## SHAHEED RAJGURU COLLEGE OF APPLIED SCIENCES FOR WOMEN

UNIVERSITY OF DELHI, VASUNDHRA ENCLAVE, DELHI-110096



# **ENVIRONMENT AUDIT REPORT**

2016-2019

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## SHAHEED RAJGURU COLLEGE OF APPLIED SCIENCES FOR WOMEN UNIVERSITY OF DELHI, DELHI

#### 1. Introduction:

Shaheed Rajguru College of Applied Sciences for Women aims at producing awareness about the environment consciousness. The institute takes initiatives to organize different events of green practices to percolate the knowledge amongst students, teachers, and nonteaching staff. This green message being transferred along with its practical dimensions among the families, societies and thereby to the stakeholders, forms a chain and network to spread the message at large. College is also aimed at giving solution to the different burning topics related to the environment, its awareness as well as its protection. As the government is taking initiative to sensitize mass with environment protection, newer concepts are being introduced to make college eco-friendly. To create and conserve the environment within the campus and to solve the environmental problems such as promotion of the energy savings, energy conservation, water reduction, water harvesting, solid waste management, improvement in the air quality of the campus, control on noise pollution, and minimizing the use of Plastic, etc. is one of the prime objective of the college.

Environment audit report is one such initiative that has been introduced to make the educational institute environmentally sustainable and active in spreading the education about the same. It is a tool to assess general practices implemented by the organization in terms of the impact on environment. The report also aims to spread the awareness on the adverse practices that are responsible for the degradation of the environment and how strongly the institute is involved in curtailing those practises. It helps in recognizing the need of a college to work around the year for environment sustainability. Thus, Environment audit forms the base line survey to decide for the Green policy.

## 1.1. Environment audit: An Hour of Need

Environment auditing is the process of identification and determination of the institution's practices in creating awareness and practising the environment friendly measures. Over the period of time over exploitation of resources like energy, water, etc. have resulted in the environmental degradation. It is necessary to check whether our way of living and handling resources is not going to cause detrimental effects in our surroundings. Environment audit Report aims at summarising the college's contribution and its activeness in creating awareness and consciousness in practically applying the environmental friendly measures towards an institute.

## **1.2.** Goals of Environment audit:

Shaheed Rajguru Shaheed Rajguru College of Applied Sciences for Women conducted a Environment auditing survey for the year 2018-2019. Following were the goals: 1. A baseline survey to know the real status of green practices.

2. Identification of the problems faced while practising green practices in the college campus.

3. Examination of the current practises that have impact on the environment such as resource utilization, waste management, energy conservation etc.

3. Analysis and suggestion for the plausible solutions for problems identified from Audit Report.

4. Increasing and spreading the awareness for environmental consciousness and sustainable use of resources amongst the students, teaching and non-teaching staff members.

5. Identification and assessment of any environmental risk if any inside the college campus.

6. Giving direction and guidance working on local environmental issues.

#### 2. Methodology:

The present study is based on throughout visit of the college, personal observations, datas that were collected using sets of questionnaires and other survey tools. In the meetings organized by Pravridhi, eco-club, SRCASW, need for a Environment audit report to raise the awareness was kept. The audit report was divided in to different areas (i) Carbon footprint (ii) Electricity and Energy audit (iii) water and water management audit and (iv) waste management audit. For proper survey whole campus was divided in to different sections, based on data requirement, sets of questionnaires about electricity consumption, water consumption, fuel waste, solid waste collection etc.

## 3. Analysis:

The data prepared were put to statistical analysis for Environment audit. The surveys from each group were tabulated in excels spreadsheets. The tabulated datas were further analyzed through statistical analysis and computing by Dr. Shalu. For the better understanding of the results and to avoid complications, averages and percentages of the tables were taken. Graphical representation of these results was made to give a summarized picture of the status. Final outcome was interpreted with the overall consequences, conclusion and plausible solutions or steps for them.

## 4. Environment audit Analysis:

## 4.1. Carbon Footprint

A carbon footprint is the total greenhouse gas emissions caused directly and indirectly by an individual, organization, event or product. It is calculated by summing the emissions resulting from every stage of a product or service's lifetime. The calculations for  $CO_2$  emission was done using method reported earlier.

