline system that takes water from the sources to the storage tanks and from tanks to the usage points. The usage points are taps in kitchens, bathrooms, drinking water points etc or cisterns in toilets. All these are fed with borewell and have been tested and found potable.

	Water fixtures in Bathrooms				
		Handwash / drinking	Cisterns	Toilet	Bathing
1	Number of functional taps	35	64	64	64
2	Dia of taps	1.5cm	1.5cm	1.5cm	1.5cm
3	flow rate	7L/min	7L/min	5L/min	7L/min
4	Number with Timer or sensor	15	_	_	_
5	Number found dripping	0	0	0	0

	Water use in kitchen	
1	Number of taps	24
2	Dia of taps	1.5cm
3	flow rate	7L/min

3.4 Water Usage

Since there is no metering system on campus, it is not possible to get an exact number in terms of water usage. However, by taking accepting benchmarks of water usage per activity, we can arrive at an estimate of the daily water use. Please note that the figure here is an average daily use figure. On ground each day might have a different usage amount. For example, all lawns may not be watered everyday. However, the figure we have taken (2litres per sqm) is arrived at by dividing the weekly water need of a lawn by 7 days.

Our estimate is that the campus uses a total of approx. 19.57 KL/day. The breakup of this usage is as follows:

Sr.no	Usage Type	Quantity of Water used
1	Gardening/Irrigation @2L/ sqm/ day for lawns, 1 L/sqm/day for trees, 2 L/sqm/day for agriculture area	10.73 kL per day
2	Domestic use (toilets, bathrooms, kitchen, cleaning, drinking) @20kL for non residential / visitors and 135kL for residential	8.84 kL per day

3.5 Disposal of Waste Water

The campus has a separate storm water and sewage drainage system. The sewage waste water generated from various departments like canteen, mess, and washrooms, hand-washing points, bathrooms, drinking water points and RO reject water is discharge out into the municipal sewage drain line.

3.6 Water Accounting and Metering System

The campus does not have a water metering system. Since it does not get municipal water supply, there are no municipal water meters. Flowmeters are not installed on borewells within the campus.

The Audit team observed that there is requirement of water flow meters on water sources to quantify water consumption in the University.

3.7 Water test parameters

The Campus conducts water quality tests for their drinking water source tubewells from time to time. Two such reports were sourced by the Audit team. The reports show that all parameters are within permissible range. The water quality is potable.

TEST REPORT

Laboratory: Ecology laboratory, School of Applied Sciences
Centurion university of Technology and Management,
Bolangir Campus, Bolangir, Odisha-767001

Date of Receipt: 06.08.2022 Date of test performed: 05.08.2022

Sample particulars: Ground water

Test Parameters required: Physio-chemical parameters

Sample collected by: Students Sample ID: CUTMBOL/EL/2022/14

S. No.	Parameters	Unit	Test method	Value
1	pH		pH meter	7.8
2	Electrical conductivity	µmhox/cm	Refracto meter ERS 10	1014
3	Total Dissolved solid (TDS)	ppm	TDS meter	346
4	Total suspended solid	ppm	Gravimetric method	0.05
5	Hardness	mg/L	Titrimetric method	700
6	Alkalinity	mg/L	Titrimetric method	580
7	Turbidity	NTU	Turbidity meter	0.008
8	Dissolve Oxygen content (DO)	ppm	Winkler method	8.6
9	BOD	ppm	Calculated from DO value	0.8
10	COD	ppm	Colorimetric method	10.2

(Analysis Signatory) (Laboratory In-charge) (Authorized Signatory)

Head of the Department
School of Applied Sciences
Centurion University
Bolangir

CUTM - BOLANGIR CAMPUS * BOLANGIR *

3.8 Environment friendly initiatives

The campus has taken some measures to prevent water wastages and to conserve water. They are conscious about their water usage. In our talk with the management team and in our interactions with the maintenance staff of the campus, we observed that they were all aware about the need to conserve water. They were alert to spot any leakages or wastages and took prompt action if they saw a fault – either directly or by reporting to the appropriate authority. We also did not see evidence of overwatering in green spaces, or stagnant overflow water around storage points. This indicates that the maintenance staff is vigilant about water wastages.

Wastage Prevention in distribution system

The audit team saw direction control and flow control valves at critical points in the distribution pipelines. These were used by the staff to regulate water pressure, flow and the direction in which water was required to flow. This enables them to make sure that water goes only where it is needed, and in the quantity it is needed. Though they do not have pressure gauges to check for pressure drops that may indicate leakages in a distribution line, they examine the pipeline regularly to check for any leakages and plug them as soon as they are spotted.

Known sources and quantity of wastage in institution

	% waste discharge	Total approx quantity per day	Type ofcontaminants in that water	Method of disposal
RO or other drinking water treatment	55% for RO & 20 to 30% water filter	100Litre	Presence of chemicals constituents more than permissible limit(eg: EC,F,AS,Fe)	NA
Waste water recycling plant	NA	NA	NA	NA
Distribution pipeline or overflow leakages	0.01%	10 Litres	Presence of chemicals constituents more than permissible limit(eg: EC,F,AS,Fe)	Through pipe.
Others (please specify)	NA	NA	NA	NA

Wastage prevention in storage

Like in the distribution network, the wastage control in storage tanks too is through valves and regular inspections. They have valves in all un-monitored tanks that By providing proper valve at very necessary points.

	% with automatic motor shut off	% with float valves	% with overflow indicator
Storage Tanks	40%	0.00%	60%

Wastage Prevention at usage points

Greening is done using hose pipes attached to taps fitted with valves. The campus also has sprinklers in some lawns. There is a team of dedicated gardeners who manage the hosepipes and sprinklers.

	% of green area irrigated through furrows	% of green area served with hose	Drip irrigation	Sprinklers
Irrigation	0.00%	10.00%	70%	20%

Area	2443.3sqm
Irrigation method	drip, sprinkler, hose-pipe
Water source	Borewell
Dia of pipe/hose	4"
Flow rate	25L/min
No. of hours of irrigation/day	2hr
Type & species of plants	Flora-113

	% with Timer / Sensor	% with water saving technology like aerator/atomizer.
Taps in bathrooms, handwash points, kitchens	5.00%	0.00%

	% of low capacity cisterns (6l per flush or less)	% with dual flush	% using recycled waste water
Cisterns and flush	0.00%	0.50%	0.00%

Rainwater Harvesting(Pit)

The campus has only one rainwater harvesting recharge pit. This is at a storm water collection point. There is no recharge well – only a recharge pit. However, this recharge pit is (15x10x10)feet and is well designed and connected to rooftop. They feed into a good unsaturated aquifer and hence the rate of recharge is high. this recharge pit has the capacity to recharge approx. 43,000 liters per hour to groundwater.

ThIS recharge pit is functional & maintained on a yearly basis.

	Nos.	Type	Dimensions	Functional/ Non functional	maintained every year?	Annual Recharge potential
Rainwater Harvesting	1	pit	(15x10x10)feet	Functional	yes	376680KL/YEAR

Institution effort to create awareness – water conservation messages

The audit team saw 6 nos sign-boards of size 1ftX1.5 ft displayed at different places in the campus with messages related to preventing water wastage. Most of the messages were displayed at drinking water points or toilets. They were reminder messages for closing taps after use and not wasting water.

Institution effort to create awareness –Programs conducted

Every year, the campus conducts atleast 2 programs for all students related to environmental awareness. In these programs, water conservation is a key message. The campus has celebrated World Water Day in a big way last year as a part of the UNICEF led Youth4Water program that they have partnered with. They are also participating in an Innovation Challenge for innovative ideas in Water Conservation, WASH and Climate Change as a part of the same program. Apart from this, the students do projects and activities related to water as a part of the curriculum.

Water policy

-4R Though the campus does not have a written water policy, in our conversations with the management, they shared that 'Recycle, Reuse, Reduce and Recover' is their Environment policy motto. They apply the same principle for their work for water.

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On the basis of water usage statistics shared by campus, the estimated water usage is 416 kilo litres per day. However, calculating using accepted benchmarks for usage types, indicates average daily water use of approx. 566 kilo Litres (kL) per day. The differential either indicates high water use efficiency or under-estimation of water usage statistics in the absence of a metering system. Most of the water used in the campus comes from borewells within the campus. It is supplemented by water sourced from outside the campus. The campus has an agreement with Municipal Authorities for supply of 100kL per day through tankers. The campus also utilizes its 210kL per day of treated waste water for greening. Together, these three sources enable the campus to fulfil all its water requirements.

Usage of water is for drinking, domestic and greening purposes. Raw water is stored in 139 storage tanks of which 129 are overhead tanks, 9 on-ground and 1 for storage of recycled water. They are all filed once a day. A pipeline system takes water from these tanks to the water usage points. There are 1656 taps and 544 cisterns that dispense water for various purposes. Most of the taps have a diameter of 1.5cm with a flow rate of 7-8 litres per minute.

Tanker and borewell water quality is as per potable water norms. The campus gets its water checked periodically. As per the reports, all major parameters are within the permissible norms for domestic water use.

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The campus has a well planned network of water storage tanks and distribution pipelines. Control valves and Float Valves used through the system enable the campus to minimize wastages through overflows. 78 out of 129 overhead tanks and all 9 on-ground tanks either have an auto-shutoff motor or float valve or indicator to prevent tank overflows. Regular inspections are done to check for leakages. If spotted, they are repaired immediately.
6.8% of taps I.e 114 taps (in bathrooms) have sensors or timers to help save water.

The campus has a sewage system which is distinct from storm water system. The sewage system collects water from toilets, bathrooms, kitchens and laboratories. Its outfall is in a 300 kLD sewage system which treats water upto safe for discharge levels. Some of the treated wastewater is stored and reused for greening. The balance is directed to an open pond for safe groundwater recharge. Any overflow from the pond is sent to the municipal sewage trunkline outside the campus

The campus also has 5 rainwater harvesting systems with a cumulative capacity of approx. 200kL per hour. These are strategically placed at points of stormwater accumulation. They are efficient and maintained regularly.

A special effort is made by the university to create awareness about water conservation among students. Signages at drinking water points and in toilets remind students to switch off taps after use and not waste water. Regular awareness events are held and important dates such as World Water Day are celebrated to remind students of the need to conserve water. The students are also encouraged to come up with innovative ideas on water conservation. The campus has an Environmental policy of 'Recycle, Reuse, Reduce and Recover'. This is applied to its approach to water as well.

AREAS FOR IMPROVEMENT AND RECOMMENDATION

Fresh water monitoring system:

There is a need to quantify the amount of water being extracted from groundwater and being brought in from outside everyday. For water being brought in through tankers, the quantification is easily done by counting the tankers and multiplying with their capacity. However for borewells, it would help to install IoT based ground water extraction monitoring system to quantify fresh water consumption per day in the University.

