Environment Audit Report

Mahatma Gandhi Arts, Science and Late N. P. Commerce College Armori, Dist. Gadchiroli

WATER AUDIT REPORT

Water auditing is a method of identifying the gaps for water management and quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. SEA Energy water audit services provide you with greater water efficiency solutions and cost savings, whether you need to meet internal policies, comply with legal obligations or demonstrate your commitment to sustainability. Efficient water management needs to take a center stage in business planning by the corporates. The contemporary approach of typical 'end-of-pipe' treatment of industrial wastewater need to shift towards decentralized, process integrated water management with efforts towards 'zero discharge' or 'positive water balance', thus reducing the fresh water consumption as well as pollution. This requires comprehensive information about the

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quantity and quality of water being used (and/or wasted) at different stages of the industrial processes. The first step towards this is the identification and measurement of the flows, water quality, and losses within different stages of the system through regular water audits.

Water audit helps in development of an integrated industrial water management strategy, which optimizes efficient use of water, improves water productivity, reduces losses and helps in identifying alternative methods of water conservation such as recycling and reuse of wastewater for various process and non-process uses, rain water harvesting & groundwater recharge. The activities ensure co-benefits in energy saving, treatment costs, water quality improvement etc. Water auditing is a method of identifying the gaps for water management and quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit determines the amount of water lost from a distribution system due to leakage and other reasons such as theft, unauthorized or illegal withdrawals from the systems and the cost of such losses to the utility. Water Audit is a qualitative and quantitative analysis of water consumption to identify means of Reducing, Reusing and Recycling of water.

Comprehensive water audit gives a detailed profile of the distribution system and water users, thereby facilitating easier and effective management of the resources with improved reliability. It helps in correct diagnosis of the problems faced in order to suggest optimum solutions.

It is also an effective tool for realistic understanding and assessment of the present performance level and efficiency of the service and the adaptability of the system for future expansion & rectification of faults during modernization. Elements of water audit include a record of the amount of water produced (total water supply), water delivered to metered users, water delivered to unmetered users, water loss and suggested measures to address water loss (through leakages and other unaccounted for water losses).

Steps of Water Audit

- Water Supply and Utilization Study
- Process Study
- System Audit
- Discharge Study
- Water Audit Report

1. Water Supply and Usage Study

Water audit comprises of review of layout of water sources, distribution network, and service/delivery points to water users and return flow of waste or excess water. Audit shall cover the study of locations and capacities of flow measurement devices installed at key points, dimensions of pipes and fittings in the water supply system, locations and particulars of flow control devices and history sheets of all measuring and control devices including pipes and fittings. A study of the availability of water sources and past consumption patterns for various sectors is necessary to understand the present water utilization and projecting future requirement. Data on development of sustainable source of water through rainwater harvesting and effluent recycling should also be taken into consideration.

2. Process Study

Flow measurement devices may be installed at all strategic points so that water losses from various components such as raw water source, conveyance system from raw water source to user points to treatment plant, from treatment plant to treated water storage system, treated water storage system to distribution networks, individual users, etc. could be assessed at regular intervals. Such studies will also prove useful information for future extension, renovation and modernization of the system. Water quality of the distribution system needs to be monitored regularly at strategic points to find out the level and nature of contaminants present in the supplied water. Depending on the types of application and degree of purity needed, the treatment system can be designed and developed. The water distribution system, leakage assessment etc. will form an integral part of this study.

3. System Audit

The current water usages and systems for water use under various area such as Utilities, Cooling Towers, Washing and Cleaning, Electro dialysis, Laboratory area, Canteen, Irrigation and others need to be studied to check their operational efficiency and level of maintenance. The scope for any modification or up-gradation will depend on the status of existing systems. Measurement methodology from the intake point of the system through various sub-systems to the ultimate user points needs to be verified periodically for its suitability, efficiency and accuracy. Bulk metering should be done at the source for and revenue metering for consumers. This will help in identifying the reaches of undue wastewater generation.

4. Discharge Analysis

The domestic wastewater, return flows from consumption point, and effluent need to be studied for conformity to environment standards and studying the possibility of recycling of waste water.

