



## WATER AUDIT IN SCHOOLS UNDER RASHTRIYA AVISHKAR ABHIYAN

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**ABSTRACT** Water audit was conducted in the schools of India from October 14 to October 21, being the month of Dr. A.P.J. Abdul Kalam's birth anniversary, under the innovative programme Rashtriya Avishkar Saptah of MHRD in which the students measured the flow of water in the school Canteen, laboratories, garden, etc to understand its usage and wastage for inculcating the value of water conservation among students. The audit reveals that wastage of water is more in many schools of India. However, the programme created a culture of thinking for water conservation among the students and they become ambassadors in spreading awareness about importance of water, ways to conserve and use it.

**KEYWORDS :**

Under the convergent frame-work of *Rashtriya Avishkar Abhiyan*, of MHRD, an innovative programme titled '*Rashtriya Avishkar Saptah* (RAS) was conducted by NCERT during the year 2019. Rashtriya Avishkar Saptah was celebrated every year in the schools of India, from October 14 to October 21, being the month of Dr. A.P.J. Abdul Kalam's birth anniversary. The programme is started with the aims to nurture the spirit of inquiry and creativity, love for Science and Mathematics, effective use of technology amongst children, to encourage students who exhibit an inclination and talent for these subjects and to support in achieving heights of academic excellence and research.

*Rashtriya Avishkar Abhiyan* (RAA) covers the students in the age group of 6-18 years from Class I to XII that provides opportunities to the schools to create an environment in which the students are motivated to learn science, mathematics and technology in and outside the classroom through activities, observation, experimentation, etc. 'Water Quality Assessment and Water Conservation' was selected as the theme during the year 2019-20.

The programme provides a very good platform for students in exploring water harvesting and storage facilities in the school thereby motivating for water conservation in real life. After the introduction of the programme the students spread awareness about importance of water, ways to conserve it and use it in different seasons based on availability in agricultural fields and domestic purpose for future generations.

It is a noble way and a fruitful learning experience to inculcate scientific attitude as well as bringing a change in the aptitude of children in school premises to save the water and conserve our resources in a eco-friendly way. The programme helps the students, parents and villagers in getting more awareness regarding water conservation and practical implementation of the same by means of rain water harvesting, preserving the natural resources of water by minimizing the ill use of water. Students enjoyed a lot to be part of drive to save water and save environment and shown positive awareness response where they pledged to conserve every drop of water and to spread the awareness in society.

As part of the programme, water audit was conducted in schools that assessed uses of water in the schools and analysed ways to increase water use efficiency. That in turn helped the schools in implementing cost-effective water-saving measures for the better use of water.

Cartias, Australia pointed out that water scarcity, poor water quality and inadequate sanitation negatively impact food security, livelihood choices and educational opportunities for families experiencing poverty across the world. Hence, it is necessary to conduct water audit in schools thereby educating the students to learn and understand about proper and judicious use of water in schools and in their home and be encouraged to think about access to water globally.

It is evident that there are no effective water management measures that includes rainwater harvesting and recycling of waste water for reducing consumption and improve water use efficiency in many of

schools in India. A water audit conducted at the Government Girls' Higher Secondary School, Eranakulam in 2018 showed that the provision for waste water management including recycling and reuse of water was not there. The waste water from wash basins and kitchen was discharged directly into drains since there was no system for its treatment and reuse.

The earth's freshwater resources are essential for all forms of life like drinking, maintain a thriving ecosystem, agriculture, industry, household, recreational and environmental activities (ICMM, 2020). It is essential to inculcate desirable behavioural changes and attitudes among students for sustainable use of water at the early period of their life. Sustainable water management should be one of the essential things to be practiced in our schools.

**Water Audit Programme Conducted in Schools**

According to Sturman, Ho and Mathew (2004), water auditing is defined as a method of quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money spend on otherwise unnecessary water use. Water auditing can quantify all the flows of water in a system to understand its usage, reduce losses, reuse if possible and improve water conservation.

Students carried out water audit in by counting taps. Some students counted total taps, some counted good taps and some counted broken taps. Students were happy and delighted to see that there is no water wasted in some school campus. While in few schools, during water auditing students came to know the water loss due to leakage in their school campus letting immediate measures to take up to repair or change the leaked taps. Creating awareness about low wastage of water and sustainable usage, students and teachers actively participated in making villagers aware of wastage of water and its consequences. This project was an eye-opener to moralize the students not to waste water, not to keep tap open when not required, to stop the leakage of water in school, to waste of water lead to decrease in level of water table and to aware the people about the no loss of water for our better future. Students are advised to maintain and clean the water appliances properly so that water can be conserve and use by needy people. As a result, students are very much aware of not wasting water and protecting and saving the consumable water.