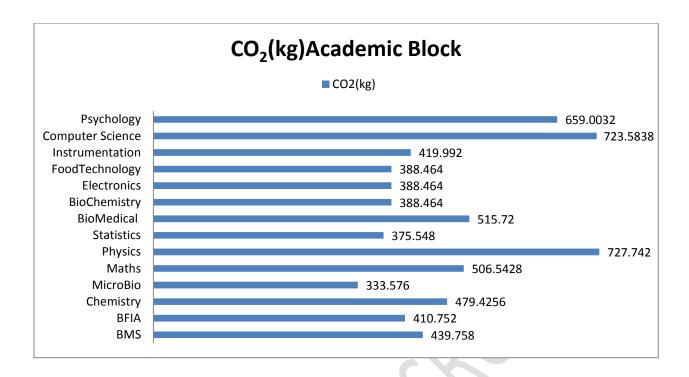
The college was divided into four regions (i) academic section, (ii) administrative building, (iii) canteen area and (iv) Guards, gardeners and sanitary workers. Data were collected and calculations were done for each departments in the academic sections.

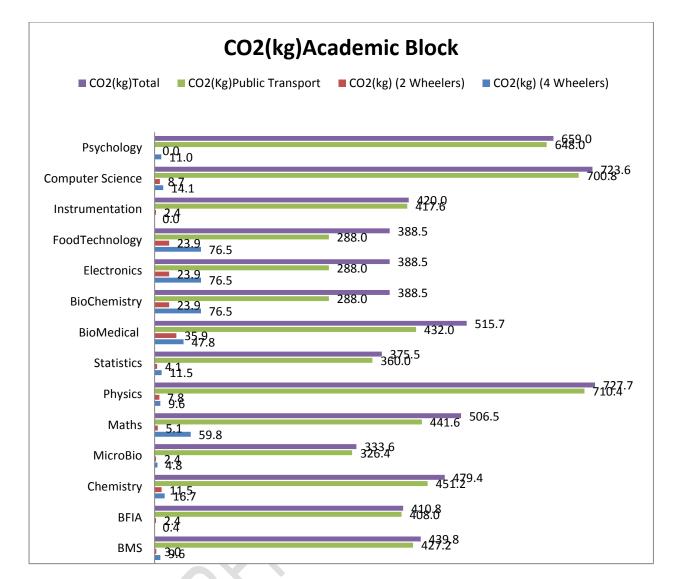
Department	CO2(kg) (4 Wheelers)	CO2(kg) (2 Wheelers)	CO2(Kg)Public Transport
BMS	9.6	3.0	427.2
BFIA	0.4	2.4	408.0
Chemistry	16.7	11.5	451.2
MicroBio	4.8	2.4	326.4
Maths	59.8	5.1	441.6
Physics	9.6	7.8	710.4
Statistics	11.5	4.1	360.0
BioMedical	47.8	35.9	432.0
BioChemistry	76.5	23.9	288.0
Electronics	76.5	23.9	288.0
FoodTechnology	76.5	23.9	288.0
Instrumentation	0.0	2.4	417.6

#### (I) Academic Block

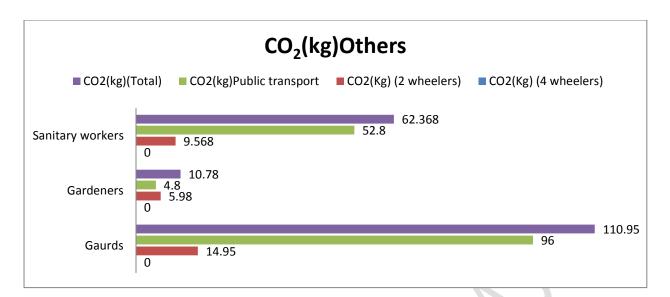
## Aggregate of all the wheelers:

Academic Block	
Department	CO2(kg)
BMS	439.758
BFIA	410.752
Chemistry	479.4256
MicroBio	333.576
Maths	506.5428
Physics	727.742
Statistics	375.548
BioMedical	515.72
BioChemistry	388.464
Electronics	388.464
FoodTechnology	388.464
Instrumentation	419.992
Computer Science	723.5838
Psychology	659.0032