5. Water Audit Report

Adequate planning and standard procedures are necessary prior to undertaking the water audit of a system. A water audit can be accomplished on the basis of water allotted for a service and water actually utilized for that service. After assessing the loss of water and the efficiency of the system, steps needed for utilization of recoverable water loss may be listed. A cost-benefit study for optimum recovery of water loss may be performed. A water audit report may, invariably, contain:

(a) Amount of water earmarked/made available to the service.
(b) Amount of water utilized both through metered and unmetered supplies.
(c) Water loss and efficiency of the system along with reasons for such water losses.
(d) Suggested measures to check water loss and improve efficiency.

An effective water audit report may be purposeful in detection of leak in distribution system, taking timely action for plugging such leaks and thereby reducing conveyance losses of water and improving efficiency of the system. Water audit of the system should be undertaken at regular interval of time, at least on an annual basis.

Benefits of Water Audit

Water audit improves the knowledge and documentation of the distribution system, problem and risk areas and a better understanding of what is happening to the water after it leaves the source point. Leak detection programs help in minimizing leakages and tackling small problems before they become major ones.

These programs lead to

1. Reduced water losses,
2. Improved financial performance,
3. Improved reliability of supply system,
4. Enhanced knowledge of the distribution system,
5. Efficient use of existing supplies,
6. Better safeguard to public health and property,
7. Improved public relations,
8. Reduced legal liability, and
9. Reduced disruption, thereby improving level of service to customers.

From the data collected for water audit of Mahatma Gandhi Arts, Science & Late N.P. commerce college Armori., the water distribution and water consumption pattern are noticed as follows. The college departments are grouped in different groups (Table 1). The total 16 water tanks are available in college each water tank has storge capacity of 1000L. The total water storage capacity of college is 16000L. Source of water supply to all tanks present in college from borewell. The details of the water storage capacity all the block of college as shown in different Table 1.

Table 1. Water storage profile in different block in college campus during the academic year 2017-2021

Sr. No	Location	Water storge capacity (L)
1	Administrative office + Chemistry department + Urinal	1000L
2	Auditorium	2000L
3	Microbiology department + Home science department + Water cooler block-A	1000L
4	Botany department + Zoology department + Physics department + Library + Geology department	1000L
5	Seminar hall building	2000L
6	Hostel	1000L
Total		**8000L**

Water storage tank:

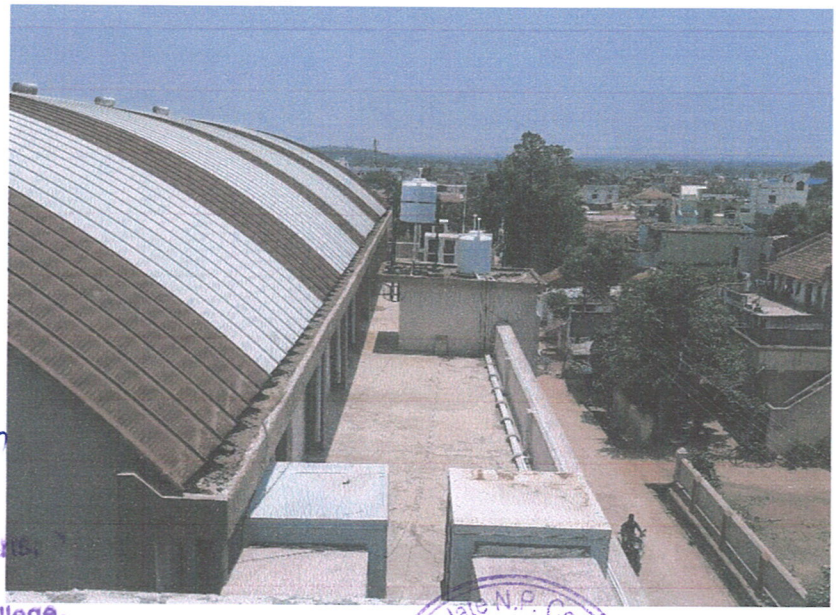

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Table 2. Water consumption in different sector of college during the academic year 2017-18