**Wastage of Water in Schools****Table 1 Wastage of Water in the Schools of States/UTs**

State/UT		Washroom/ toilet/litre	Drinking /litre	Lab/litr e	Canteen/ litre
Chandigarh	N	33	33	13	14
	Mean	13.11	0.20	0.00	0.00
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	75.19	1.18	0.00	0.00
	Delhi	N	69	68	57
Delhi	Mean	8.82	98.47	0.01	0.00
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	58.03	812.00	0.06	0.00

Himachal Pradesh	N	34	42	18	2
	Mean	188.48	314.00	720.00	0.00
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	756.84	955.84	3054.70	0.00
Jharkhand	N	11	16	5	
	Mean	218.29	116.10	0.00	
	Median	0.00	0.00	0.00	
	Std. Deviation	642.74	382.09	0.00	
Karnataka	N	11	28	7	4
	Mean	1753.52	3.17	0.00	0.00
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	5192.10	16.31	0.00	0.00
Telangana	N	61	171	29	20
	Mean	2104.40	907.77	104.38	10.81
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	8375.84	10571.62	540.96	48.29
West Bengal	N	10	17	13	6
	Mean	453.60	3057.03	132.92	0.00
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	968.39	10553.53	479.26	0.00
Total	N	229	375	142	50
	Mean	707.62	610.76	124.75	4.32
	Median	0.00	0.00	0.00	0.00
	Std. Deviation	4542.12	7498.63	1121.19	30.54

**Note: States/UTs Having Less Than 10 Observations/Counts Are Not Included In The Analysis**

The Mean, Median and Standard deviation of scores regarding wastage of water from Washroom/Toilet, Drinking water, Laboratories and Canteens from the Schools of different States and Union Territories of India like Chandigarh, Delhi, Himachal Pradesh, Jharkhand, Karnataka, Telangana and West Bengal is given in Table – 1 as shown above.

The sample was taken from 33 Schools from Chandigarh to check the wastage of water from washroom/toilet and Drinking water and the average water wasted was found to be 13.11 and 0.20 litres respectively. There was no water wastage from laboratories of 13 schools and canteen from 14 schools from Chandigarh. The average wastage of washroom/toilet water from 69 Delhi based Schools was 8.82 litres, the average drinking water wastage from 68 Schools from Laboratories of 57 Schools of Delhi was 0.01 litres and there was no water wasted from the canteens of four schools of Delhi. The average water wastage from Schools of Himachal Pradesh was 188.48 litres of water from washroom/toilet (sample was 34 schools), 314 litres of drinking water (sample was 42 schools), 720 litres of water from Laboratories (sample was 18 schools) and there was no water wastage from Canteen (sample was 2 schools). The average water wastage from Schools of Jharkhand was 218.29 litres of water from Washroom/Toilet (sample was 11 Schools), 116.10 litres of drinking water (sample was 16 schools) and there was no water wasted from laboratories (sample was five schools). The average water wastage from schools of Karnataka was 1753.52 litres of water from Washroom/Toilet (sample was 11 Schools), 3.17 litres of drinking water (sample was 28 schools) and there was no water wastage from laboratories (sample was seven schools) and canteen (sample was four schools). The average water wastage from schools of Telangana was 2104.40 litres of water from washroom/toilet (sample was 61 Schools), 907.77 litres of drinking water (sample was 171 schools), 104.38 litres of water from laboratories (sample was 29 schools) and 10.81 litres from canteen (sample was 20 schools). The average water wastage from the schools of West Bengal was 453.60 litres of water from washroom/toilet (sample was 10 Schools), 3057 litres of drinking water (sample was 17 schools), 132.92 litres of water from laboratories (sample was 13 schools) and there was no water wastage from canteen (sample was six schools). The average wastage of water from all the States was 707.62 litres of water from washroom/toilet (total sample

was 229 Schools), 610.76 litres of drinking water (total sample was 375 schools), 124.75 litres of water from Laboratories (total sample was 142 schools) and 4.32 litres from Canteen (total sample was 50 schools).