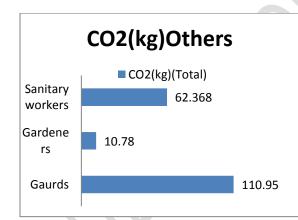




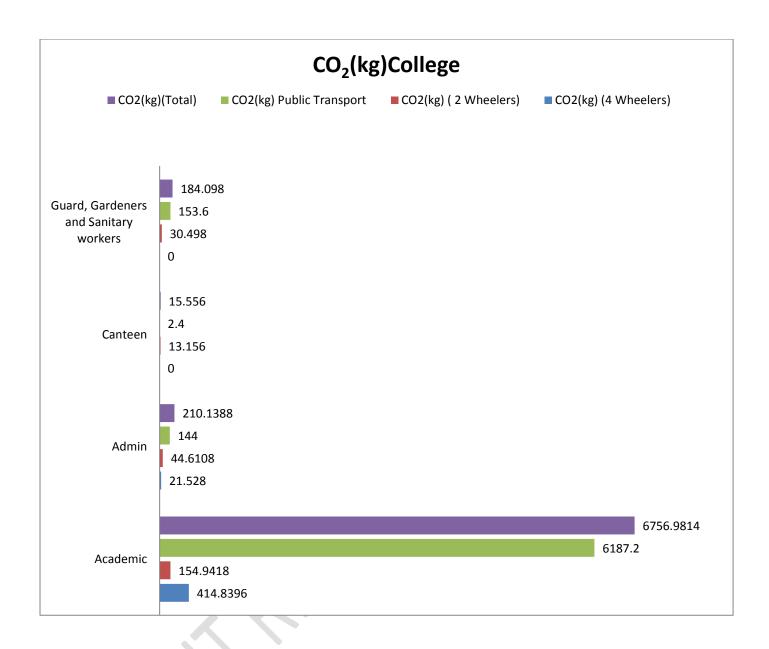
Guard, Gardeners an	d Sanitary Workers			
	CO2(Kg) (4 wheelers)		CO2(Kg) (2 wheelers)	CO2(kg)Public transport
Gaurds		0	14.95	96
Gardeners		0	5.98	4.8
Sanitary workers		0	9.568	52.8
			30.498	153.6



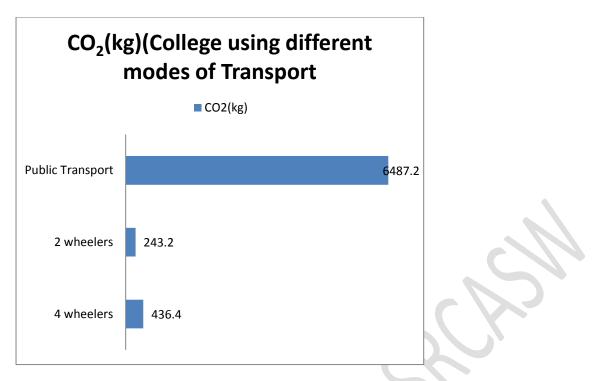
Guard, Gardeners a	nd Sanitary Workers	
	CO2(kg)(Total)	
Gaurds		110.95
Gardeners		10.78
Sanitary workers		62.368



College	CO2(kg) (4 Wheelers)	CO2(kg) ( 2 Wheelers)	CO2(kg) Public Transport
Academic	414.8396	154.9418	6187.2
Admin	21.528	44.6108	144
Canteen	0	13.156	2.4
Guard, Gardeners and	0	30.498	153.6



College	CO2(kg)
4 wheelers	436.4
2 wheelers	243.2
Public Transport	6487.2



## Tree Cover:

College has a total area of 34,068.7 sq m. Out of this 15,750 sq m is uncovered/non-cemented region. Approximately 65 % i.e. 10,237.5 sq m of this uncovered region is occupied by trees and forms the part of green cover of the campus.

Students were motivated and sensitized by 'adopting' trees, taking care of them that was made part of their project work.