Sr. No	Sector	Total daily used in (L)	Total yearly used (kL)	Percentage (%)
1	Garden (Ga)	4000	1,460	41.24
2	Laboratories (La)	2000	730	20.62
3	Drinking (Dr)	1000	365	10.31
4	Toilet (To)	1000	365	10.31
5	Urinal (Ur)	2000	730	20.62
6	Wash basin (Wb)	500	182	5.15
7	Water loss during filling (Wf)	200	73	2.06
Total		**10700**	**3540**	**100**

Use of water for garden :

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Use of water for drinking:

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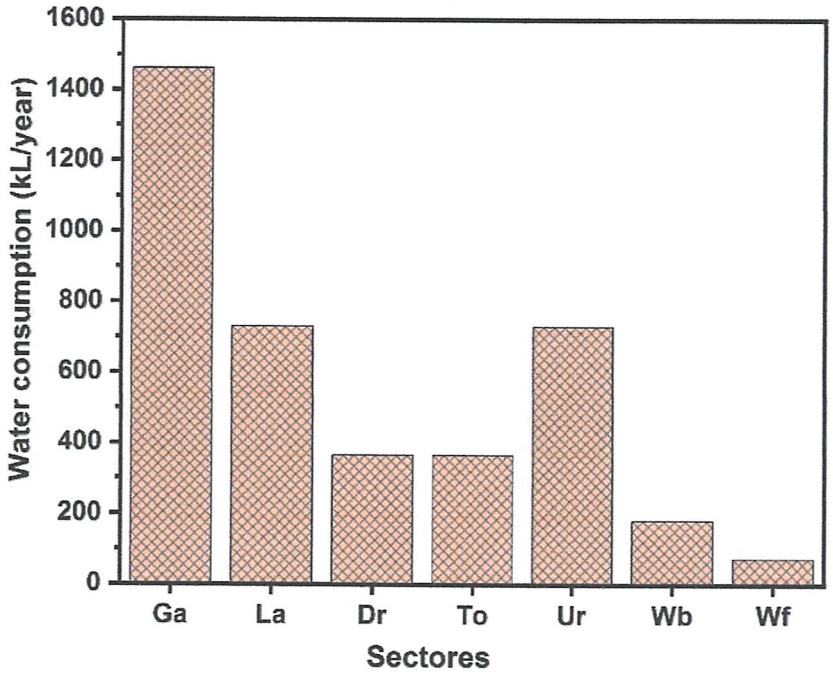

Figure 1. Water consumption (kL/year) verses use of water in different sector during the academic year 2017-18

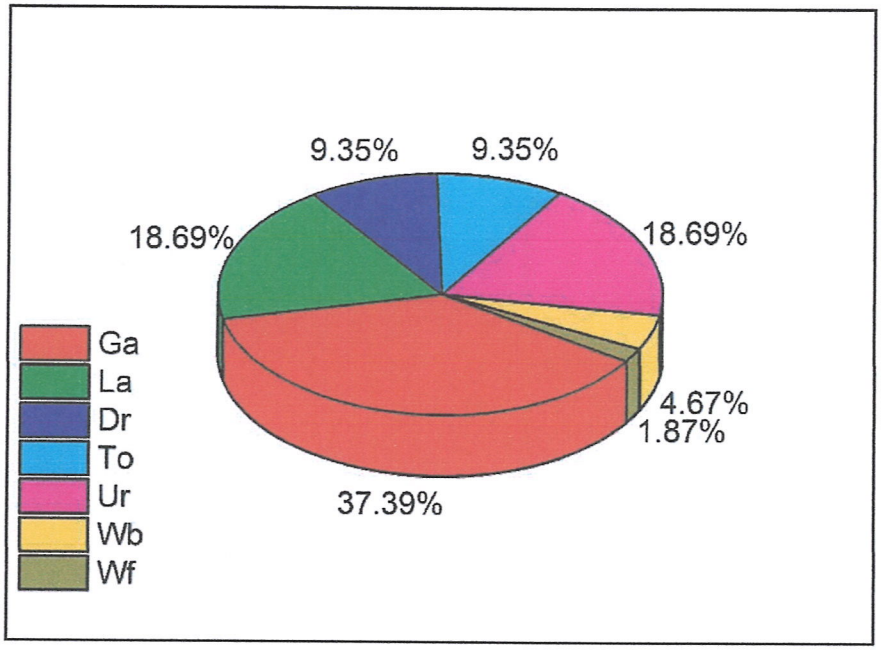

Figure 2. Average yearly water consumption in different sector of college during academic year 2017-2018