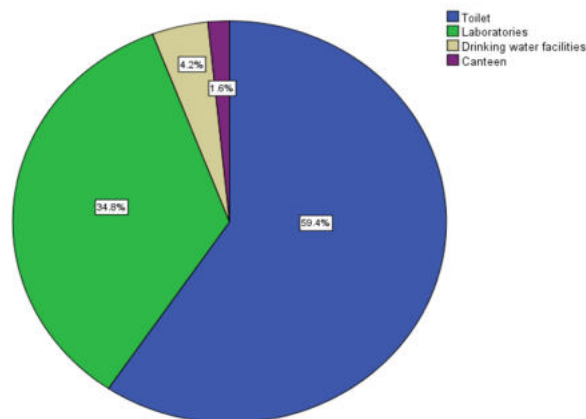
The Maximum water wastage from Washroom/Toilet was found in Telangana (2104.40 litres) followed by Karnataka (1753.52 litres), West Bengal (453.60 litres), Jharkhand (218.29 litres), Himachal Pradesh (188.48 litres), Chandigarh (13.11 litres) and minimum water wastage was from the Schools of Delhi (8.82 litres).

The Maximum water wastage in the form of Drinking water was found in West Bengal (3057.03 litres) followed by Telangana (907.77 litres), Himachal Pradesh (314 litres), Jharkhand (116.10 litres), Delhi (98.47 litres), Karnataka (3.17 litres) and minimum water wastage was from the Schools of Chandigarh (0.20 litres).

The Maximum water wastage from Laboratories was found in Himachal Pradesh (720 litres), followed by West Bengal (132.92 litres), Telangana (104.36 litres) and Delhi (0.01 litres), while there was no water wastage from the Laboratories of Jharkhand, Karnataka and Chandigarh.

The average water wastage from the Canteen of Schools from Telangana was 10.81 litres and it was found that there was no water wastage from the Canteen of Schools from Chandigarh, Delhi, Himachal Pradesh, Karnataka and West Bengal.

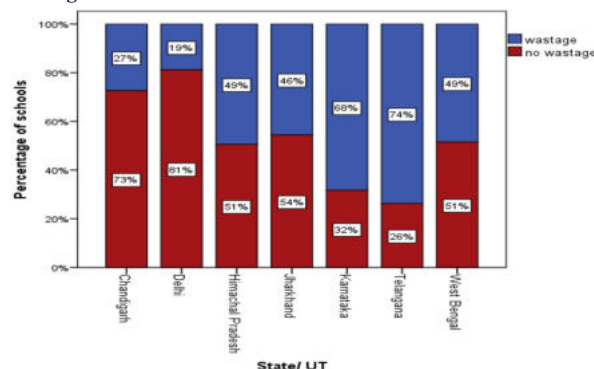
### Wastage of Water in Different Areas of Schools



**Figure 1: Overall Wastage of Water in Different Areas of all Schools**

It is evident from the table that wastage of water happens more in toilets (59.4 percent) and laboratories (34.8 percent) of the schools and very limited amount of water wasted in the canteens. The study pointed out that the students should be trained to reduce the wastage of water in the toilets and science laboratories.

### Wastage of Water in Toilets/Washrooms

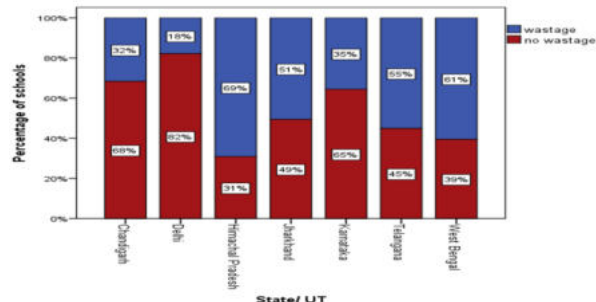


**Figure 2: Wastage of Water in Toilets/Washrooms**

The above figure shows that the schools in many States/UTs viz., Chandigarh (27 percentage), Delhi (19 percentage) Himachal Pradesh (49 percentage) Jharkhand (49 percentage) West Bengal (49 percentage) did not waste water in toilets/washrooms. However, in the

case of Telangana (74 percent) and Karnataka (68 percent) the schools waste water in toilets/ washrooms.

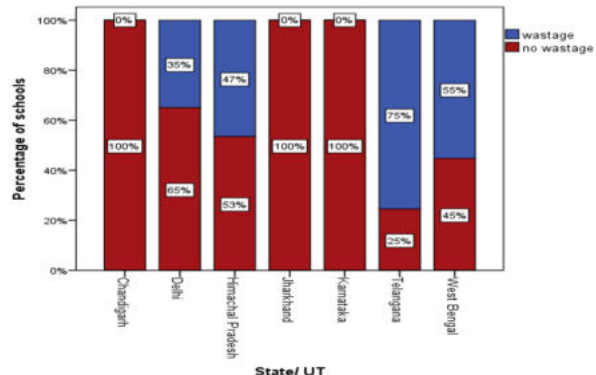
**Wastage of Water in Drinking Platforms/ Water Coolers**



**Figure 3: Wastage of Water in Drinking Platforms/Water Coolers**

It is evident from the above figure that wastage of water in drinking platforms/ water coolers was more in Himachal Pradesh (69 percent) Jharkhand (51 percent) Telangana (55 percent) and West Bengal (61 percent). It was less from the schools of Delhi (18 percent), Chandigarh (32 percent) and Karnataka (35 percent).