## 4.2. Energy Audit Report

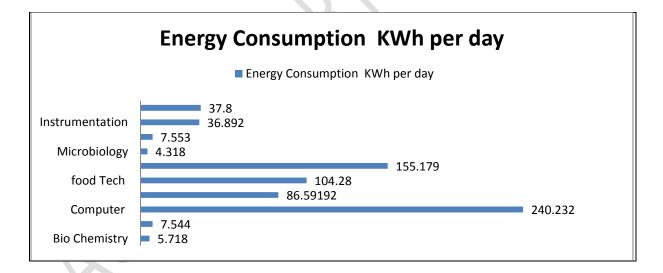
As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption".

Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

I. Analysis of Energy Consumption in KWh per day in various departments of the college.

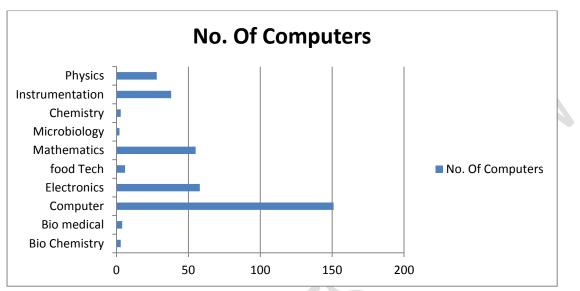
	Energy Consumption *
Department	KWh per day
Bio Chemistry	5.718
Bio medical	7.544
Computer	240.232
Electronics	86.59192
food Tech	104.28
Mathematics	155.179
Microbiology	4.318
Chemistry	7.553
Instrumentation	36.892
Physics	37.8
TOTAL	686.11

- \* This Energy consumption includes
  - Printers
  - Scanners
  - Photocopier
  - Electronic and Electrical equipment used by the respective department
  - Electronic and Electrical Appliances like Fridge, Microwave oven etc.



Department	No. Of Computers
Bio Chemistry	3
Bio medical	4
Computer	151
Electronics	58
food Tech	6
Mathematics	55

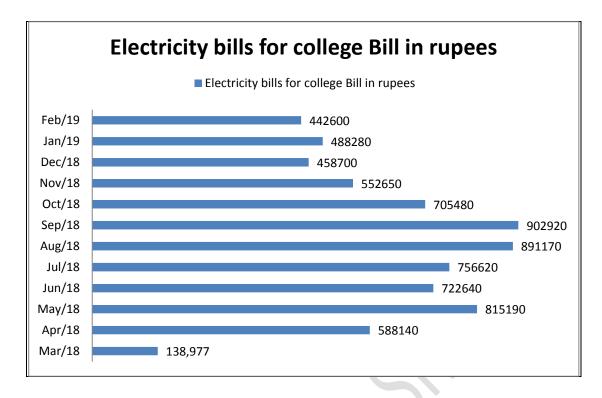
Microbiology	2
Chemistry	3
Instrumentation	38
Physics	28



The major difference in Energy consumption of various departments is due to the usage of various electronic and electrical equipment. Data is shown in the table above for comparison of no. of computers in each Department. The difference in no. of computers used is reflected in their respective energy consumption.

II. Analysis of Electricity bills of the college (excluding hostel) month wise across the year

Electricity bills for college		
Month	Bill in rupees	
Mar-18	1,38,977	
Apr-18	588140	
May-18	815190	
Jun-18	722640	
Jul-18	756620	
Aug-18	891170	
Sep-18	902920	
Oct-18	705480	
Nov-18	552650	
Dec-18	458700	
Jan-19	488280	
Feb-19	442600	
Total	74,63,367	



The above graph is showing a comparative study of electricity bills of college (excluding hostel) month wise.

The major difference is coming because of usage of air conditioners. The peaks can be seen in summer season in the months of May, August and September. For the month of June and most of July, teaching is suspended and that is reflected in electricity bills.

There are total of 200 VRV air conditioners in college and there energy consumption in KWh per day is **3580.8** 

III. Rain Water Harvesting

There are total of 7 pits for rain water harvesting which utilize the water for increasing ground water level.