There is also a need to install water flow meters (Mechanical or Electronics) in distribution network, like University building, drinking, Gardening for quantity per day water consumption and waste water generation in the University campus. This will not only help get exact quantities consumed but will also be a useful tool for planning conjunctive and efficient water use within the campus.

Automatic shutoff switches in overhead tanks

Though most storage tanks have indicators or float valves to alert people about overflows and prevent them, auto shutoff motors / switches for overhead tanks can make the task of preventing water overflows much easier. This should be done for all overhead tanks since they are very difficult to monitor

Aerators / Atomizers / sensors / timers in taps

All the taps in toilets and kitchens were manual taps. These would be a source of over consumption of water especially because students might be careless about closing them post use or during non-essential periods of use. It is advised that aerators/atomizers be fitted in taps – especially those used primarily for handwashing such as in toilets. Also, sensors or timer taps can be installed wherever possible to prevent the possibility of water wastage due to tap being left on. Such taps are also drip resistant.

Sprinklers and Drip water irrigation system for gardening.

Though sprinklers have been installed in some lawns, there is potential for more sprinklers and also for drip water irrigation.

Rainwater Harvesting

Though there are 5 rainwater harvesting recharge wells, their capacity is less than the groundwater recharge potential of the campus. We strongly advise that a 'Zero Rainwater Flowout plan' be prepared for the campus. This will recommend the number, types and location of groundwater recharge structures that can enable the campus to fully utilize its rainwater.

Given the high dependence of the campus on borewells, it is highly advisable that the campus do additional rainwater harvesting for sustainability of its water supply.

Other suggestions.

We also recommend that the Campus prepare a 'Water Management Policy', and make a multi-year blueprint to work towards making the campus water secure and with a zero waste water footprint.

Perhaps more training programs on water management can be done. University can also ensure participation of students and teachers in local water issues.

CHAPTER 1 – INTRODUCTION

1.1 About the University

Centurion University is duly recognized as a pioneer is 'Skill Integrated Higher Education". Its unique model lays specific emphasis on creating sustainable livelihoods on a national scale in challenging geographies through education that results in employability and sparks entrepreneurship. This model has been recognized by multiple Governments (Central and State), International Organizations such as UNESCO and the World Bank as well as Policy Think-tanks such as the Niti Ayog. Recently, Centurion University's School of Vocational Education and Training has been recognized as a Center of Excellence by Ministry of Skill Development and Entrepreneurship, Government of India. It is the only University in India to be recognized as such.

Centurion has continually strived to be a best in class human resource development hub that builds employable, enterprising and society centric youth through industry relevant education, skill development, new ventures, production, and technology development.

The founders, faculty and staff are fully committed to its credo: **Shaping Lives. Empowering Communities.** This credo is underpinned by a value system of Inclusivity, Integrity, Equity, Respect and Sustainability in everything they do.

Since its inception in 2005 and subsequent establishment as a University in 2010 (vide Odisha Act 4 of 2010), Centurion has created a unique environment that ensures a tailored learning and employability path for youth in some of the poorest and underserved geographies in Odisha and Andhra Pradesh.

Centurion has embraced the Agenda for Sustainable Development and the associated Sustainable Development Goals (SDGs) since being formally announced in 2015. SDGs have been both formally and informally used as a guiding framework and are now firmly embedded in the Centurion DNA.

Whilst having an indirect impact and contribution on almost all 17 SDGs, Centurion has specifically focused on 9 SDGs and embedded it in everything from its strategy, governance, institutional management and outcomes.

Vision

A globally accredited human resource center of excellence catalyzing "sustainable livelihoods" in the "less developed markets across the globe".

Mission

- Provision of quality, globally accredited academic programmes in technology and management .
- Provision of globally accredited employability training for less endowed segments of the population.
- Promotion of entrepreneurial culture and enterprise in the target areas.
- Facilitating improved market access to goods and financial services to the target population.
- Promotion of lighthouse project interventions in the target area .

The journey of Centurion University of Technology and Management (CUTM) began in the year 2005 by a group of ambitious academics with aspirations to provide high quality education both nationally and internationally. The first step in this direction was to take over an ailing engineering Institute, the Jagannath Institute for Technology and Management (JITM) in one of the most challenging tribal districts of Odisha and one which was considered to be a left-wing extremist affected area. Subsequently, JITM was transformed into Centurion University of Technology and Management in August 2010, through an act of Odisha Legislative Assembly. It became the First Multi-Sector State Private University in Odisha.

The founders during their earlier stint as teachers realized that education is one of the most powerful tool for empowerment, was in reality designed for the elite. In response, they embarked on this ambitious journey with the aim to bring employment-linked education within the reach of those who needed it the most. As a result, Centurion University has skilled, trained and linked 80,000+ "poor, more poor and ultra poor" youth to find gainful employment. Through five Social Enterprises established under the University, Teaching, Training, Production and Community engagement is

converged into mainstream education thus enabling the University to ensure hands-on knowledge, experiential learning and practice-linked pedagogy with the flexibility of horizontal and vertical mobility.

Their vision was to build Centurion University brick by brick not only as a home for research and education but as an institution which provides opportunities for growth to all students from across the social canvas and they have succeeded in consolidating Centurion University as a truly remarkable place, with expertise across a wide range of disciplines and a superb academic atmosphere.

Figure: 1.1 - Image of Centurion University, Jatni Campus from Google map

1.2 About Water Audit

A water audit is a study of the water use of an entity. It starts at the point where water enters the premises and goes up to the point where the wastewater is discharged, critically examining all aspects of use. The audit establishes the quantity/volume of water being used, wastage if any, leakages existing, excess use etc., and identifies areas where consumption can be reduced. It critically examines existing treatment systems and practices and recommends changes to improve efficiency and reduce usage. Based on this detailed study and observations, an audit gives recommendations on how to reduce wastage as well as consumption of water, improvements in treatment practices and methods along with cost benefit analyses. It also recommends the setting up of a system to maintain a record of the amount of water entering a system and to keep track of how this water is used.

Water audit is a systematic process of objectively obtaining a water balance by measuring flow of water from the site of water withdrawal or treatment, through the distribution system, and into areas where it is used and finally discharged. Conducting a water audit involves calculating water balance, water use and identifying ways for saving water.

Water audit involves preliminary water survey and detailed water audit. Preliminary water survey is conducted to collect background information regarding institution activities, water consumption and water discharge pattern and water billing, rates and water cess.

The detailed water audit report contains the following:

- Water consumption and wastewater generation pattern
- Specific water use and conservation
- Water saving opportunities
- Method of implementing the proposals

It is essential that any environmentally responsible institution should examine its water use practices.

CHAPTER 2

2.1 Water Audit Team

The Audit team of FORCE constituted of the following:

Name	Role	Designation	Profile
Jyoti Sharma	Convenor & Guide	President & Chief Functionary FORCE	18 year experience as Head of FORCE in Water conservation.
Ankit Kumar Singh	Audit team member	Engineer in charge- Water	Civil Engineer with 5 years experience.
Subrat Sabyasachi Mishra	Audit team member	Agriculture Engineer	Agriculture Engineer with 1 year experience in water conservation
Smrutirupa Swain	Audit team member	Climate Change Expert	Masters in Environment with 1 year experience.

All team members have significant experience in water conservation in different areas. They have done Water Audits of village and urban community habitations from the point of view of doing Need and Sustainability Assessments for water i.e. evaluated the existing need vis a vis the existing supply and analysed the data to design the plan and details for new interventions needed to fulfil that demand in a sustainable manner. They have led teams for construction of multiple water conservation structures .

2.2 About Centurion University Jatni Campus:

Spread over 40 acres of land in the foothill of Barunei hills, near Jatni town, the campus is adjacent to National Institute of Science, Education and Research (NISER), Indian Institute of Technology (IIT), All India Institute of Medical Sciences (AIIMS) and Xavier University. The famous 11th century Lingaraj temple is about 20 kms from this campus. The Campus has several buildings housing different learning streams:

1) School of Engineering & Technology
2) School of Management
3) School of Applied Science
4) School of Vocational Education and Training

5) School of Pharmacy
6) School of Media & Communications
7) School of Paramedics & Allied Health Sciences
8) School of Forensic Science

2.3 Area under different catchments in campus

The Campus plays host to almost 7000 people every day. This includes students in hostels, day students, faculty, staff and visitors. Adequate water needs to be provided for each of these people and for maintaining the campus suitably. A breakup of people is given below.

		Non-residential	Residential individuals	Residential with families
1	Total number of students on campus	3043	3186	0

2	Total number of faculty / staff on campus	601		14
3	Average visitors per day	152		

The University is spread over 202343(sq. M) beautiful land with plenty of open space interspersed within academic buildings. Some of the open space is planted with trees, some of it is grassy lawns, some is used for agriculture and the rest is paved or road area.

A breakup of the total area under each of these catchment types is given in the table below:

Catchment Type	Area in campus	Used for
Building	22937 sqm	Teaching, administration
Paved	11473 sqm	Walking tracks, open event spaces
Road	4055 sqm	Driving, parking
Lawn	3497 sqm	Aesthetics, games, gatherings
Forested	40594 sqm	Tree cover for greening, shade & environment
Agriculture	1124 sqm	Demo/ practice plots for students
Kuchcha, unplanted area	79456 sqm	
TOTAL AREA	**194787.51 sq.m.**	

Each of these surfaces and uses have a different water need and hence knowing this breakup of area is important for the water audit.

2.4 Methodology followed for water audit

A four-step process was designed for the water audit.

Step 1: Discussion with University, faculty member in-charge of co-ordinating the Water Audit.

The objective of this step was to get an overview about the university and expectation setting between FORCE and the university. The FORCE Water Audit Convenor shared about the need

for and benefits of doing a water audit. She also shared the process the team would follow and the type of analysis that the water audit would do. The University faculty in-charge also shared about their expectations.

Following the introductory discussion, FORCE shared a questionnaire with the university campus co-ordinator. It had questions regarding number of students and staff on campus, water sources, consumption patterns, wastages and water conservation methods. The data was to be compiled by the university team and shared with FORCE prior to the Audit Team's visit to the campus. This would enable to Audit team to do pre-visit analysis that would help them make the physical audit more efficient and effective. A cohort of eight youth volunteers assisted in the process of data collection.

Step 2: Visit and Walk through the campus by Audit team

The Audit team visited the campus and walked all around it along with the youth volunteers and college staff. The objective to get a holistic view of the water management system in the campus and to see the different uses the water was being put to. While walking the audit team members discussed issues faced by the campus in water management, plans for the future, and historical water management experiences of the campus.

