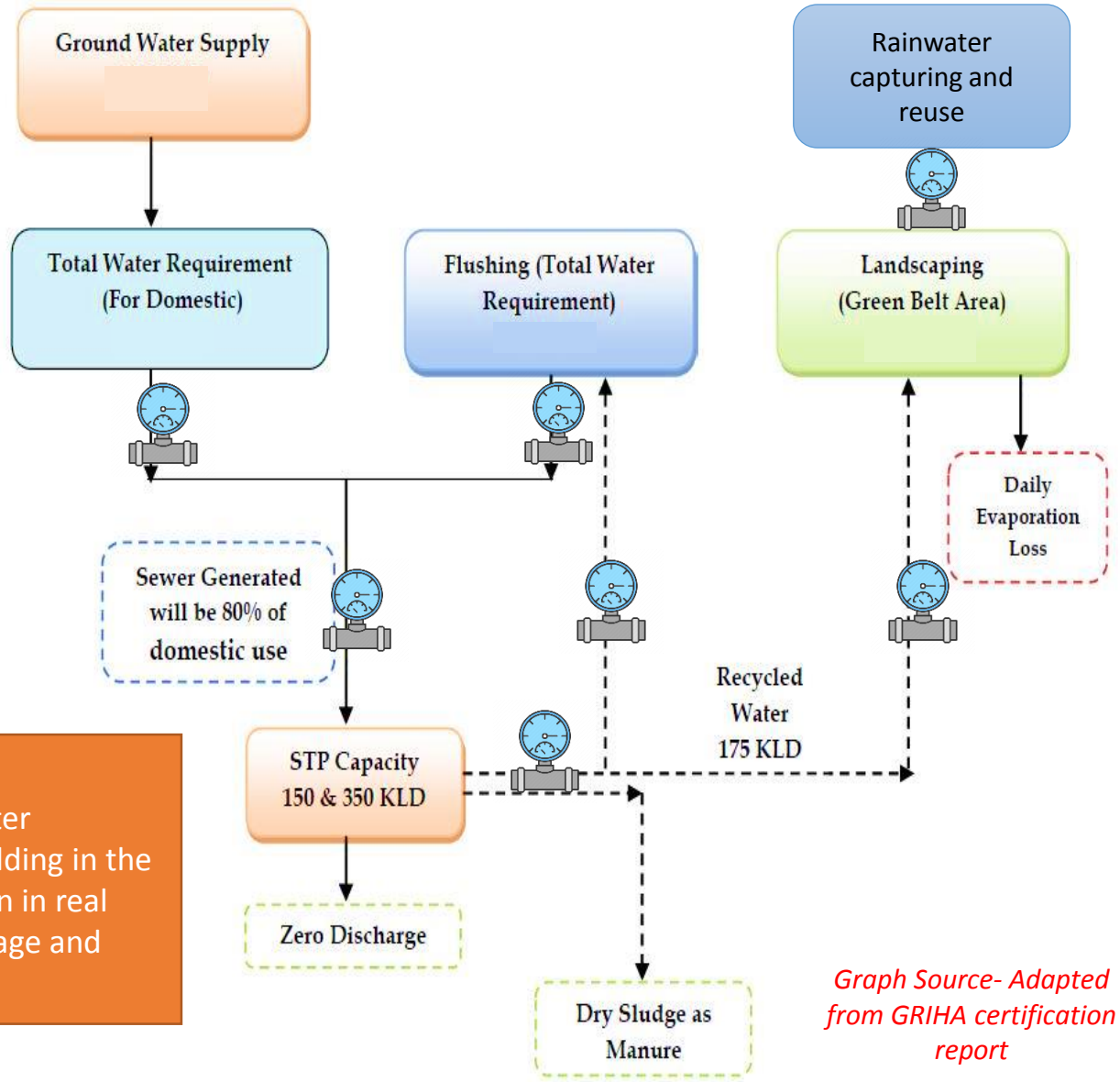
Water Consumption and Treatment 2021-2022

- Manipal University Jaipur

Water Source and Distribution in MUJ Campus

Manipal university has an Integrated Water management strategies that are designed & implemented for the campus mainly focusing on triple bottom line benefits i.e., social, economic and environmental benefits. This created a flexible, resilient water infrastructure which helped MUJ progress towards water neutrality.