For the academic year 2017-2018, It is observed from the data given in Table No. 2 and Figure 1&2 shows that total 10700 litres of water is used daily and 3540 kL yearly. For the systematic study

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purpose consumption of water in college divided into seven sectors, garden (Ga), laboratories (La), toilet (To), drinking (Dr), urinal (Ur), laboratory (La), wash basin (Ws) and water loss during filling (Wf). From above data it is observed that the maximum water consumption for garden purpose is 4000 liters / day i.e., 1460 kl/year. Water for laboratories, drinking, toilet, urinal, wash basin and loss of water during filling the tank consumed 730 kl/year, 365 kl/year, 365 kl/year, 730kl/year, 182kl/year and 73 kl/year respectively. In the case of Garden, water used yearly is 1460 kl while for drinking purpose less amount of water is required which is provided by water cooler is 365 kl per year. Water loss during filling of water in tank was noted as 73kl/year.

Table 3. Water consumption in different sector of college during the academic year 2018-19

Sr. No	Sector	Total daily used in (L)	Total yearly used (kL)	Percentage (%)
1	Garden	3900	1423.5	37.68
2	Laboratories	1800	712	18.85
3	Drinking	1100	401.5	10.62
4	Toilet	900	328.5	8.69
5	Urinal	1800	657	17.39
6	Wash basin	500	182.5	4.83
7	Water loss during filling	200	73	1.93
Total		**10700**	**3778**	**100**

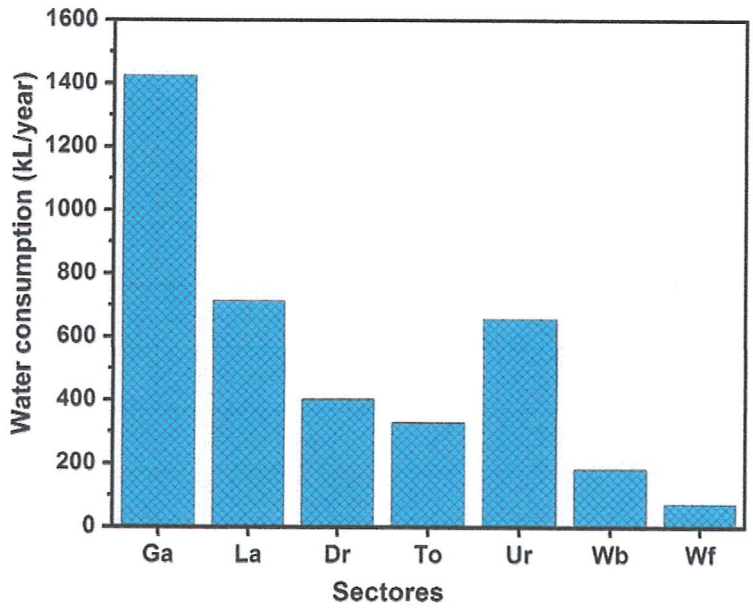

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Figure 3. Water consumption (kL/year) verses use of water in different sector during the academic year 2018-19