Step 3: Verifying and supplementing the data submitted in step 1

During and after the campus walk through, the audit team also used their own observations and expertise to fill gaps in data as shared in step 1. They also validated the data shared by the youth volunteers. In this step the following were done by the team:

a) Analyse historic water use and wastewater generation
b) Field measurements for estimating current water use
c) Whether supply is metered or unmetered. In case the campus has both, which supplies are metered and which are unmetered.
d) In case it is metered, then collect some sample bills
e) In case water quality is tested then collect sample results
f) Wastewater treatment scheme & costs etc.
g) Rainwater harvesting and other water conservation methods adopted.

h) Detection of potential leaks & water losses in the system

i) Assessment of productive and unproductive usage of water

j) Determine key opportunities for water consumption reduction, reuse & recycle.

Step 4: Preparation of Water Audit report

With all data and observations collected, the team then prepares the Water Audit report. The report gives the cumulative water consumption of the camps, the attempts of campus to create a water balance by also adopting some wastage control or water conservation practices.

CHAPTER 3 – FINDINGS

3.1 Fresh water sources

The main source of freshwater is Borewell and Municipal Connection for the University. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of Fresh water sources are in the table below:

Sr.no	Water Source	Location	Quantity
1	Borewell	In campus different locations	18 nos
2	Municipal Water tanker	Come from outside	100kL per day
3	Recycled water	In campus	300kL per day plant capacity

Further, a break-up of borewells based on the use that they primarily put to is as below:

5	Borewells on campus	Irrigation	Drinking & domestic	Construction
	Number	1	15	2
	Dia and depth	1ft & 280ft	1ft & 280ft	1ft & 280ft
	flow rate	90L/min	90L/min	90L/min
	Quality of water	good	good	good
	Number of hours running per day	1he	4 to 5 hr	_

The quantity of water yielded by each water source is listed in the table below:

	Type of supply	Quality (Potable/ Non-potable)	Quantity used per day. (In Kilo litre)	Purposes for which it is used
1)	Municipal water supply	potable	100KL/DAY	drinking and other purposes
2)	Own tubewells(18 no=11(1.5HP)+6(2HP)+1(5HP)	potable	416KL/DAY	domestic
3)	Stored rainwater (5000 sqm)	non potable	64000 KL/Annum	ground water recharge
4)	Recycled waste water(STP Capacity=300KL/DAY)	Non potable	210 KL/DAY	Gardening
5)	Reuse of untreated waste water	NA	NA	NA

6)	Private Tankers	NA	NA	NA
7)	Other sources if any Please specify	NA	NA	NA

3.2 Water Storage Capacity on Campus

The campus has widely distributed storage tanks. Water brought in by tankers is first stored in ground level tanks. Then it is pumped up to overhead tanks kept over all buildings which then supply water to the building water usage points by gravity. Water is pumped up from borewells into those overhead tanks too before supply.

The total water storage capacity , built into the 139 nos water tanks is 5,14,210 L. The breakup of water storage capacities in tanks is as given in the table below:

Storage Tanks				
	Number	Capacity	Refills per day	Nos with Float valve/ auto shut/indicator
Overhead	129	489000KL	129	78
On ground	9	25000KL	9	9
Storage Tanks for recycled water	1	210KL	_	_

3.3 Fresh Water Distribution mechanism

There is a well-planned and well managed pipeline system that takes water from the sources to the storage tanks and from tanks to the usage points. The usage points are taps in kitchens, bathrooms, drinking water points etc or cisterns in toilets. All these are fed with a mix of borewell and tanker water since both have been tested and found potable.

	Water fixtures in Bathrooms				
		Handwash / drinking	Cisterns	Toilet	Bathing
1	Number of functional taps	742	544	544	356
2	Dia of taps	1.5cm	1.5cm	1.5cm	1.5cm
3	flow rate	7L/min	8L/min	8L/min	8L/min
4	Number with Timer or sensor	114	_	_	_
5	Number found dripping	0	0	0	0

	Water use in kitchen	
1	Number of taps	54
2	Dia of taps	1.5cm
3	flow rate	8L/min

3.4 Water Usage

Since there is no metering system on campus, it is not possible to get an exact number in terms of water usage. However, by taking accepting benchmarks of water usage per activity, we can arrive at an estimate of the daily water use. Please note that the figure here is an average daily use figure. On ground each day might have a different usage amount. For example, all lawns may not be watered everyday. However, the figure we have taken (2litres per sqm) is arrived at by dividing the weekly water need of a lawn by 7 days.

Our estimate is that the campus uses a total of approx. 566 KL/day. The breakup of this usage is as follows:

Sr.no	Usage Type	Quantity of Water used
1	Gardening/Irrigation @2L/ sqm/ day for lawns, 1 L/sqm/day for trees, 2 L/sqm/day for agriculture area	49.8 kL per day
2	Domestic use (toilets, bathrooms, kitchen, cleaning, drinking) @20kL for non residential / visitors and 135kL for residential	506 kL per day
3	Construction @10kL per day	10kL per day

3.5 Disposal of Waste Water

The campus has a separate storm water and sewage drainage system. The sewage waste water generated from various departments like canteen, mess, and washrooms, hand-washing points, bathrooms, drinking water points and RO reject water is discharge into the sewage

drain line. The sewage drainage system ends at the STP plant where it is treated. The treated wastewater is stored in a storage tank and, as per need, reused for gardening and irrigation. Surplus treated water is placed in a pond where it helps safely recharge to groundwater.

3.6 Water Accounting and Metering System

The campus does not have a water metering system. Since it does not get municipal water supply via pipeline, there are no municipal water meters. Flowmeters are not installed on borewells within the campus. However, since the municipality gives a bill to the campus for its 100kL water supply. That is the only formal document available to track the quantity of water supplied and/or used.

The Audit team observed that there is requirement of water flow meters on water sources to quantify water consumption in the University.

3.7 Water test parameters

The Campus conducts water quality tests for their drinking water source tubewells from time to time. Two such reports were sourced by the Audit team. The reports show that all parameters are within permissible range. The water quality is potable.

TEST REPORT

Issued to
Centurion University of Technology and Management,
BBSR Campus, Odisha-752050

Date of receipt 11.08.2021 Date of test performed 12.08.2021
Sample particulars Drinking water
Test Parameters required Physico-chemical parameters
Sample collected by Students Page No. 1

Sl. No.	Parameters	Unit	Test method	Value
1	pH		Electrometric method	7.8
2	Electrical conductivity	µS/cm	Electrometric method	698
3	Total Dissolved solid	ppm	Electrometric method	0.1-48
4	Total Suspended solid	ppm	Gravimetric method	0.046
5	Hardness	mg/L	Titrimetric method	16.2
6	Alkalinity	mg/L	Titrimetric method	44.22
7	Turbidity	NTU	Electrometric method	0.06
8	Dissolve Oxygen content	mg/L	Winkler method	6.88
9	BOD	mg/L	Calculated from DO value	0.006
10	COD	mg/L	Colorimetric method	8.2

Swatimayee Mohapatra 12.08.21
Analyst Signatory

Pratap Chikatwar 12.08.21
Laboratory incharge

Authorised Signatory
H.O.D
Department of Chemistry

3.8 Environment friendly initiatives

The campus has taken some measures to prevent water wastages and to conserve water. They are conscious about their water usage. In our talk with the management team and in our interactions with the maintenance staff of the campus, we observed that they were all aware about the need to conserve water. They were alert to spot any leakages or wastages and took prompt action if they saw a fault – either directly or by reporting to the appropriate authority. We also did not see evidence of overwatering in green spaces, or stagnant overflow water around storage points. This indicates that the maintenance staff is vigilant about water wastages.

Wastage Prevention in distribution system

The audit team saw direction control and flow control valves at critical points in the distribution pipelines. These were used by the staff to regulate water pressure, flow and the direction in which water was required to flow. This enables them to make sure that water goes only where it is needed, and in the quantity it is needed. Though they do not have pressure gauges to check for pressure drops that may indicate leakages in a distribution line, they examine the pipeline regularly to check for any leakages and plug them as soon as they are spotted.

Known sources and quantity of wastage in institution

	% waste discharge	Total approx quantity per day	Type ofcontaminants in that water	Method of disposal
RO or other drinking water treatment	NIL	NA	NIL	NA
Waste water recycling plant	NIL	NIL	NA	NA
Distribution pipeline or overflow leakages	0.50%	10 Litres	no contamination found, as it is maintained regularly	drop wise diposed from leakage pipe/loose tap
Others (please specify)	NA	NA	NA	NA

Wastage prevention in storage

Like in the distribution network, the wastage control in storage tanks too is through valves and regular inspections. They have valves in all un-monitored tanks that By providing proper valve at very necessary points.

	% with automatic motor shut off	% with float valves	% with overflow indicator
Storage Tanks	40%	0.00%	60%

Wastage Prevention at usage points

Greening is done using hose pipes attached to taps fitted with valves. The campus also has sprinklers in some lawns. There is a team of dedicated gardeners who manage the hosepipes and sprinklers.

	% of green area irrigated through furrows	% of green area served with hose	Drip irrigation	Sprinklers
Irrigation	0.00%	10.00%	70%	20%

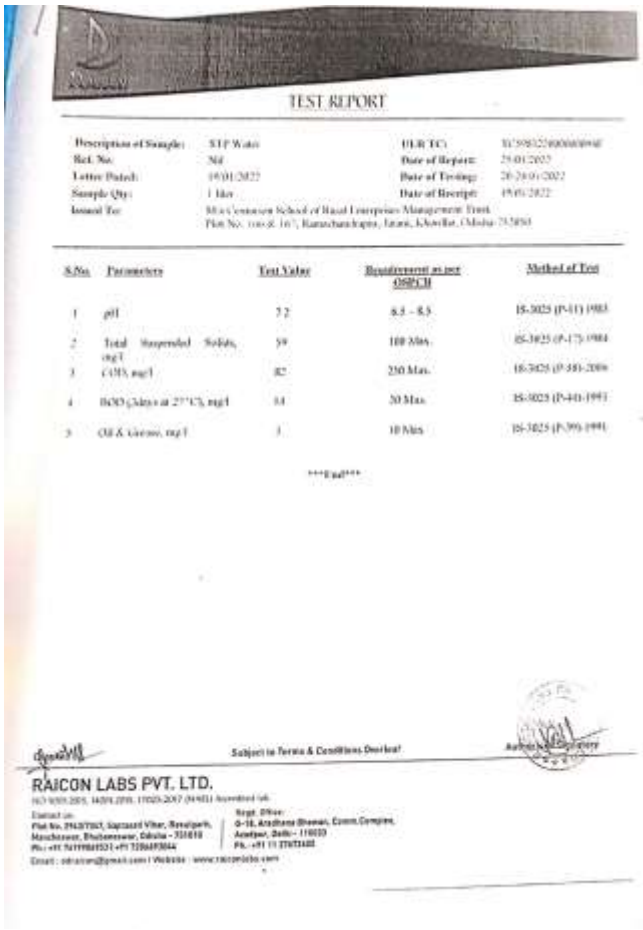
Area	45215sqm
Irrigation method	drip, sprinkler, hose-pipe
Water source	Recycled water
Dia of pipe/hose	4"
Flow rate	25L/min
No. of hours of irrigation/day	1hr
Type & species of plants	641

	% with Timer / Sensor	% with water saving technology like aerator/atomizer.
Taps in bathrooms, handwash points, kitchens	5.00%	0.00%

	% of low capacity cisterns (6l per flush or less)	% with dual flush	% using recycled waste water
Cisterns and flush	0.00%	0.50%	0.00%

Waste water treatment system

The campus has a Sewage Treatment plant to treat all its waste water. The plant has a capacity of 300kL per day which is more than the waste water generated daily in the campus. Capacity utilization of the plant stands at 70% i.e. 210 kL of wastewater is treated daily.