Graph Source- Adapted from GRIHA certification report

RECOMMENDATIONS -
Water meters to be installed at all water sources/distribution lines at every building in the campus to monitor water consumption in real time basis to understand excessive usage and leaks

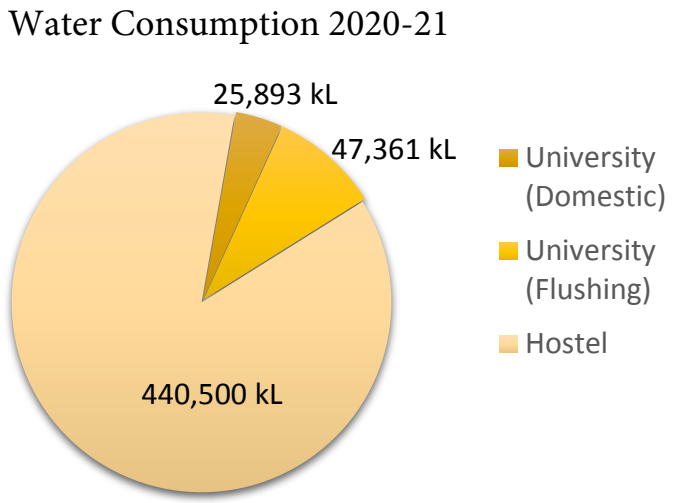
Observations:

The ground water supply water requirement as per the design guidelines for the MUJ university campus is 220 LKD. The Total water requirement is segregated under domestic use, flushing requirement and landscaping irrigation purposes.
The domestic purpose requirements gets fulfilled through ground water supply. For flushing and landscaping requirements MUJ uses the treated water from the Sewage Treatment Plant (STP). For landscaping requirements MUJ also use the rainwater from the RWH tanks. The dry sludge from the STP is further converted into manure used for on-site landscaping purpose.

Criteria - Water

Water Consumption

- MUJ consumes **25,893 kL/year** of water annually for the university blocks & **440,500 kL/year** for hostel blocks
- Total water consumption is **513,754 kL/year**
- 100% wastewater is treated on site and used for flushing and landscape purposes within the campus.



University (Administrative +Academic Blocks) data for domestic and flushing comes is shared by MUJ.
Hostel (Student accommodation + staff accommodation + Guest House) is available from GRIHA report

- To reduce the water usage, all the building toilets in MUJ are equipped with automatic, low flow fixtures and low flush fixtures. These fixtures when compared with conventional fixtures can save significant amount of water.

FIXTURE TYPE	CONVENTIONAL FLOW/ FLUSH FIXTURE FLOW RATE LPF/LPM	FIXTURE FLOW RATES INSTALLED IN MUJ LPF/LPM	Estimated Water Savings (%)
WC Flush	≤ 6 LPF	3 & ≤6 LPF	50%
Sensor Urinals	≤ 3.8 LPF	≤ 0.5 LPF	86%
Restroom Faucets	≤ 9.4 LPM	≤ 2.75 LPM	70%
Pillar cock	≤ 9.4 LPM	≤ 2.75 LPM	70%
Health faucet	≤ 9.4 LPM	≤ 6.4 LPM	32%
Kitchen Faucet	≤ 9.4 LPM	≤ 7.5 LPM	20%

RECOMMENDATIONS-
Regular monitoring of water use at the building level and regular maintenance checks for leaks will ensure additional water savings

Observations:

The total water consumption in the campus is segregated for domestic and flushing purposes. 80% of waste-water from domestic and flushing purpose is treated and this recycled water is used for landscape irrigation and the dry sludge generated in the sewage treatment plant is used as manure for landscape.