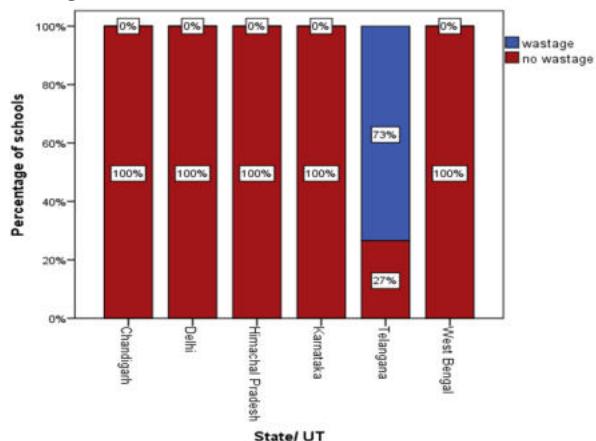
**Wastage of Water in Laboratories**



**Figure 4: Wastage of Water in Laboratories**

It is evident from the above graph that wastage of water is less in the laboratories in the schools of Chandigarh, Jharkhand and Karnataka. However, it is more in West Bengal (55 percent), Telangana (75 percent) Himachal Pradesh (47 percent) and in Delhi (35 percent).

**Wastage of Water in Canteen**



**Figure 5: Wastage of Water in Canteen**

It is clear from the graph that wastage of water in canteen in almost all the schools. However in the case of Telangana, 73 percent of schools waste water in school canteens.

**RESULTS AND DISCUSSION**

Rashtriya Avishkar Saptah (RAS) 2019 provided a very good platform for students in conducting water auditing in the schools thereby motivating for water conservation in real life. The *Saptah* was

successful in inculcating the spirit of inquiry, love for science & experimentation among the students through observation, experimentation, inference, etc. A culture of thinking for water conservation was created among the students and they become ambassadors in spreading awareness about importance of water, ways to conserve and use it.

It is a noble way and a fruitful learning experience to inculcate scientific attitude as well as bringing a change in the aptitude of children in school premises to save water and conserve our resources in a eco-friendly way and helps the students, parents and villagers in creating more awareness regarding water conservations and practical implementation of the same by means of rain water harvesting, preserving the natural resources of water by minimizing the ill use of water. Students enjoyed a lot to be part of drive to save water and save environment and shown positive awareness response where they pledged to conserve every drop of water and to spread the awareness in society.

Involving in the water audit programme, students came to know about water crisis, its judicious uses in our daily life and learnt the value of water conservation by conducting surveys and by various other activities organized in the school premises such as awareness lectures, declamation contest, posters making, quiz and essay writing competition on 'Water Conservation', etc.

They even gathered information from their grand-parents on "how they fetched water, where did they store it & what all they did to conserve it". Overall it was really fun learning for students where such activities encourage, inspire and support them to do hands on activity to conserve/preserve water, to avoid wastage of water in any form, to utilized rain water at optimum use. This was innovative way to do something other than syllabus. Guidelines provided were very helpful. Students took active interest in the activities and got interesting insights of how to conserve water thereby giving suggestions for improvement for water harvesting such as plantation, stop mining, awareness about water uses and water wastage.

The study reveals that wastage of water happens more in toilets and laboratories of the schools and very limited amount of water wasted in the school canteens. The study pointed out that the schools of Telangana and Karnataka waste more water in toilets/ washrooms. Wastage of water in the laboratories of the schools was more in the States West Bengal, Telangana, Himachal Pradesh and Delhi. Wastage of water in the school canteens were more in Telangana. Hence, care should be taken by teachers to make the children aware of the value of sustainable use of water in schools. It can be concluded that the programme generated enthusiasm among students to learn about conservation of water and they were motivated to learn more about water crisis.

As Rabab, Waled, Abd (2019) said we should educate school children on the effects of global climate change on water sources and the strategies of adapting to the climatic change. There is a need to encourage the teachers to discuss on the advantages and benefits of water conservation and the techniques that that can be adopted by the students for using less water. All the teachers and students of the schools may be provided information on water conservation for incorporating water efficiency practices into classroom activities.

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