TEST REPORT

S.No.	Parameters	Test Value	Requirement as per CPCB	Method of Test
1	pH	7.2	6.5 – 8.5	IS-3025 (P-11) 1983
2	Total Suspended Solids, mg/l	59	100 Max.	IS-3025 (P-17) 1984
3	COD, mg/l	82	250 Max.	IS-3025 (P-58)-2006
4	BOD (3days at 27°C), mg/l	34	30 Max.	IS-3025 (P-44)-1993
5	Oil & Grease, mg/l	3	10 Max.	IS-3025 (P-39)-1991

End

Subject to Terms & Conditions Overleaf

RAICON LABS PVT. LTD.

The treated waste water is collected in a separate storage tank. The water is used for greening and irrigation. When the system is maintained, the sludge removed is used as manure in the green areas. The STP water complies with the required noms.

Rainwater Harvesting(Directly Through Bore-well)

The campus has five rainwater harvesting recharge wells. Each of these is at a storm water collection point. There is no recharge pit – only a recharge well. However, these recharge wells are 8-10 inch diameter borewells and are well designed. They feed into a good unsaturated aquifer and hence the rate of recharge is high. Each recharge well has the capacity to recharge approx. 40,000 liters per hour to groundwater.

All the recharge wells are functional. They are maintained on a yearly basis.

	Nos.	Type	Dimensions	Functional/ Non functional	maintained every year?	Annual Recharge potential

Rainwater Harvesting	5	Dugwell	(1feet dia, 280 ft depth	Functional	yes	350400KL/YEAR
Pond	1	Treated sewage	5000sqm	functional	yes	NA

Institution effort to create awareness – water conservation messages

The audit team saw 15 nos sign-boards of size 1ftX1.5 ft displayed at different places in the campus with messages related to preventing water wastage. Most of the messages were displayed at drinking water points or toilets. They were reminder messages for closing taps after use and not wasting water.

Institution effort to create awareness –Programs conducted

Every year, the campus conducts atleast 2 programs for all students related to environmental awareness. In these programs, water conservation is a key message. The campus has celebrated World Water Day in a big way last year as a part of the UNICEF led Youth4Water program that they have partnered with. They are also participating in an Innovation Challenge for innovative ideas in Water Conservation, WASH and Climate Change as a part of the same program. Apart from this, the students do projects and activities related to water as a part of the curriculum.

Water policy

-Though the campus does not have a written water policy, in our conversations with the management, they shared that 'Recycle, Reuse, Reduce and Recover' is their Environment policy motto. They apply the same principle for their work for water.

WATER AUDIT REPORT

For

Centurion University Of Technology And Management

Village Alluri Nagar, R Sitapur, Via- Uppalada, Paralakhemundi, Odisha 761211

Odisha - 761211

Year 2022-23

CONSULTATION and REPORT by

FORCE

(Pandit Jagat Ram Memorial FORCE Trust)

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CONTENTS

ACKNOWLEDGEMENT

FORCE (Pandit Jagat Ram Memorial FORCE Trust) takes this opportunity to appreciate & thank the management of **Centurion University Technology & Management,Village Alluri Nagar, R Sitapur, Paralakhemundi, Odisha** for giving us an opportunity to conduct Water audit for the University.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

We are grateful also to the UNICEF led Youth4Water campaign for their support and for the opportunity to provide a learning by doing training in conducting Water Audits to 4 Youth4Water volunteers from Centurion University as a part of this initiative.

(signed)

Jyoti Sharma

Jyoti Sharma

President, FORCE Non-profits

Taubman Fellow 2016, Brown University (USA)

Ashoka Fellow, TedMed Speaker

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EXECUTIVE SUMMARY & RECOMMENDATIONS

The executive summary of the water audit report furnished in this section briefly gives the findings and recommendations of the Audit team.

WATER SOURCES, QUALITY AND USAGE

On the basis of water usage statistics shared by campus, the estimated water usage is 483 kilo litres per day. However, calculating using accepted benchmarks for usage types, indicates average daily water use of approx. 662 kilo Litres (kL) per day. The differential can be accounted for by the campus supplementing its freshwater used with recycled waste water. This is a good practice. Most of the water used in the campus comes from borewells within the campus. The campus also utilizes its 300kL per day of treated wastewater for greening. Together, these two sources enable the campus to fulfil all its water requirements.

Usage of water is for drinking, domestic and greening purposes. Raw water is stored in 33 storage tanks of which 18 are overhead tanks, 11 on-ground and 4 for storage of recycled water. Throughout the day it filled continuously. A pipeline system takes water from these tanks to the water usage points. There are 3424 taps and 800 cisterns that dispense water for various purposes. Most of the taps have a diameter of 1.7 cm with a flow rate of 12-14 litres per minute.

Borewell water quality is as per potable water norms. The campus gets its water checked periodically. As per the reports, all major parameters are within the permissible norms for domestic water use.

CONSERVATION INITIATIVES TAKEN BY THE CAMPUS

The campus has a well planned network of water storage tanks and distribution pipelines. Control valves and Float Valves. This system helps minimize wastages through overflows. 1 out of 17 tubewells and 3 out of 18 overhead tanks have an auto-shutoff motor or float valve or indicator to prevent tank overflows. Regular inspections are done to check for leakages. If spotted, they are repaired immediately.

15% of taps have a timer and sensor and 20% of taps have water saving technology like aerator/atomizer.

The campus has a sewage system which is distinct from the storm water system. The sewage system collects water from toilets, bathrooms, kitchens and laboratories. Its outfall is in a 300 kLD sewage system which treats water upto safe for discharge level. The treated wastewater is stored and reused for greening. The balance is directed to an open pond outside the campus.

The campus also has a rainwater harvesting system. Stormwater accumulation is channelized and dispersed into 5 unlined percolation tanks for ground water recharge. They are efficient and maintained regularly.

A special effort is made by the university to create awareness about water conservation among students. Signages at drinking water points and in toilets remind students to switch off taps after use and not waste water. Regular awareness events are held and important dates such as World Water Day are celebrated to remind students of the need to conserve water. The students are also encouraged to come up with innovative ideas on water conservation. The campus has an Environmental policy of 'Recycle, Reuse, Reduce and Recover'. This is applied to its approach to water as well.

AREAS FOR IMPROVEMENT AND RECOMMENDATION

Fresh water monitoring system:

There is a need to quantify the amount of water being extracted from groundwater For borewells, it would help to install an IoT based groundwater extraction monitoring system to quantify fresh water consumption per day in the University.

There is also a need to install water flow meters (Mechanical or Electronics) in distribution networks, like University building, drinking, Gardening for quantity per day water consumption and

waste water generation in the University campus. This will not only help get exact quantities consumed but will also be a useful tool for planning conjunctive and efficient water use within the campus.

Automatic shutoff switches in overhead tanks

Though some storage tanks have indicators or float valves to alert people about overflows and prevent them, and auto shutoff motors / switches for overhead tanks can make the task of preventing water overflows much easier. This should be done for all overhead tanks since they are very difficult to monitor

Aerators / Atomizers / sensors / timers in taps

All the taps in toilets and kitchens were manual taps. These would be a source of over consumption of water especially because students might be careless about closing them post use or during non-essential periods of use. It is advised that aerators/atomizers be fitted in taps – especially those used primarily for handwashing such as in toilets. Also, sensors or timer taps can be installed wherever possible to prevent the possibility of water wastage due to tap being left on. Such taps are also drip resistant.

Sprinklers and Drip water irrigation system for gardening.

Though sprinklers and drip water irrigation have been installed in most areas in lawns and orchards, there is potential for more sprinklers and drip water irrigation.

Rainwater Harvesting

Though there are good channelized systems for rainwater harvesting and percolation tanks for ground water recharge but they have no particular rainwater harvesting structure for campus. We strongly advise that a 'Zero Rainwater Flow Out plan' be prepared for the campus. This will recommend the number, types and location of groundwater recharge structures that can enable the campus to fully utilize its rainwater.

Given the high dependence of the campus on borewells, it is highly advisable that the campus do rainwater harvesting for sustainability of its water supply.

Other suggestions.

We also recommend that the Campus prepare a 'Water Management Policy', and make a multi-year blueprint to work towards making the campus water secure and with a zero waste water footprint.

Perhaps more training programs on water management can be done. Universities can also ensure participation of students and teachers in local water issues.

CHAPTER 1 – INTRODUCTION

1.1 About the University

Centurion University is duly recognized as a pioneer is 'Skill Integrated Higher Education". Its unique model lays specific emphasis on creating sustainable livelihoods on a national scale in challenging geographies through education that results in employability and sparks entrepreneurship. This model has been recognized by multiple Governments (Central and State), International Organizations such as UNESCO and the World Bank as well as Policy Think-tanks such as the Niti Ayog. Recently, Centurion University's School of Vocational Education and Training has been recognized as a Center of Excellence by the Ministry of Skill Development and Entrepreneurship, Government of India. It is the only University in India to be recognized as such.

Centurion has continually strived to be a best in class human resource development hub that builds employable, enterprising and society centric youth through industry relevant education, skill development, new ventures, production, and technology development.

The founders, faculty and staff are fully committed to its credo: **Shaping Lives. Empowering Communities.** This credo is underpinned by a value system of Inclusivity, Integrity, Equity, Respect and Sustainability in everything they do.

Since its inception in 2005 and subsequent establishment as a University in 2010 (vide Odisha Act 4 of 2010), Centurion has created a unique environment that ensures a tailored learning and employability path for youth in some of the poorest and underserved geographies in Odisha and Andhra Pradesh.