Solar panel is used for water heater which is being used throughout college.

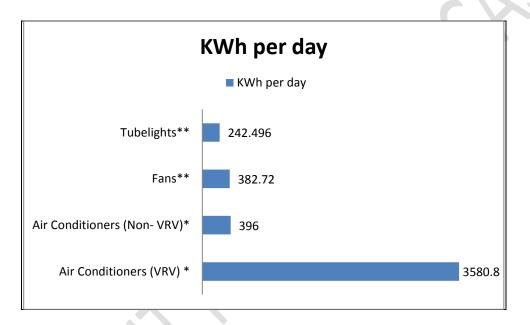
## V. Others

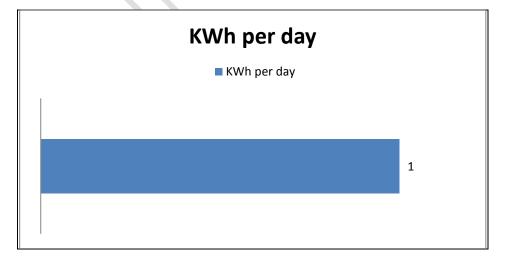
Heads	KWh per day
Air Conditioners (VRV) *	3580.8

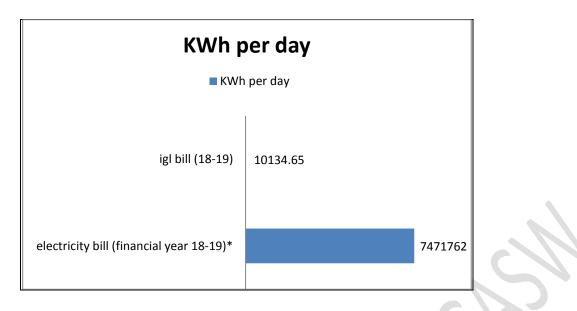
Air Conditioners (Non- VRV)*	396
Fans**	382.72
Tubelights**	242.496
Total KWh with ac	5294.31892
Total KWh without Ac	1317.51892
electricity bill (financial year 18-19)*	7471762
igl bill (18-19)	10134.65
	for financial year april 2018- march 2019

\* For Adminstrative and Academic Block

\*\* For Administrative, Academic Block and Hostel







## 4.3. Water and water management:

Data related to water audit was collected by circulating a proforma based on water user profiles. The college has roughly 1,070 students enrolled in 14 different courses, and more than 150 employees.

The assessment of water requirement comprises of sanitation, laboratory, kitchen, drinking, washing, etc.

For assessmet of water manamgement, the college has been divided into four blocks: administrative block, academic block, hostel, and teaching and non teaching staff residing on campus. The details of various blocks are as under:

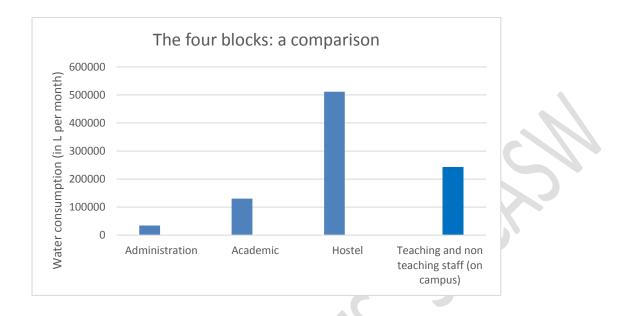
- the administrative block comprises Principal's office, accounts section and library.
- the academic block comprises of the students, teaching and non teaching staff of the 14 departments, and canteen.
- the hostel comprises of roughly 108 students, and
- there are roughly 52 members comprising of teaching and non teaching staff (with family) residing on campus.

## Consumption of water by the four blocks: a comparison

Details of water consumption by the four blocks are tabulated as under:

S,No.	Name of the block	Consumption of water (in L per month)					
1.	Administration	34,500					
2.	Academic	1,30,152					
3.	Hostel	5,11,500					
4.	Teaching and non - teaching (with	2,41,800					
	family members)						

Graphical representation is as under:



Water consumption by the four blocks is compiled as under:

Administration: 3.76%

Academic: 14.18%

Hostel (comprising of students): 55.72%

Teaching and non - teaching staff (with family members): 26.34%

Water consumption by administration and academic block comprises of sanitation, drinking purpose, laboratory usage, washings and for cooking purpose in canteen. For hostel and teaching and non - teaching staff it comprises of sanitation, drinking purpose, washings, cooking, bathing, etc.