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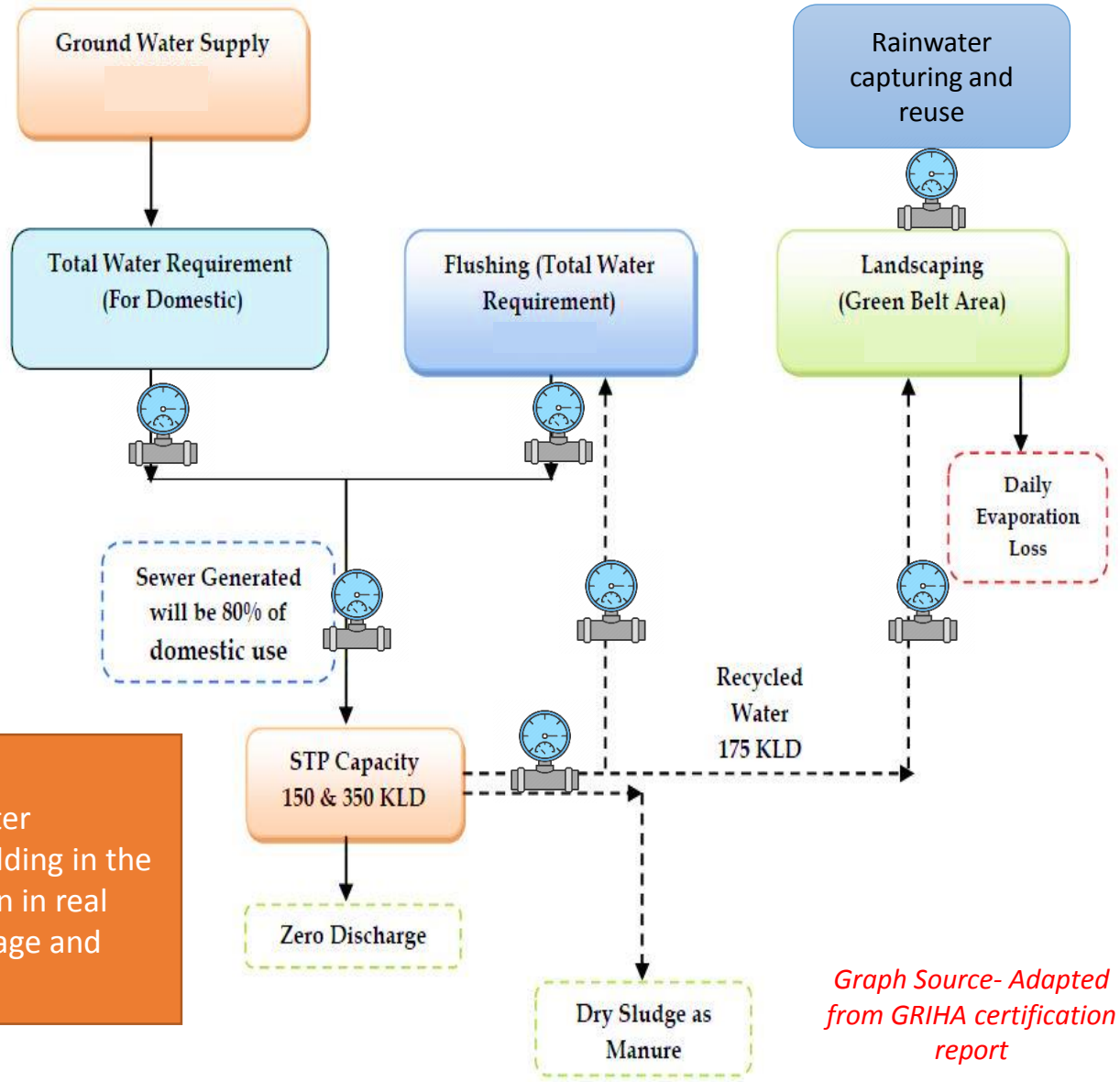

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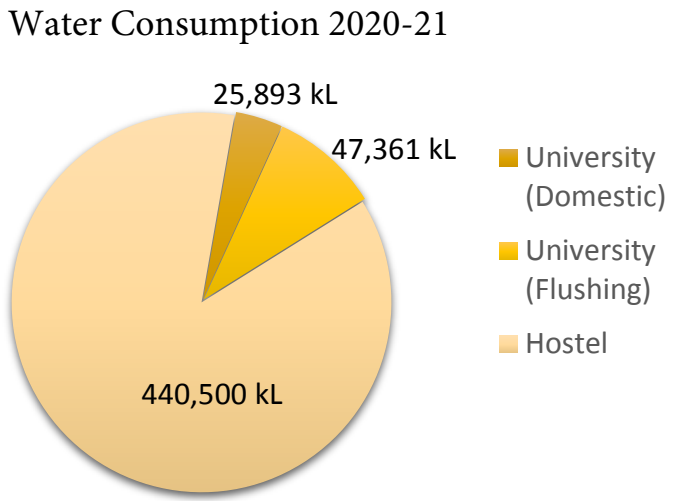