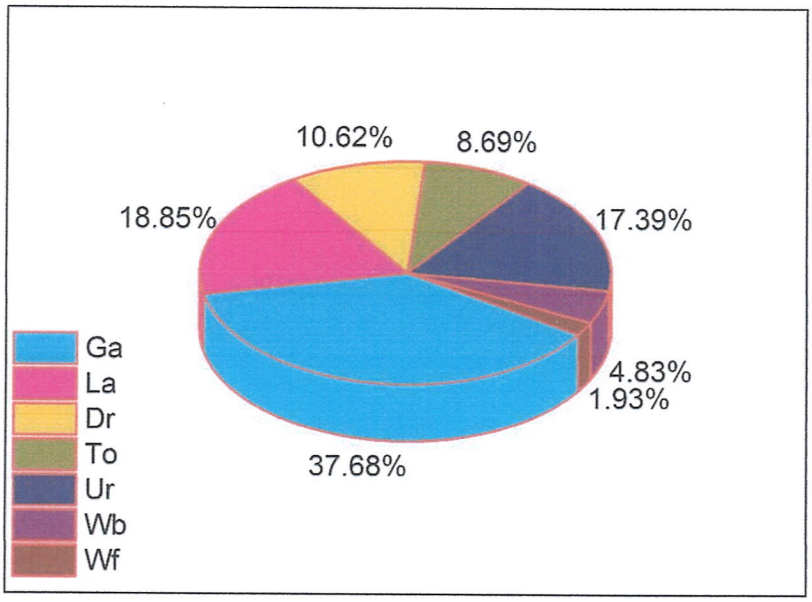

Figure 4. Average yearly water consumption in different sector of college during academic year 2018-19

For the academic year 2018-2019, It is observed from the data given in Table No. 3 and Figure 3&4shows that total 10700 litres of water is used daily and 3738 kL yearly. For the systematic study purpose consumption of water in college divided into seven sectors, garden (Ga), laboratories (La), toilet (To), drinking (Dr), urinal (Ur), laboratory (La), wash basin (Ws) and water loss during filling (Wf). From above data it is observed that the maximum water consumption for garden purpose is 3900 liters / day i.e., 1423.5kl/year. Water for laboratories, drinking, toilet, urinal, wash basin and loss of water during filling the tank consumed 712kl/year, 401.5 kl/year, 328.5 kl/year, 657kl/year, 182.5kl/year and 73 kl/year respectively. In the case of Garden, water used yearly is 1423.5 kl while for drinking purpose less amount of water is required which is provided by water cooler is 401.5 kl per year. Water loss during filling of water in tank was noted as 73kl/year.

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Table 4. Water consumption in different sector of college during the academic year 2019-20

Sr. No	Sector	Total daily used in (L)	Total yearly used (kL)	Percentage (%)
1	Garden	3800	1387	46.34
2	Laboratories	1000	365	12.19
3	Drinking	800	292	9.76
4	Toilet	800	292	9.79
5	Urinal	1200	438	14.63
6	Wash basin	400	146	4.88
7	Water loss during filling	200	73	2.43
Total		**8200**	**2993**	**100**

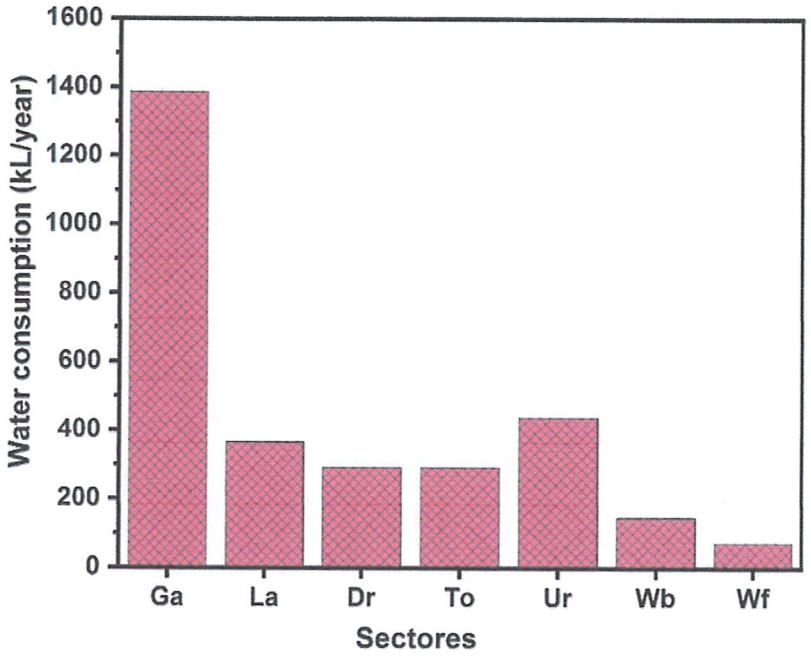

Figure 5. Water consumption (kL/year) verses use of water in different sector during the academic year 2019-20