Centurion has embraced the Agenda for Sustainable Development and the associated Sustainable Development Goals (SDGs) since being formally announced in 2015. SDGs have been both formally and informally used as a guiding framework and are now firmly embedded in the Centurion DNA.

Whilst having an indirect impact and contribution on almost all 17 SDGs, Centurion has specifically focused on 9 SDGs and embedded it in everything from its strategy, governance, institutional management and outcomes.

Vision

A globally accredited human resource center of excellence catalyzing “sustainable livelihoods” in the “less developed markets across the globe”.

Mission

- Provision of quality, globally accredited academic programmes in technology and management .
- Provision of globally accredited employability training for less endowed segments of the population.
- Promotion of entrepreneurial culture and enterprise in the target areas.
- Facilitating improved market access to goods and financial services to the target population.
- Promotion of lighthouse project interventions in the target area .

The journey of Centurion University of Technology and Management (CUTM) began in the year 2005 by a group of ambitious academics with aspirations to provide high quality education both nationally and internationally. The first step in this direction was to take over an ailing engineering Institute, the Jagannath Institute for Technology and Management (JITM) in one of the most challenging tribal districts of Odisha and one which was considered to be a left-wing extremist affected area. Subsequently, JITM was transformed into Centurion University of Technology and Management in August 2010, through an act of the Odisha Legislative Assembly. It became the First Multi-Sector State Private University in Odisha.

The founders during their earlier stint as teachers realized that education is one of the most powerful tools for empowerment, and was in reality designed for the elite. In response, they embarked on this ambitious journey with the aim to bring employment-linked education within the reach of those who needed it the most. As a result, Centurion University has skilled, trained and linked 80,000+ “poor, more poor and ultra poor” youth to find gainful employment. Through five Social Enterprises established under the University, Teaching, Training, Production and Community engagement is

converged into mainstream education thus enabling the University to ensure hands-on knowledge, experiential learning and practice-linked pedagogy with the flexibility of horizontal and vertical mobility.

Their vision was to build Centurion University brick by brick not only as a home for research and education but as an institution which provides opportunities for growth to all students from across the social canvas and they have succeeded in consolidating Centurion University as a truly remarkable place, with expertise across a wide range of disciplines and a superb academic atmosphere.

Figure: 1.1 - Image of Centurion University, Paralakhemundi Campus from Google map

1.2 About Water Audit

A water audit is a study of the water use of an entity. It starts at the point where water enters the premises and goes up to the point where the wastewater is discharged, critically examining all aspects of use. The audit establishes the quantity/volume of water being used, wastage if any, leakages existing, excess use etc., and identifies areas where consumption can be reduced. It critically examines existing treatment systems and practices and recommends changes to improve efficiency and reduce usage. Based on this detailed study and observations, an audit gives recommendations on how to reduce wastage as well as consumption of water, improvements in treatment practices and methods along with cost benefit analyses. It also recommends the setting up of a system to maintain a record of the amount of water entering a system and to keep track of how this water is used.

Water audit is a systematic process of objectively obtaining a water balance by measuring flow of water from the site of water withdrawal or treatment, through the distribution system, and into areas where it is used and finally discharged. Conducting a water audit involves calculating water balance, water use and identifying ways for saving water.

Water audit involves preliminary water survey and detailed water audit. Preliminary water survey is conducted to collect background information regarding institution activities, water consumption and water discharge pattern and water billing, rates and water cess.

The detailed water audit report contains the following:

- Water consumption and wastewater generation pattern
- Specific water use and conservation
- Water saving opportunities
- Method of implementing the proposals

It is essential that any environmentally responsible institution should examine its water use practices.

CHAPTER 2

2.1 Water Audit Team

The Audit team of FORCE constituted of the following:

Name	Role	Designation	Profile
Jyoti Sharma	Convenor & Guide	President & Chief Functionary FORCE	18 year experience as Head of FORCE in Water conservation.
Ankit Kumar Singh	Audit team member	Engineer in charge- Water	Civil Engineer with 5 years experience.
Subrat Sabyasachi Mishra	Audit team member	Agriculture Engineer	Agriculture Engineer with 1 year experience in water conservation
Smrutirupa Swain	Audit team member	Climate Change Expert	Masters in Environment with 1 year experience.

All team members have significant experience in water conservation in different areas. They have done Water Audits of village and urban community habitations from the point of view of doing Need and Sustainability Assessments for water i.e. evaluated the existing need vis a vis the existing supply and analysed the data to design the plan and details for new interventions needed to fulfil that demand in a sustainable manner. They have led teams for construction of multiple water conservation structures .

2.2 About Centurion University Paralakhemundi Campus:

Spread over 120 acres on the foothills of the Eastern ghats in a serene environment lies the main campus of Centurion university in Paralakhemundi. It is the only technological University in South Odisha.

1) School of Fisheries
2) M. S. Swaminathan School of Agriculture
3) School of Engineering & Technology
4) School of Vocational Education and Training
5) School of Applied Science
6) School of Management

Figure: 1.2 - Image of Centurion University, Paralakhemundi Campus

2.3 Area under different catchments in campus

The Campus plays host to almost 4500 people every day. This includes students in hostels, day students, faculty, staff and visitors. Adequate water needs to be provided for each of these people and for maintaining the campus suitably. A breakup of people is given below.

		Non-residential	Residential individuals	Residential with families
1	Total number of students on campus	1764	2000	0
2	Total number of faculty / staff on campus	404	120	204
3	Average visitors per day	20		

The University is spread over 493737(sq. M) beautiful land with plenty of open space interspersed within academic buildings. Some of the open space is planted with trees, some of it is grassy lawns, some is used for agriculture and the rest is paved or road area.

A breakup of the total area under each of these catchment types is given in the table below:

Catchment Type	Area in campus	Used for
Building	31970 sqm	Teaching, administration
Paved	5590 sqm	Walking tracks, open event spaces
Road	10904 sqm	Driving, parking

Lawn(Playground and Orchard)	251632 sqm	Aesthetics, games, gatherings
Forested	96679 sqm	Tree cover for greening, shade & environment
Agriculture	74866 sqm	Demo/ practice plots for students
Kuchcha, unplanted area	22095 sqm	
TOTAL AREA	**493737sq.m.**	

Each of these surfaces and uses have a different water need and hence knowing this breakup of area is important for the water audit.

2.4 Methodology followed for water audit

A four-step process was designed for the water audit.

Step 1: Discussion with University, faculty member in-charge of co-ordinating the Water Audit.

The objective of this step was to get an overview about the university and expectation setting between FORCE and the university. The FORCE Water Audit Convenor shared about the need for and benefits of doing a water audit. She also shared the process the team would follow and the type of analysis that the water audit would do. The University faculty in-charge also shared about their expectations.

Following the introductory discussion, FORCE shared a questionnaire with the university campus coordinator. It had questions regarding the number of students and staff on campus, water sources, consumption patterns, wastages and water conservation methods. The data was to be compiled by the university team and shared with FORCE prior to the Audit Team's visit to the campus. This would enable the Audit team to do pre-visit analysis that would help them make the physical audit more efficient and effective. A cohort of eight youth volunteers assisted in the process of data collection.

Step 2: Visit and Walk through the campus by Audit team

The Audit team visited the campus and walked all around it along with the youth volunteers and college staff. The objective was to get a holistic view of the water management system in the campus and to see the different uses the water was being put to. While walking the audit team members discussed issues faced by the campus in water management, plans for the future, and historical water management experiences of the campus.

Step 3: Verifying and supplementing the data submitted in step 1

During and after the campus walk through, the audit team also used their own observations and expertise to fill gaps in data as shared in step 1. They also validated the data shared by the youth volunteers. In this step the following were done by the team:

a) Analyse historic water use and wastewater generation
b) Field measurements for estimating current water use
c) Whether supply is metered or unmetered. In case the campus has both, which supplies are metered and which are unmetered.
d) In case it is metered, then collect some sample bills
e) In case water quality is tested then collect sample results
f) Wastewater treatment scheme & costs etc.
g) Rainwater harvesting and other water conservation methods adopted.
h) Detection of potential leaks & water losses in the system
i) Assessment of productive and unproductive usage of water
j) Determine key opportunities for water consumption reduction, reuse & recycle.

Step 4: Preparation of Water Audit report

With all data and observations collected, the team then prepares the Water Audit report. The report gives the cumulative water consumption of the camps, the attempts of the campus to create a water balance by also adopting some wastage control or water conservation practices.

CHAPTER 3 – FINDINGS

3.1 Fresh water sources

The main source of freshwater is the Borewell. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction projects. Details of Fresh water sources are in the table below:

Sr.no	Water Source	Location	Quantity
1	Borewell	In campus different locations	17 nos
3	Recycled water	In campus	300kL per day plant capacity

Further, a break-up of borewells based on the use that they primarily put to is as below:

Sr. no	Borewells on campus	Irrigation	Drinking & domestic		Construction
1	Number	1	8	7	1
2	Dia and depth	1ft & 200 ft	1ft & 200ft	1ft/150 ft	1ft & 200ft
3	flow rate	222 L/min	222L/min	54L/min	222L/min
4	Quality of water	good	good	good	good
5	Number of hours running per day	1 to 2 hr	4 hr	4 hr	

The quantity of water yielded by each water source is listed in the table below:

Sr no	Type of supply	Quality (Potable/ Non-potable)	Quantity used per day. (In Kilo litre)	Purposes for which it is used
1	Own tubewells(18 no=10(5HP)+7(3HP)	Potable	516KL/DAY	Domestic
2	Recycled wastewater(STP Capacity: 300KL/DAY)	Non potable	240 KL/DAY	Gardening
3	Reuse of untreated wastewater	NA	NA	NA
4	Private Tankers	NA	NA	NA

Figure: 1.3 - Verification of quantity of water yielded from each water source

3.2 Water Storage Capacity on Campus

The campus has widely distributed storage tanks. Water drawn from the borewell is first stored in ground level tanks. Then it is pumped up to overhead tanks kept over all buildings which then supply water to the building water usage points by gravity. Water is pumped up from borewells in some overhead tanks.

The total water storage capacity , built into the 33 nos water tanks is 9,78,000L. The breakup of water storage capacities in tanks is as given in the table below:

Storage Tanks	Particulars			
	Number	Capacity	Refills per day	Nos with Float valve/ auto shut/indicator
Overhead	18	288 KL	Continuously	3
On ground	11	390 KL	Continuously	1
Storage Tanks for recycled water	4	300 KL	0	0

Figure: 1.4- Image of Overhead Tank and Sump

3.3 Fresh Water Distribution mechanism

There is a well-planned and well managed pipeline system that takes water from the sources to the storage tanks and from tanks to the usage points. The usage points are taps in kitchens, bathrooms, drinking water points etc or cisterns in toilets. All these are fed with a mix of borewell since it has been tested and found potable.