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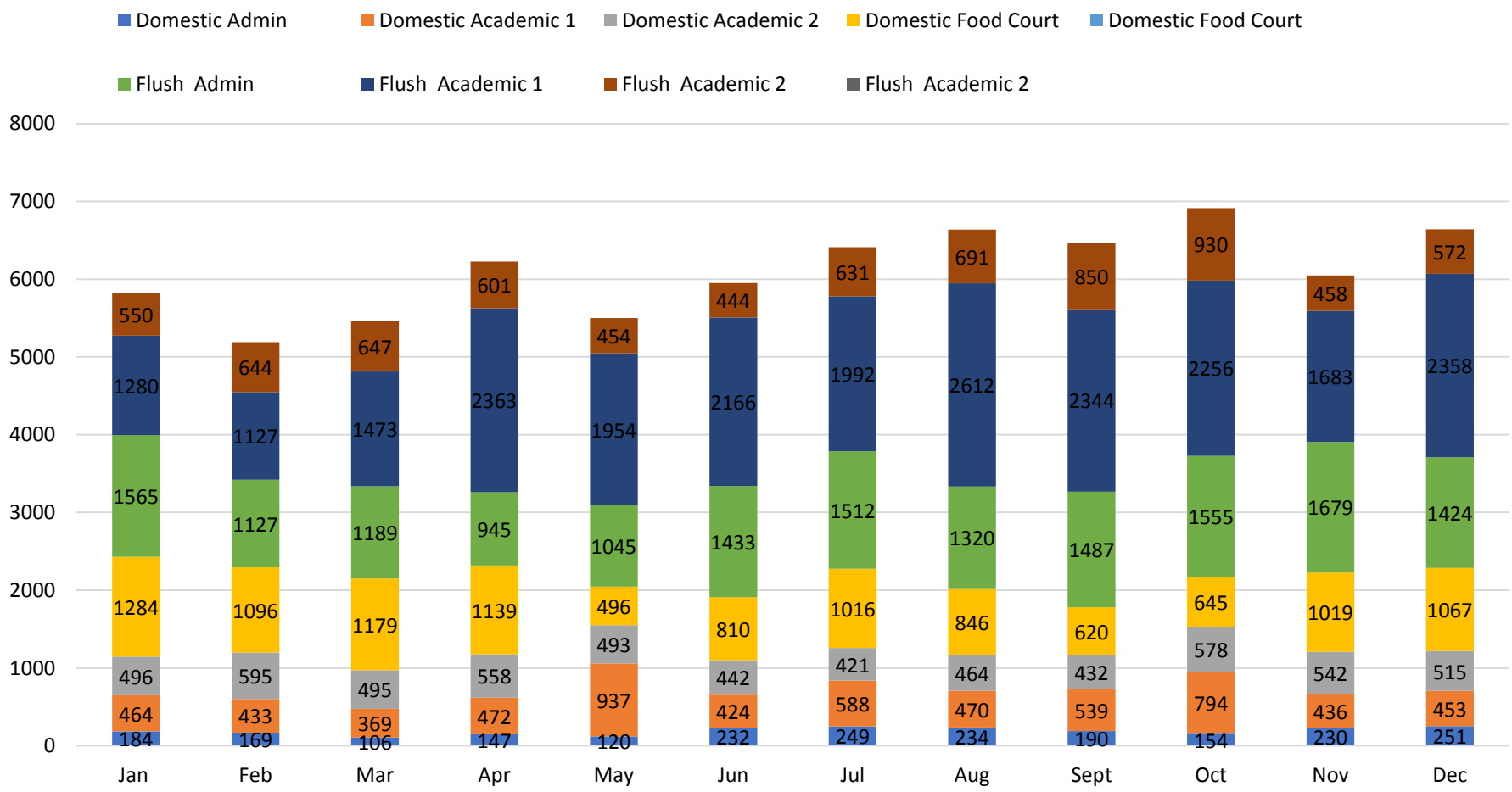
Criteria - Water

Monthly Water Consumption: Admin, AB-1 and AB-2, Hostels

January 2021 to December 2021 Monthly Water Consumption in KL



Key Performance Indicator (KPI):

"Water Consumption per student per year" of MUJ is

Campus Level:
56.1 kL/Student. Year

University Level:
2.83 kL/Student. Year

Hostel Level:
88.4 kL/Student. Year

NOTE- From September to December, all the water consumption data is from 2018 as 2019 data was not provided