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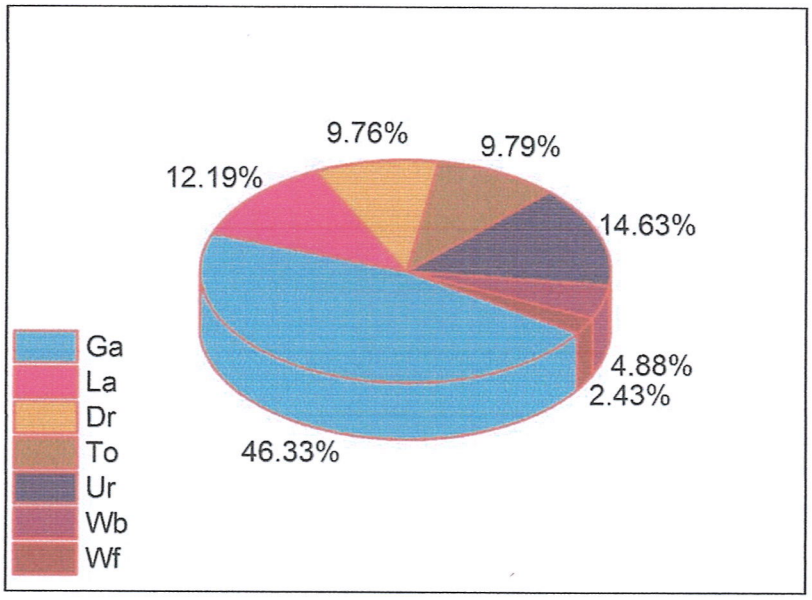

Figure 6. Average yearly water consumption in different sector of college during academic year 2019-20

For the academic year 2019-2020, It is observed from the data given in Table No. 4 and Figure 4&5 shows that total 8200 litres of water is used daily and 2993 kL yearly. The water consumption in college from march 2020 is less due to covid-19 pandemic, students were not physically presented in to college that's why water consumption during this year less compare to 2018 and 2019. For the systematic study purpose consumption of water in college divided into seven sectors, garden (Ga), laboratories (La), toilet (To), drinking (Dr), urinal (Ur), laboratory (La), wash basin (Ws) and water loss during filling (Wf). From above data it is observed that the maximum water consumption for garden purpose is 3800 liters / day i.e., 1387.5kl/year. Water for laboratories, drinking, toilet, urinal, wash basin and loss of water during filling the tank consumed 365kl/year, 292 kl/year, 292 kl/year, 438kl/year, 146kl/year and 73 kl/year respectively. In the case of Garden, water used yearly is 1387 kl while for drinking purpose less amount of water is required which is provided by water cooler is 292kl per year. Water loss during filling of water in tank was noted as 73kl/year.

Table 5. Water consumption in different sector of college during the academic year 2020-21

Sr. No	Sector	Total daily used in (L)	Total yearly used (kL)	Percentage (%)
1	Garden	4000	1,460	27.21
2	Laboratories	50	730	13.61
3	Drinking	100	365	6.80
4	Toilet	500	365	6.80
5	Urinal	500	730	13.61
6	Wash basin	100	182	3.40
7	Water loss during filling	100	73	1.36
8	Construction	5000	1825	34.01
Total		**10350**	**5365**	**100**