Sr no.	Water fixtures in Bathrooms				
		HandWash/ drinking	Cisterns	Toilet	Bathing
1	Number of functional taps	800	800	1000	1600
2	Dia of taps	2cm	1.7cm	1.7cm	1.5cm
3	flow rate	8L/min	12L/min	12L/min	12L/min
4	Number with Timer or sensor	280	0	0	0
5	Number found dripping	0	0	0	0

Sr no.	Water use in kitchen	
1	Number of taps	24
2	Dia of taps	1.7cm
3	flow rate	7L/min

3.3 Water Usage

Since there is no metering system on campus, it is not possible to get an exact number in terms of water usage. However, by accepting benchmarks of water usage per activity, we can arrive at an estimate of the daily water use. Please note that the figure here is an average daily use figure. On ground each day might have a different usage amount. For example, all lawns may not be watered everyday. However, the figure we have taken (2litres per sqm) is arrived at by dividing the weekly water need of a lawn by 7 days. Our estimate is that the campus uses a total of approx. 662 KL/day. The breakup of this usage is as follows:

Sr.no	Usage Type	Quantity of Water used
1	Gardening/Irrigation @2L/ sqm/ day for lawns, 1 L/sqm/day for trees, 2 L/sqm/day for agriculture area	294.40 kL per day
2	Domestic use (toilets, bathrooms, kitchen, cleaning, drinking) @20kL for non residential / visitors and 135kL for residential	357.5 kL per day
3	Construction @10kL per day	10kL per day

3.4 Disposal of Waste Water

The campus has a separate storm water and sewage drainage system. The sewage waste water generated from various departments like canteen, mess, and washrooms, hand-washing points, bathrooms, drinking water points and RO reject water is discharged into the sewage drain line. The sewage drainage system ends at the STP plant where it is treated. The treated wastewater is stored in a storage tank and, as per need, reused for gardening and irrigation. Surplus treated water is placed in a pond outside the campus where it helps safely recharge to groundwater.

Figure: 1.4 - Sewage Water Treatment

3.5 Water Accounting and Metering System

The campus does not have a water metering system. Since it does not get municipal water supply via pipeline, there are no municipal water meters. Flowmeters are not installed on borewells within the campus.

The Audit team observed that there is a requirement of water flow meters on water sources to quantify water consumption in the University.

3.6 Water test parameters

The Campus conducts water quality tests for their drinking water source from tube wells and treats waste water from STP plants from time to time. Two such reports were sourced by the Audit team. The reports show that all parameters are within permissible range. The drinking water quality is potable.

KALYANI LABORATORIES PVT. LTD.

TEST REPORT

167 | 03790123/C/KLPL/7/17/WATER/00229

WASTE WATER

STP OUTLET WATER

TEST REPORT BASED ON GENERAL STANDARDS FOR DISCHARGE OF EFFLUENTS TO INLAND SURFACE WATER(CPCB)

CHEMICAL PARAMETER

PHYSICAL PARAMETER

Figure: 1.5 - Image of waste water testing Report

KALYANI LABORATORIES PVT. LTD.

Figure: 1.6 - Image of drinking water testing Report

3.7 Environment friendly initiatives

The campus has taken some measures to prevent water wastages and to conserve water. They are conscious about their water usage. In our talk with the management team and in our interactions with the maintenance staff of the campus, we observed that they were all aware about the need to conserve water. They were alert to spot any leakages or wastages and took prompt action if they saw a fault – either directly or by reporting to the appropriate authority. We also did not see evidence of overwatering in green spaces, or stagnant overflow water around storage points. This indicates that the maintenance staff is vigilant about water.

Wastage Prevention in distribution system

The audit team saw direction control and flow control valves at critical points in the distribution pipelines. These were used by the staff to regulate water pressure, flow and the direction in which water was required to flow. This enables them to make sure that water goes only where it is needed, and in the quantity it is needed. Though they do not have pressure gauges to check for pressure drops that may indicate leakages in a distribution line, they examine the pipeline regularly to check for leakages and plug them as soon as spotted.

Known sources and quantity of wastage in institution

Details	% waste discharge	Total approx quantity per day	Type of contaminants in that water	Method of disposal
RO or other drinking water treatment	30%	8860 L	NIL	Disposed water used for Utensils washing
Waste water recycling plant	NIL	NIL	NA	NA
Distribution pipeline or overflow leakages	NA	NA	NA	NA
Others (please specify)	NA	NA	NA	NA

Wastage prevention in storage

Like in the distribution network, the wastage control in storage tanks too is through valves and regular inspections. They have valves in all un-monitored tanks that provide proper valves at very necessary points.

Details	% with automatic motor shut off	% with floatvalve	% with overflow indicator
Storage Tanks	15%	0.00%	0%

Wastage Prevention at usage points

Greening is done using hose pipes attached to taps fitted with valves. The campus also has sprinklers in some lawns. There is a team of dedicated gardeners who manage the hosepipes and sprinklers.

Details	% of green area irrigated through furrows	% of green area served with hose	Drip irrigation	Sprinklers
Irrigation	0.00%	30.00%	50%	20%

Area	326498 sqm
Irrigation method	drip, sprinkler, hose-pipe
Water source	Recycled water
Dia of pipe/hose	4"
Flow rate	Gravity Flow & 30 L/min
No. of hours of irrigation/day	2 to 4 hr
Type & species of plants	350

Details	% with Timer / Sensor	% with water saving technology like aerator/atomizer.
Taps in bathrooms, handwash points, kitchens	15%	20%

Details	% of low capacity cisterns (6l per flush or less)	% with dual flush	% using recycled waste water
Cisterns and flush	0.00%	5%	0.00%

Wastewater treatment system

The campus has a Sewage Treatment plant to treat all its wastewater. The plant has a capacity of 300kL per day which is more than the waste water generated daily in the campus. Capacity utilization of the plant stands at 80% i.e. 240 kL of wastewater is treated daily.

The treated wastewater is collected in a separate storage tank. The water is used for greening and irrigation. When the system is maintained, the sludge removed is used as manure in the green areas. The STP water complies with the required noms.

Rainwater Harvesting(Through percolation tank)

The campus has no such rainwater harvesting structures but a stormwater channelized system is present which discharges water into 5 percolation tanks . All percolation tanks are functional and maintained yearly.

	Nos.	Type	Dimensions	Functional/ Non functional	Maintained every year?	Annual Recharge potential
Pond	5	Rain water	10286 sqm	functional	yes	NA

Institution effort to create awareness – water conservation messages

The audit team saw 10 nos sign-boards of size 1ftX1.5 ft displayed at different places in the campus with messages related to preventing water wastage. Most of the messages were displayed at drinking water points or toilets. They were reminder messages for closing taps after use and not wasting water.

Institution effort to create awareness –Programs conducted

Every year, the campus conducts at least 2 programs for all students related to environmental awareness. In these programs, water conservation is a key message. The campus has celebrated World Water Day in a big way last year as a part of the UNICEF led Youth4Water program that they have partnered with. They are also participating in an Innovation Challenge for innovative ideas in Water Conservation, WASH and Climate Change as a part of the same program. Apart from this, the students do projects and activities related to water as a part of the curriculum.

Water policy

Though the campus does not have a written water policy, in our conversations with the management, they shared that 'Recycle, Reuse, Reduce and Recover' is their Environment policy motto. They apply the same principle for their work for water.

WATER AUDIT REPORT

For

School of Pharmacy, Centurion University Of Technology And Management

University in sunkarimentu, pitamahal, Rayagada

Odisha - 765002

Year 2022-23

CONSULTATION and REPORT by

FORCE

(Pandit Jagat Ram Memorial FORCE Trust)

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CONTENTS

ACKNOWLEDGEMENT

FORCE (Pandit Jagat Ram Memorial FORCE Trust) takes this opportunity to appreciate & thank the management of **Centurion University Technology & Management, pitamahal, Rayagada, Odisha** for giving us an opportunity to conduct a Water audit for the University.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

We are grateful also to the UNICEF led Youth4Water campaign for their support and for the opportunity to provide a learning by doing training in conducting Water Audits to 4 Youth4Water volunteers from Centurion University as a part of this initiative.

(signed)

Jyoti Sharma

Jyoti Sharma

President, FORCE Non-profits

Taubman Fellow 2016, Brown University (USA)

Ashoka Fellow, TedMed Speaker

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Neoliberal takeover of social entrepreneurship

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EXECUTIVE SUMMARY & RECOMMENDATIONS

The executive summary of the water audit report furnished in this section briefly gives the findings and recommendations of the Audit team.

WATER SOURCES, QUALITY AND USAGE

On the basis of water usage statistics shared by campus, the estimated water usage is 44 kilo litres per day. However, calculating using accepted benchmarks for usage types, indicates average daily water use of approx. 86 kilo Litres (kL) per day. The differential either indicates extremely high water use efficiency or under-reporting of water usage statistics. Borewells are the only source of water that is used for both campus and greenery purposes.

Usage of water is for drinking, domestic and greening purposes. Raw water is stored in 9 overhead tanks. And it is filled twice every 24 hours . A pipeline system takes water from these tanks to the water usage points. There are 182 taps and 81 cisterns that dispense water for various purposes. Most of the taps have a diameter of 1.7 cm with a flow rate of 7 litres per minute.

Borewell water quality is as per potable water norms. The campus gets its water checked periodically. As per the reports, all major parameters are within the permissible norms for domestic water use.

CONSERVATION INITIATIVES TAKEN BY THE CAMPUS

The campus has a well planned network of water storage tanks and distribution pipelines. Control valves and Float Valves remind students to switch off taps after use and not waste water. Regular awareness events are held and important dates such as World Water Day are celebrated to remind students of the need to conserve water. The students are also encouraged to come up with innovative ideas on water conservation. The campus has an Environmental policy of 'Recycle, Reuse, Reduce and Recover'. This is applied to its approach to water as well.

A special effort is made by the university to create awareness about water conservation among students. Signages at drinking water points and in toilets.

An observation made by the audit team is that a pond is present inside the campus which in later days can be used for a percolation tank via channelizing the storm water of the campus.

AREAS FOR IMPROVEMENT AND RECOMMENDATION

Fresh water monitoring system:

There is a need to quantify the amount of water being extracted from groundwater. For borewells, it would help to install an IoT based groundwater extraction monitoring system to quantify fresh water consumption per day in the University.

There is also a need to install water flow meters (Mechanical or Electronics) in distribution networks, like University building, drinking, Gardening for quantity per day water consumption and waste water generation in the University campus. This will not only help get exact quantities consumed but will also be a useful tool for planning conjunctive and efficient water use within the campus.