Monthly water consumption data of Hostel was not available

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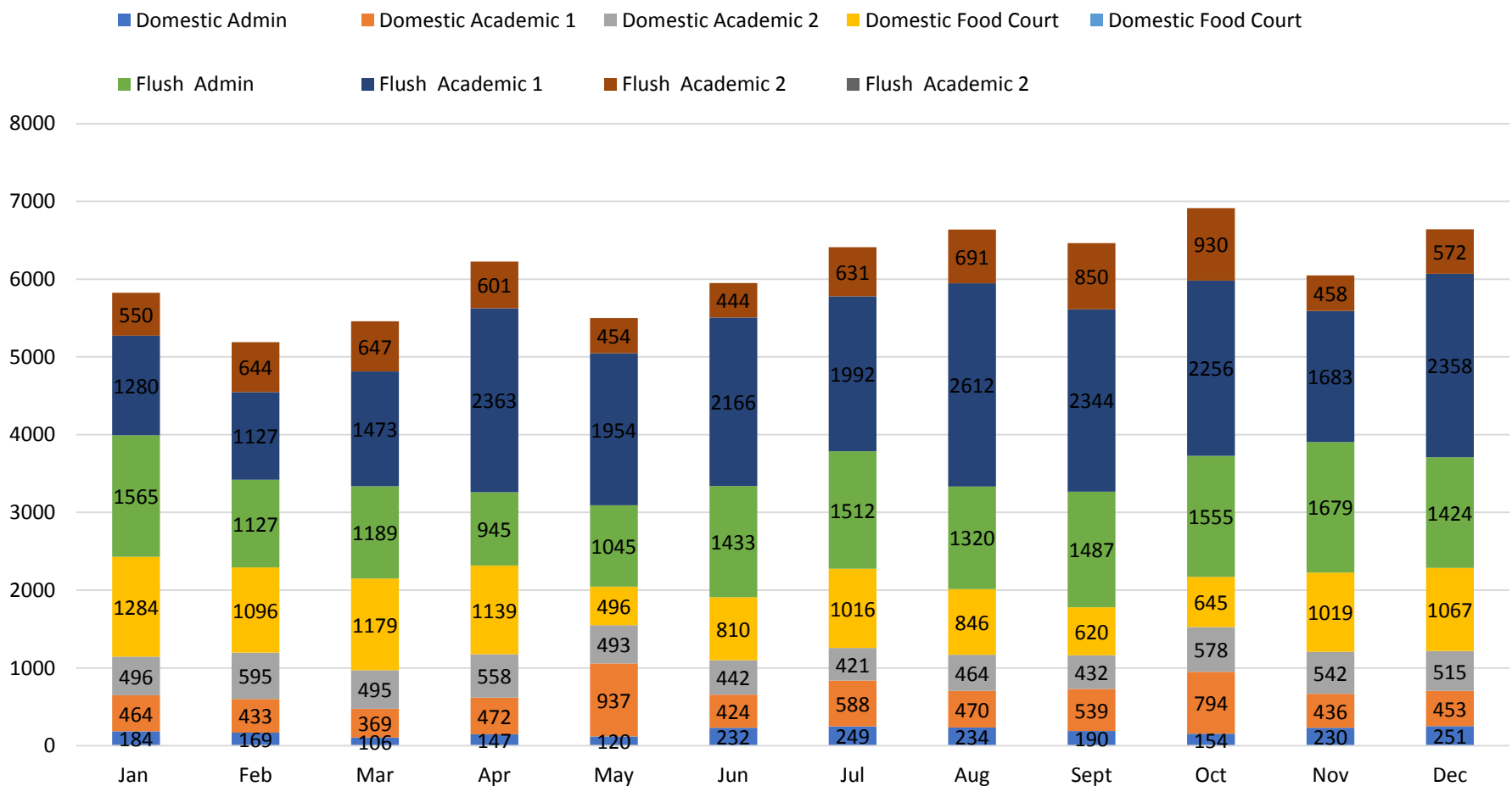

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Criteria - Water

Water Consumption

For university

Total consumption domestic- 25,893 Kl/year

For hostel (domestic)

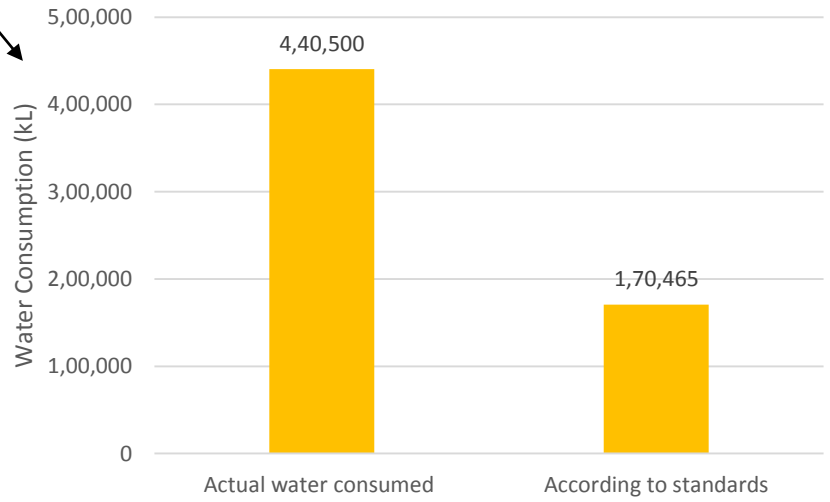
Total consumption- **440,500 Kl/year**

Total consumption excluding flushing- 4,60,912 Kl/year

(all the flushing water requirement is catered by STP treated water)

Total consumption flushing- 47,361 Kl/year

Total no of students in hostel in 2021 - 4140
According to NBC,
Water required for domestic purpose is 135 liters per person per day
Estimated water consumption for 305 days of operation is 170,465 kL/year



COST IMPLICATIONS:
Regular monitoring of water use in the buildings can save – 2,70,036 kL
1 litre of water cost – INR 60/kL
Calculated cost savings – 1,62,02,160 INR

HYPOTHESIS -
As the water savings can be upto 61%, there is a merit of investigating further the water consumption in the hostel area. This can be done by active remote monitoring of water consumption at the building level

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Sewage Treatment plant

Manipal University Jaipur has zero discharge waste-water policy. Hence 100% of the wastewater generated on site is treated to tertiary standards and reused within the campus for various purposes like Flushing, cooling tower makeup, Horticulture etc.