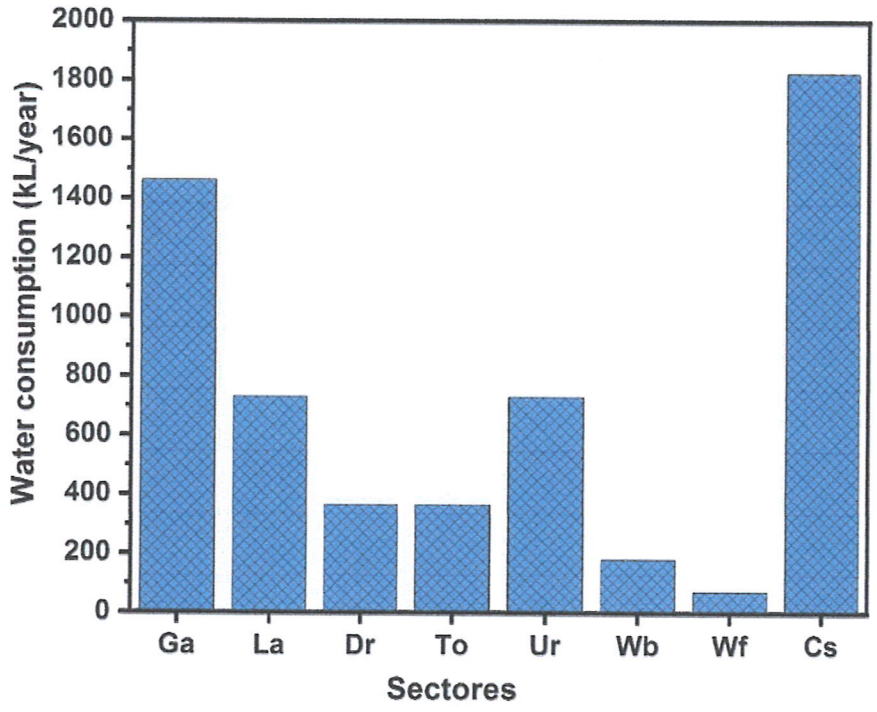

Figure 7. Water consumption (kL/year) verses use of water in different sector during the academic year 2020-21

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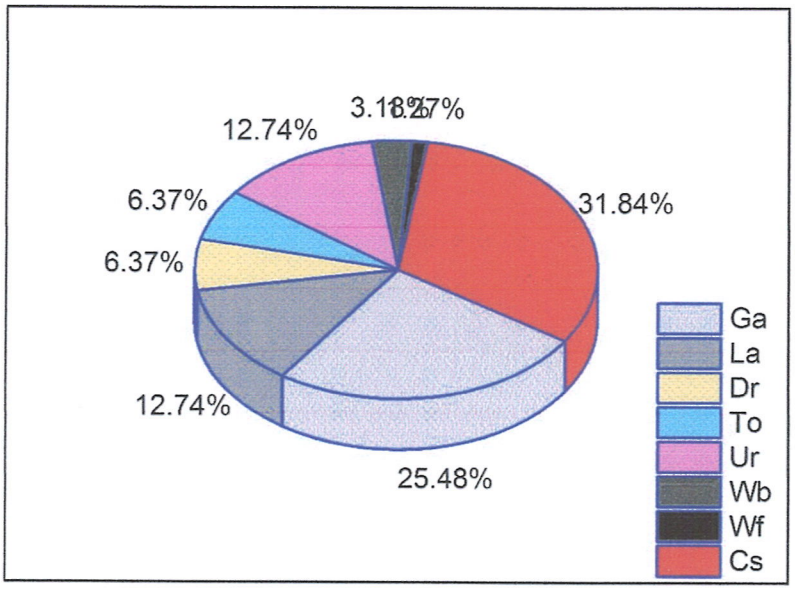

Figure 8. Average yearly water consumption in different sector of college during academic year 2020-21

For the academic year 2020-2021, It is observed from the data given in Table No. 5 and Figure 7&8 shows that total 10350 litres of water is used daily and 5365 kL yearly. The water consumption in college during the academic year is highest compare to 2017to 2020. Currently one building construction work is going on in college campus. For the building construction daily near about 5000 l per day water consumption is increased compare to 2017 to 2020 9. For the systematic study purpose consumption of water in college divided into seven sectors, garden (Ga), laboratories (La), toilet (To), drinking (Dr), urinal (Ur), laboratory (La), wash basin (Ws), water loss during filling (Wf), construction (Cs). From above data it is observed that the maximum water consumption for construction purpose is 5000 liters / day i.e., 1825.5kl/year. Water for gardening, laboratories, drinking, toilet, urinal, wash basin and loss of water during filling the tank consumed 1460kl/year, 730 kl/year, 365 kl/year, 365 kl/year, 730kl/year, 182kl/year and 73 kl/year respectively. In the case of Garden, water used yearly is 1387 kl while for drinking purpose less amount of water is required which is provided by water cooler is 292kl per year. Water loss during filling of water in tank was noted as 73kl/year.