Automatic shutoff switches in overhead tanks

Auto shutoff motors / switches for overhead tanks can make the task of preventing water overflows much easier. This should be done for all overhead tanks since they are very difficult to monitor.

Aerators / Atomizers / sensors / timers in taps

All the taps in toilets and kitchens were manual taps. These would be a source of over consumption of water especially because students might be careless about closing them post use or during non-essential periods of use. It is advised that aerators/atomizers be fitted in taps – especially those used primarily for handwashing such as in toilets. Also, sensors or timer taps can be installed wherever possible to prevent the possibility of water wastage due to tap being left on. Such taps are also drip resistant.

Sprinklers and Drip water irrigation system for gardening.

Hose pipe installed in most areas in lawns and orchards, there is potential for sprinklers and drip water irrigation which should be focused more.

Rainwater Harvesting

They have no particular rainwater harvesting structure for campus. We strongly advise that a 'Zero Rainwater Flow Out plan' be prepared for the campus. This will recommend the number, types and location of groundwater recharge structures that can enable the campus to fully utilize its rainwater.

Given the high dependence of the campus on borewells, it is highly advisable that the campus do rainwater harvesting for sustainability of its water supply.

Other suggestions.

We also recommend that the Campus prepare a 'Water Management Policy', and make a multi-year blueprint to work towards making the campus water secure and with a zero waste water footprint.

Perhaps more training programs on water management can be done. Universities can also ensure participation of students and teachers in local water issues.

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Centurion has continually strived to be a best in class human resource development hub that builds employable, enterprising and society centric youth through industry relevant education, skill development, new ventures, production, and technology development.

The founders, faculty and staff are fully committed to its credo: **Shaping Lives. Empowering Communities.** This credo is underpinned by a value system of Inclusivity, Integrity, Equity, Respect and Sustainability in everything they do.

Since its inception in 2005 and subsequent establishment as a University in 2010 (vide Odisha Act 4 of 2010), Centurion has created a unique environment that ensures a tailored learning and employability path for youth in some of the poorest and underserved geographies in Odisha and Andhra Pradesh.

Centurion has embraced the Agenda for Sustainable Development and the associated Sustainable Development Goals (SDGs) since being formally announced in 2015. SDGs have been both formally and informally used as a guiding framework and are now firmly embedded in the Centurion DNA.

Whilst having an indirect impact and contribution on almost all 17 SDGs, Centurion has specifically focused on 9 SDGs and embedded it in everything from its strategy, governance, institutional management and outcomes.

Vision

A globally accredited human resource center of excellence catalyzing "sustainable livelihoods" in the "less developed markets across the globe".

Mission

- Provision of quality, globally accredited academic programmes in technology and management .
- Provision of globally accredited employability training for less endowed segments of the population.
- Promotion of entrepreneurial culture and enterprise in the target areas.
- Facilitating improved market access to goods and financial services to the target population.
- Promotion of lighthouse project interventions in the target area .

The journey of Centurion University of Technology and Management (CUTM) began in the year 2005 by a group of ambitious academics with aspirations to provide high quality education both nationally and internationally. The first step in this direction was to take over an ailing engineering Institute, the Jagannath Institute for Technology and Management (JITM) in one of the most challenging tribal districts of Odisha and one which was considered to be a left-wing extremist affected area. Subsequently, JITM was transformed into Centurion University of Technology and Management in August 2010, through an act of the Odisha Legislative Assembly. It became the First Multi-Sector State Private University in Odisha.

The founders during their earlier stint as teachers realized that education is one of the most powerful tools for empowerment, and was in reality designed for the elite. In response, they embarked on this ambitious journey with the aim to bring employment-linked education within the reach of those who needed it the most. As a result, Centurion University has skilled, trained and linked 80,000+ "poor, more poor and ultra poor" youth to find gainful employment. Through five

Social Enterprises established under the University, Teaching, Training, Production and Community engagement is converged into mainstream education thus enabling the University to ensure hands-

on knowledge, experiential learning and practice-linked pedagogy with the flexibility of horizontal and vertical mobility.

Their vision was to build Centurion University brick by brick not only as a home for research and education but as an institution which provides opportunities for growth to all students from across the social canvas and they have succeeded in consolidating Centurion University as a truly remarkable place, with expertise across a wide range of disciplines and a superb academic atmosphere.

Figure: 1.1 - Image of Centurion University, Rayagada Campus from Google map

1.2 About Water Audit

A water audit is a study of the water use of an entity. It starts at the point where water enters the premises and goes up to the point where the wastewater is discharged, critically examining all aspects of use. The audit establishes the quantity/volume of water being used, wastage if any, leakages existing, excess use etc., and identifies areas where consumption can be reduced. It critically examines existing treatment systems and practices and recommends changes to improve efficiency and reduce usage. Based on this detailed study and observations, an audit gives recommendations on how to reduce wastage as well as consumption of water, improvements in treatment practices and methods along with cost benefit analyses. It also recommends the setting up of a system to maintain a record of the amount of water entering a system and to keep track of how this water is used.

Water audit is a systematic process of objectively obtaining a water balance by measuring flow of water from the site of water withdrawal or treatment, through the distribution system, and into areas where it is used and finally discharged. Conducting a water audit involves calculating water balance, water use and identifying ways for saving water.

Water audit involves preliminary water survey and detailed water audit. Preliminary water survey is conducted to collect background information regarding institution activities, water consumption and water discharge pattern and water billing, rates and water cess.
The detailed water audit report contains the following:

- Water consumption and wastewater generation pattern
- Specific water use and conservation
- Water saving opportunities
- Method of implementing the proposals

It is essential that any environmentally responsible institution should examine its water use practices.

CHAPTER 2

2.1 Water Audit Team

The Audit team of FORCE constituted of the following:

Name	Role	Designation	Profile
Jyoti Sharma	Convenor & Guide	President & Chief Functionary FORCE	18 year experience as Head of FORCE in Water conservation.
Ankit Kumar Singh	Audit team member	Engineer in charge- Water	Civil Engineer with 5 years experience.
Subrat Sabyasachi Mishra	Audit team member	Agriculture Engineer	Agriculture Engineer with 1 year experience in water conservation
Smrutirupa Swain	Audit team member	Climate Change Expert	Masters in Environment with 1 year experience.

All team members have significant experience in water conservation in different areas. They have done Water Audits of village and urban community habitations from the point of view of doing Need and Sustainability Assessments for water i.e. evaluated the existing need vis a vis the existing supply and analysed the data to design the plan and details for new interventions needed to fulfil that demand in a sustainable manner. They have led teams for construction of multiple water conservation structures .

2.2 About Centurion University Rayagada Campus:

Situated in the mineral rich southern part of Odisha, Rayagada is a district of meadows, forests, waterfalls and terraced valleys, inhabited by many primitive tribal groups. The scenic beauty and heritage of the land is an unexplored paradise. Spread over 7 acres of land this campus provides skill integrated education in the region. It has a School of Pharmacy

Figure: 1.2 - Image of Centurion University, Rayagada Campus

2.3 Area under different catchments in campus

The Campus plays host to almost 910 people every day. This includes students in hostels, day students, faculty, staff and visitors. Adequate water needs to be provided for each of these people and for maintaining the campus suitably. A breakup of people is given below.

		Non-residential	Residential individuals	Residential with families
1	Total number of students on campus	527	264	0
2	Total number of faculty / staff on campus	54	5	0
3	Average visitors per day	40-60		

The University is spread over 30050 (sq. M) beautiful land with plenty of open space interspersed within academic buildings. Some of the open space is planted with trees, some

of it is grassy lawns and the rest is paved or road area.

A breakup of the total area under each of these catchment types is given in the table below:

Catchment Type	Area in campus	Used for
Building	8454 sqm	Teaching, administration
Paved/Road	2924 sqm	Walking tracks, open event spaces
Lawn(Playground and Orchard)	8788 sqm	Aesthetics, games, gatherings
Forested	8435 sqm	Tree cover for greening, shade & environment
Agriculture	372 sqm	Demo/ practice plots for students
Kuchcha, unplanted area	1077 sqm	
TOTAL AREA	**30050 sq.m.**	

Each of these surfaces and uses have a different water need and hence knowing this breakup of area is important for the water audit.

2.4 Methodology followed for water audit

A four-step process was designed for the water audit.

Step 1: Discussion with University, faculty member in-charge of co-ordinating the Water Audit.

The objective of this step was to get an overview about the university and expectation setting between FORCE and the university. The FORCE Water Audit Convenor shared about the need for and benefits of doing a water audit. She also shared the process the team would follow and the type of analysis that the water audit would do. The University faculty in-charge also shared about their expectations.

Following the introductory discussion, FORCE shared a questionnaire with the university campus coordinator. It had questions regarding the number of students and staff on campus, water sources, consumption patterns, wastages and water conservation methods. The data was to be compiled by the university team and shared with FORCE prior to the Audit Team's visit to the campus. This would enable the Audit team to do pre-visit analysis that would help them make the physical audit more efficient and effective. A cohort of eight youth volunteers assisted in the process of data collection.

Step 2: Visit and Walk through the campus by Audit team

The Audit team visited the campus and walked all around it along with the youth volunteers and college staff. The objective was to get a holistic view of the water management system in the campus and to see the different uses the water was being put to. While walking the audit team members discussed issues faced by the campus in water management, plans for the future, and historical water management experiences of the campus.

Step 3: Verifying and supplementing the data submitted in step 1

During and after the campus walk through, the audit team also used their own observations and expertise to fill gaps in data as shared in step 1. They also validated the data shared by the youth volunteers. In this step the following were done by the team:

a) Analyse historic water use and wastewater generation
b) Field measurements for estimating current water use
c) Whether supply is metered or unmetered. In case the campus has both, which supplies are metered and which are unmetered.
d) In case it is metered, then collect some sample bills
e) In case water quality is tested then collect sample results
f) Wastewater treatment scheme & costs etc.
g) Rainwater harvesting and other water conservation methods adopted.

h) Detection of potential leaks & water losses in the system

i) Assessment of productive and unproductive usage of water

j) Determine key opportunities for water consumption reduction, reuse & recycle.

Step 4: Preparation of Water Audit report

With all data and observations collected, the team then prepares the Water Audit report. The report gives the cumulative water consumption of the camps, the attempts of the campus to create a water balance by also adopting some wastage control or water conservation practices.