MUJ has two Sewage treatment plants with **150kLd** and **350 kLd** respectively.

Membrane Bioreactor (MBR) type Sewage Treatment plant with total capacity of **500 kLd** is commissioned at MUJ university campus considering the future developments & excess wastewater from hostels.

A standalone 350 kLd Sewage Treatment plant is commissioned to serve only the Hostel blocks, excess wastewater is sent to University STP.

Wastewater treated on site will have projected water quality standards meeting Central Pollution Control Board (CPCB) norms.

Observations:

- Annually ***1,14,609 kl/year*** of treated water is available for flushing and landscape uses in MUJ Academic side
- ***30,726 kl/year*** i.e. ***26.7%*** of total available treated wastewater is used for non potable uses in all the buildings.
- ***83,883 kl/ year*** i.e. ***73.3%*** of total available treated wastewater is used for landscape requirement in university campus.

HYPOTHESIS-
If the treated water used for landscape can be reduced by 10-15% then this water can be used for flushing purpose as the 2019 water consumption was flushing is not 100% catered by treated water.

Criteria - Water

Annual Rainwater Potential

Annual rainfall is the sum of daily rainfall, that is collected from building roof area. With this calculation we understand the potential usage of this collected water that can be used for irrigation and flushing purpose.
The table explains the effective harvesting possibilities.

NAME	ROOF AREA (sqm) - X	RUNOFF COeF. - Y	ANNUAL RAINFALL (m) -Z	Effective Harvesting Potential (m^3)- (X*Y*Z)
Admin block	6860	0.95	0.536	3,493
Mess block	5185	0.95	0.536	26,402
AB_1 block	7814	0.95	0.536	3,978
Garden Lawn	3571	0.2	0.536	382
AB_2 block	8565	0.95	0.536	4,361
Garden	3517	0.2	0.536	377
Road	15567	0.95	0.536	7,926
			Total (in kL)	**23,160**

536 mm is the annual rainfall. The driest month is December. There is 3 mm | 0.1 inch of precipitation in December. Most of the precipitation here falls in July, averaging 178 mm | 7.0 inch.

The peak rainfall months (July & August) harvesting potential is **7700 kL** (i.e. 256kLd).

Observations:

- Rainwater holding capacity at MUJ **Hostel blocks 670 kL** & **University blocks is 490 kL**
- Rainwater from roofs is collected on site in the rainwater harvesting tanks and used for irrigation purposes in the MUJ campus.
- Rainwater from different areas on site is conveyed to RWH tanks through channels.

Hypothesis & Recommendations:
The RWH tanks currently used for harvesting the rain water are **not sufficient** to hold the peak demand of rainfall, which is around **7700 kL** for peak rainfall month (i.e. **256 kL/day**). It is important to **increase the harvesting capacity of RWH** tanks to catch the surplus rainwater and utilize it for domestic/ potable purposes in the university campus.

**Source:
Surface areas – Provided by MUJ
Rainwater tank sizes – GRIHA report
Rainfall data - https://en.climate-data.org/asia/india/rajasthan/jaipur-3888/#climate-graph

Criteria - Water

Storm Water Harvesting Potential

Storm water harvesting is the sum of daily rainfall, that is collected from the ground area. With this calculation we understand the potential usage of this collected water that can be used for irrigation and flushing purpose or ground water recharge.
The table explains the effective harvesting possibilities.