Table 6. Physico-chemical analysis of drinking and gardening water during academic year 2017-18

Sample code	Turbidity (mg/L)	Hardness (mg/L)	Fluoride (mg/L)	TDS (mg/L)	pH
DW-1	0.41	**81**	6.7	496	6.7
DW-2	0.41	81	6.7	497	6.8

*[DW] Water use for drinking in college campus and [GW] Water use for gardening in college campus

Table 8. Physico-chemical analysis of drinking and gardening water during academic year 2018-19

Sample code	Turbidity (mg/L)	Hardness (mg/L)	Fluoride (mg/L)	TDS (mg/L)	pH
DW-1	0.4	**80**	6.8	495	6.8
DW-2	0.4	80	6.8	495	6.8

Table 9. Physico-chemical analysis of drinking and gardening water during academic year 2019-2020

Sample code	Turbidity (mg/L)	Hardness (mg/L)	Fluoride (mg/L)	TDS (mg/L)	pH
DW-1	0.43	**82**	6.8	495.2	6.8
DW-2	0.43	82	6.8	495.2	6.8

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Table 10. Physico-chemical analysis of drinking and gardening water during academic year 2020-2021

Sample code	Turbidity (mg/L)	Hardness (mg/L)	Fluoride (mg/L)	TDS (mg/L)	pH
DW-1	0.39	**83**	6.89	485	6.8
DW-2	0.39	83	6.78	487	6.8

Total five parameters of drinking water are analyzed every year regularly. The samples were collected from two different source one is from administrative building sample code for that sample is DW-1 and DW-2 sample collected from water cooler present at near microbiology department, sample code for that sample is DW-2. Table No. 6 to 10 shows the Physico-chemical analysis of drinking and garden water for the year 2018 to 2021 respectively. Turbidity measured by digital turbidometer, hardness measured by complexometric titration EDTA used as indicator, Total dissolve salt measured by using TDS meter, pH measured by using pH meter. In the present above table shows analysis of samples collected from the tank used for drinking and gardening purpose plant. The yearly analysis of various physicochemical parameters was carried out by standards methods. Physico-chemical parameters like Turbidity, Hardness, Fluoride, Total dissolve salt (TDS) and pH were for analyzed for water samples. All the physic-chemical parameters are within the permissible limit of WHO.

From figure it is observed that water consumption for 2018-2019 is more compare to 2017 2018, highest water consumption during the academic year 2020-21 is observed. Water consumption during the academic year 2019-20 is less due to covid -19 pandemic students are physically are not avail in college campus. But the year 2020-21 more water consumption is observed this because of building construction work is going on our college campus. Day to day requirement of water demand increases. In our audit reports we observed that some amount water waste during the water feeling in tank. Near about 73Kl/year water waste during the tank feeling to avoid this some modification is necessary during the feeling water tank like alarm system, proper observation is needed. Also, the regular washing of water tank is necessary for good quality of water.

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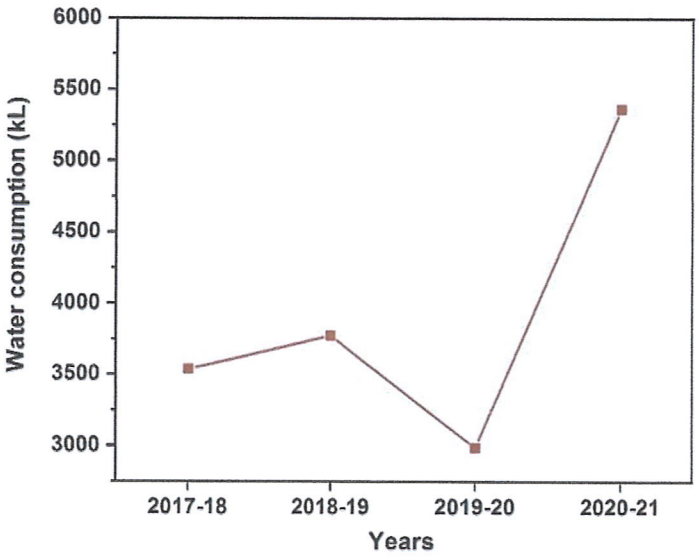

Figure 9: Yearly consumption of water for different sector

Many of the most effective things we can do to reduce your water consumption and protect your community's water supply are simple and easy. Here are a few suggestions that are either one-time investments in water-saving equipment that you can do or have someone else install for you, or simple changes of habit.

1. Install an automatic-rain shutoff device
2. Eliminate the leakage
3. Water the soil, not the leaves
4. Upgrade to water-efficient emitters
5. Don't overwater

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