CHAPTER 3 – FINDINGS

3.1 Fresh water sources

The main source of freshwater is the Borewell. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction projects. Details of Fresh water sources are in the table below:

Sr.no	Water Source	Location	Quantity
1	Borewell	In campus different locations	3 nos

Further, a break-up of borewells based on the use that they primarily put to is as below:

Sr. no	Borewells on campus	Drinking, domestic, irrigation & construction	
1	Number	2	1
2	Dia and depth	1ft & 180ft	1ft/200 ft
3	flow rate	40 L/min	66 L/min
4	Quality of water	good	good
5	Number of hours running per day	4 hr	4 hr

The quantity of water yielded by each water source is listed in the table below:

Sr no	Type of supply	Quality (Potable/ Non-potable)	Quantity used per day. (In Kilo litre)	Purposes for which it is used
1	Own tubewells(3 no=2(1.5 HP)+1(2 HP)	Potable	44 KL/DAY	Domestic & Irrigation
2	Recycled wastewater	NA	NA	NA
3	Reuse of untreated wastewater	NA	NA	NA
4	Private Tankers	NA	NA	NA

Figure: 1.3 - Verification of quantity of water yielded from each water source

3.2 Water Storage Capacity on Campus

The campus has widely distributed storage tanks. Water drawn from the borewell is directly pumped up to overhead tanks kept over all buildings which then supply water to the building water usage points by gravity.

The total water storage capacity , built into the 9 nos water tanks is 44,000 L. The breakup of water storage capacities in tanks is as given in the table below:

Storage Tanks	Particulars			
	Number	Capacity	Refills per day	Nos with Float valve/ auto shut/indicator
Overhead	9	44 KL	Twice	0
On ground	NA	NA	NA	NA
Storage Tanks for recycled water	NA	NA	NA	NA

Figure: 1.4- Image of Overhead Tank

3.3 Fresh Water Distribution mechanism

There is a well-planned and well managed pipeline system that takes water from the sources to the storage tanks and from tanks to the usage points. The usage points are taps in kitchens, bathrooms, drinking water points etc or cisterns in toilets. All these are fed with a mix of borewell since it has been tested and found potable.

Sr no.	Water fixtures in Bathrooms				
		HandWash/ drinking	Cisterns	Toilet	Bathing
1	Number of functional taps	62	81	88	32
2	Dia of taps	1.7 cm	1.7cm	1.7cm	1.7cm
3	flow rate	7 L/min	7 L/min	7 L/min	7 L/min
4	Number with Timer or sensor	0	0	0	0
5	Number found dripping	0	0	0	0

Sr no.	Water use in kitchen	
1	Number of taps	10
2	Dia of taps	1.7cm
3	flow rate	8 L/min

3.4 Water Usage

Since there is no metering system on campus, it is not possible to get an exact number in terms of water usage. However, by accepting benchmarks of water usage per activity, we can arrive at an estimate of the daily water use. Please note that the figure here is an average daily use figure. On ground each day might have a different usage amount. For example, all lawns may not be watered everyday. However, the figure we have taken (2litres per sqm) is

arrived at by dividing the weekly water need of a lawn by 7 days.

Figure: 1.5 - Image of hand washing tap

Using accepted benchmarks of water usage, our estimate is that the campus uses a total of approx. 86 KL/day. The breakup of this usage is as follows:

Sr.no	Usage Type	Quantity of Water used
1	Gardening/Irrigation @2L/ sqm/ day for lawns, 1 L/sqm/day for trees, 2 L/sqm/day for agriculture area	26.75 kL per day
2	Domestic use (toilets, bathrooms, kitchen, cleaning, drinking) @20kL for non residential / visitors and 135kL for residential	49.13 kL per day
3	Construction @10kL per day	10 kL per day

3.5 Disposal of Waste Water

The campus has no storm water and sewage drainage system. The sewage waste water generated from various departments like canteen, mess, and washrooms, hand-washing points, bathrooms, drinking water points and RO reject water is discharged into the outside campus into municipality drainage.

3.6 Water Accounting and Metering System

The campus does not have a water metering system. Since it does not get municipal water supply via pipeline, there are no municipal water meters. Flowmeters are not installed on borewells within the campus.

The Audit team observed that there is a requirement of water flow meters on water sources to quantify water consumption in the University.

3.7 Water test parameters

The Campus conducts water quality tests for their drinking water source from tube wells and treats waste water from STP plants from time to time. Two such reports were sourced by the Audit team. The reports show that all parameters are within permissible range. The drinking water quality is potable.

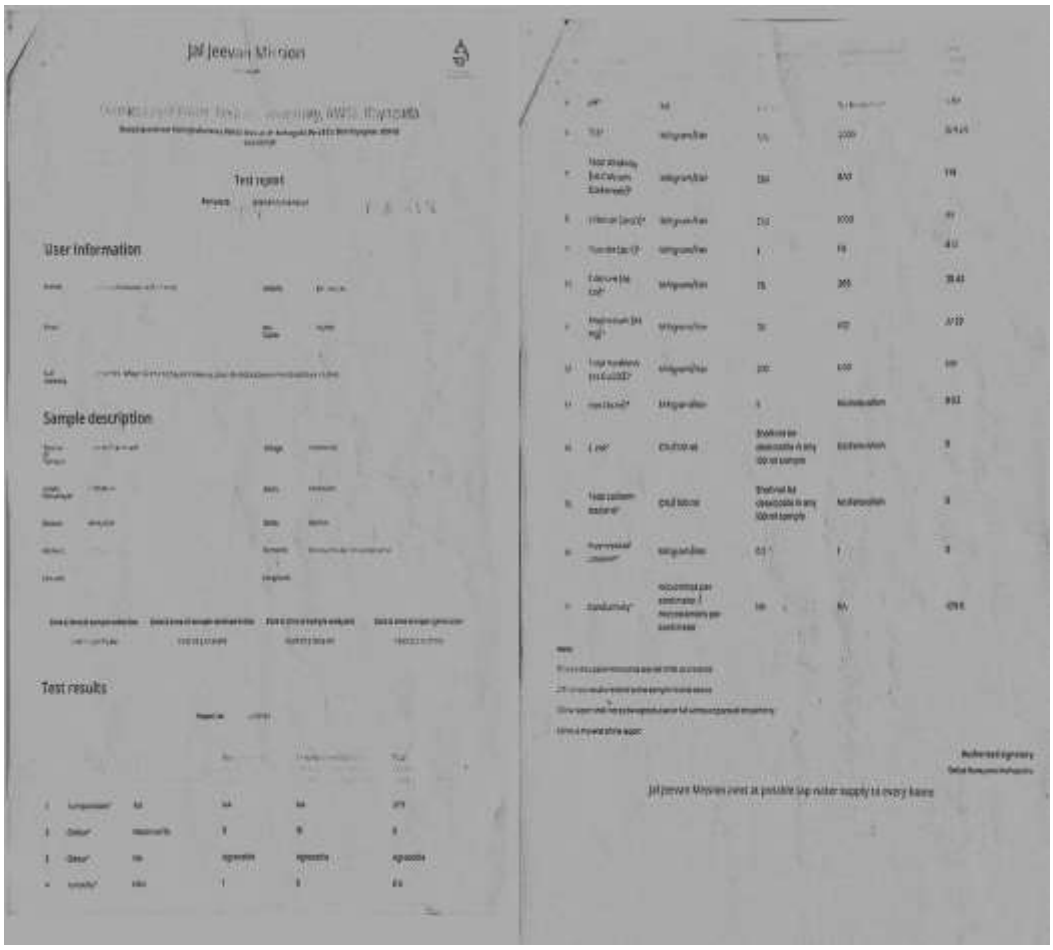

Figure: 1.6 - Drinking water testing report

3.8 Environment friendly initiatives

The campus has taken some measures to prevent water wastages and to conserve water. They are conscious about their water usage. In our talk with the management team and in our interactions with the maintenance staff of the campus, we observed that they were all aware about the need to conserve water. They were alert to spot any leakages or wastages and took prompt action if they saw a fault – either directly or by reporting to the appropriate authority. We also did not see evidence of overwatering in green spaces, or stagnant overflow

water around storage points. This indicates that the maintenance staff is vigilant about water wastages.

Wastage Prevention in distribution system

The audit team saw direction control and flow control valves at critical points in the distribution pipelines. These were used by the staff to regulate water pressure, flow and the direction in which water was required to flow. This enables them to make sure that water goes only where it is needed, and in the quantity it is needed. Though they do not have pressure gauges to check for pressure drops that may indicate leakages in a distribution line, they examine the pipeline regularly to check for any leakages and plug them as soon as they are spotted.

Details	% waste discharge	Total approx quantity per day	Type of contaminants in that water	Method of disposal
RO or other drinking water treatment	10 %	100 L	NIL	Disposed water is drained out.
Waste water recycling plant	NIL	NIL	NA	NA
Distribution pipeline or overflow leakages	5 %	50 L	NA	Disposed water is drained out.
Others (please specify)	NA	NA	NA	NA

Wastage prevention in storage

Like in the distribution network, the wastage control in storage tanks is through inspections. There are no such valves for automatic shut off.

Details	% with automatic motor shut off	% with float valves	% with overflow indicator
Storage Tanks	0%	0.00%	0%

Wastage Prevention at usage points

Greening is done using hose pipes attached to taps fitted with valves. There is a team of dedicated gardeners who manage the hose pipes.

Details	% of green area irrigated through furrows	% of green area served with hose	Drip irrigation	Sprinklers
Irrigation	100 %	00.00%	0%	0%

Area	17595 sqm
Irrigation method	hose-pipe
Water source	Borewell water
Dia of pipe/hose	0.5"
Flow rate	30 L/min
No. of hours of irrigation/day	2 hr
Type & species of plants	25

Details	% with Timer / Sensor	% with water saving technology like aerator/atomizer.
Taps in bathrooms, handwash points, kitchens	0%	0%

Details	% of low capacity cisterns (6l per flush or less)	% with dual flush	% using recycled waste water
Cisterns and flush	100 %	0 %	0.00%

Institution effort to create awareness – water conservation messages

The audit team saw 4 nos sign-boards of size 1ftX1.5 ft displayed at different places in the campus with messages related to preventing water wastage. Most of the messages were displayed at drinking water points or toilets. They were reminder messages for closing taps after use and not wasting water.

Institution effort to create awareness –Programs conducted

Every year, the campus conducts at least 2 programs for all students related to environmental awareness. In these programs, water conservation is a key message. The campus has celebrated World Water Day in a big way last year as a part of the UNICEF led Youth4Water

program that they have partnered with. They are also participating in an Innovation Challenge for innovative ideas in Water Conservation, WASH and Climate Change as a part of the same program. Apart from this, the students do projects and activities related to water as a part of the curriculum.

Water policy

Though the campus does not have a written water policy, in our conversations with the management, they shared that 'Recycle, Reuse, Reduce and Recover' is their Environment policy motto. They apply the same principle for their work for water.