Surfaces	GROUND AREA (sqm) - X	RUNOFF COEFFICIENT - Y	ANNUAL RAINFALL (m) -Z	Effective Harvesting Potential (m3- (X*Y*Z)
Granite Flooring	2,381	0.95	0.536	1,212
Road Median	568	0.25	0.536	76
Lawn	14,818	0.2	0.536	1,588
Football ground	10,392	0.35	0.536	1,949
Cricket Ground	16,286	0.35	0.536	3,055
Open Area (batching plant)	15,544	0.5	0.536	4,165
Open area Thadi	16,912	0.5	0.536	4,532
Open area behind basketball ground	17,445	0.25	0.536	2,337
Lawn area near admin block	4,663	0.2	0.536	499
Area under dense tree plantation (No. of trees- 126	23,233	0.25	0.536	3,113
Pathway Area	3,658	0.95	0.536	1,862
			Total (in KL)	**24,393**

536 mm** annual rainfall

**Source: https://en.climate-data.org/asia/india/rajasthan/jaipur-3888/#climate-graph

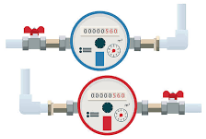
Observations:

Storm water from the site is collected in swales. Part of this water is diverted to a collection tank that also works as a sedimentation pit. The rest of the stormwater is diverted to 3 recharge pits located in the lowest part of the site. The collection tank is in turn connected to the WTP. The swales reduce the rate of flow during conveyance and allow stormwater to percolate into the ground as it reaches the recharge pits.

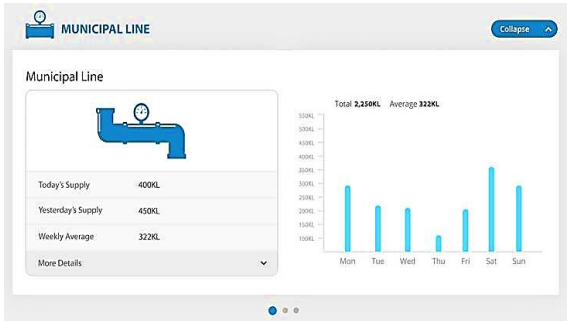
HYPOTHESIS-
There is good scope to collect water and store. Currently, MUJ is collecting water from 35% of its surfaces (roof top and open areas). Considering that Jaipur faces water scarcity due its climate, investing in water harvesting measures will be beneficial lead to cost savings of ~ INR 14,63,580 annually.

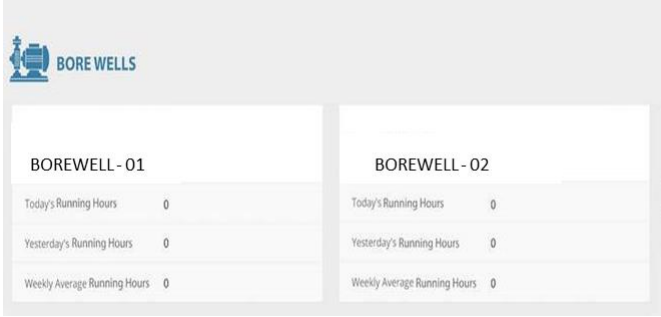
Recommendations:

Following recommendations are suggested to manage water in a sustainable manner:

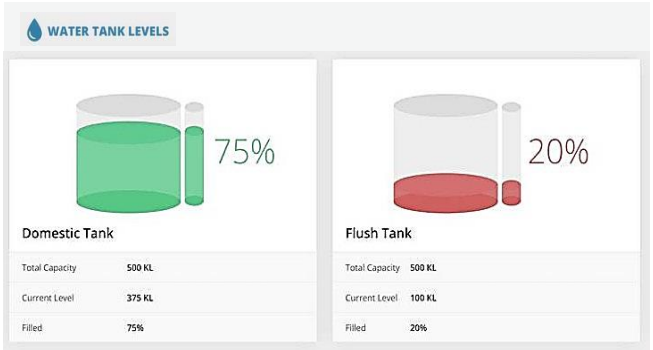


Consider carrying out meter readings on a regular basis (e.g. bi-monthly) or through remote monitoring system in order to monitor water usage. Not only will this make checking water bills much easier but will also allow a baseline to be set from which further reductions can be measured, as well as identifying the possibility to any leaks.



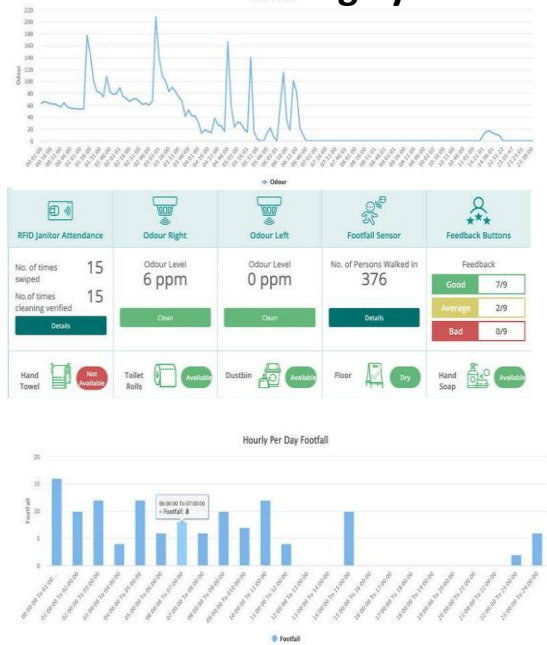


Investigate the feasibility of sub-metering different areas of the buildings and blocks, in order to give a more accurate picture of water use.



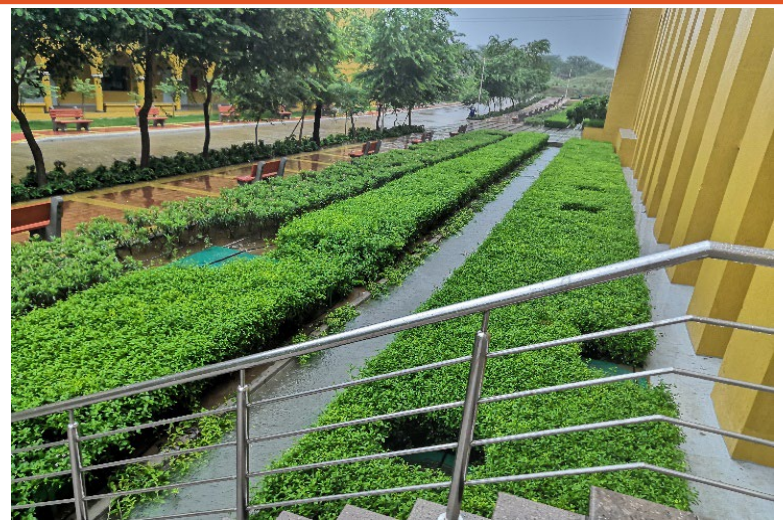
It would be useful to digitalise the tank level in the rainwater harvesting tanks to optimally use the captured rain-water.

Water Monitoring Systems:



Consider installing spray taps or water-saving cartridges in sinks that are still to be refurbished.

USAGE OF RECYCLE WATER

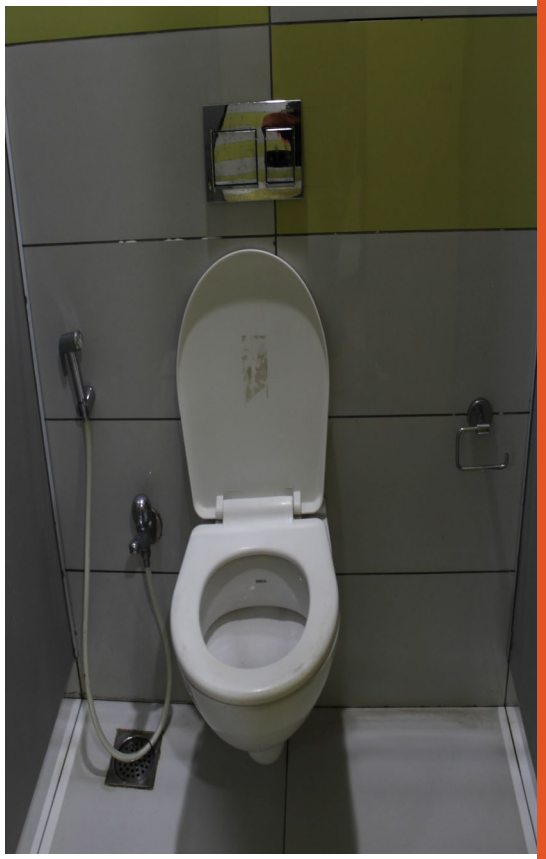


- Zero Water Discharge Campus (Water Recycling)
- Sludge From STP Used As Manure For Landscaping. Reusing the debris waste for the pathways and road areas base compaction
- Vehicle Washing
- Gardening and Horticulture

WATER EFFICIENT APPLIANCES

Water Aerator Installed in all

Sensor Based Urinals



Drip Irrigation

WATER USE REDUCTION WITH WATER EFFICIENT FIXTURES:

Manipal University Jaipur has implemented dual plumbing for all its buildings, this helps in efficiently separating the potable water from reclaimed water for building use.

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- 100% wastewater is treated on site and used for flushing purposes within the building .
- Regular monitoring of water use in the building and regular maintenance checks for leaks

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Some of the key highlights of sustainable water management at MUJ:

- Potable water use reduction by using water efficient fixtures
- Recycling 100% of waste water generated on site and reuse on site.
- Use of treated water for non-potable water requirement
- Reduction in landscape water use by choosing right species of plants which are regional and adaptable to local conditions & reduction of turf areas
- Use of Highly efficient Irrigation equipment like micro drips for landscape needs
- A well-developed stormwater management infrastructure to capture and use rainwater for both building and landscape needs