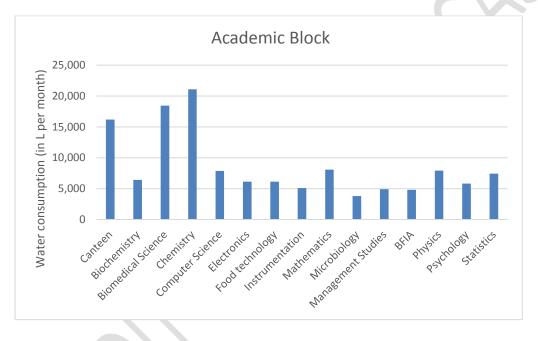
## Consumption of water by academic block:

Details of water consumption by academic block are tabulated as under:

S.No.	Name of the department	Consumption of water (in L per month)					
1.	Canteen	16,200					
2.	Biochemistry	6,405					
3.	Biomedical Science	18,446					
4.	Chemistry	21,091					
5.	Computer Science	7,866					

6.	Electronics	6,141
7.	Food technology	6,141
8.	Instrumentation	5,084
9.	Mathematics	8,084
10.	Microbiology	3,795
11.	Management Studies	4,922
12.	BFIA	4,795
13.	Physics	7,923
14.	Psychology	5,830
15.	Statistics	7,429

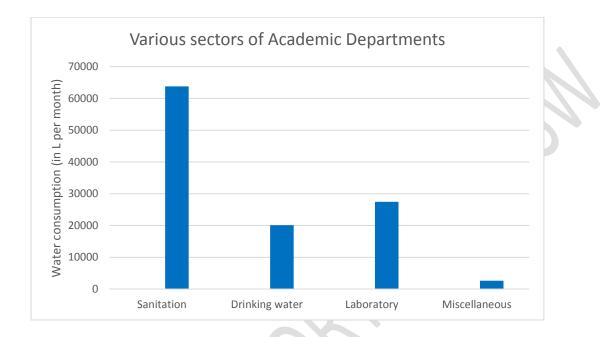
#### Graphical representation



As it can be seen, the consumption of water by canteen is 1.76 % as compared to 12.41% for the academic departments. The major consumers are science departments, especially chemistry and biomedical sciences departments. The collective consumption of water by science departments (comprising of biochemistry, biomedical science, chemistry, computer science, electronics, food technology, instrumentation, mathematics, microbiology, physics is 9.91% as compared to 1.06% for commerce departments (comprising of psychology and statistics)

The consumption of water by the 14 academic departments (including students, teaching and non - teaching staff) is further divided into requirements for sanitation, drinking purpose, laboratory and miscellaneous (washing, etc.). Details are tabulated as under:

S,No.	Purpose	Consumption of water (in L per month)						
1.	Sanitation	63,802						
2.	Drinking water	20,083						
3.	Laboratory	27,447						
4.	Miscellaneous	2,622						



As it can be seen that the major consumption is in saniataion sector. Percentatge consumption by various sectors is compiled as under:

Sanitation: 55.36%

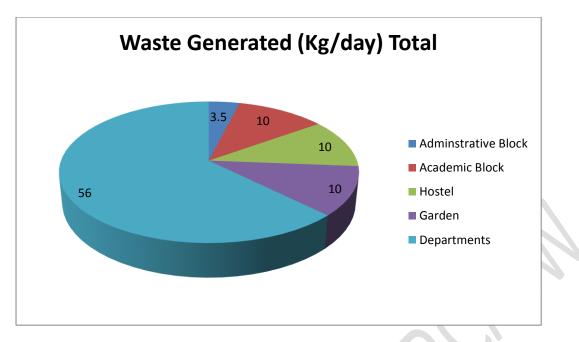
Drinking water: 17.62%

Laboratory: 24.09%

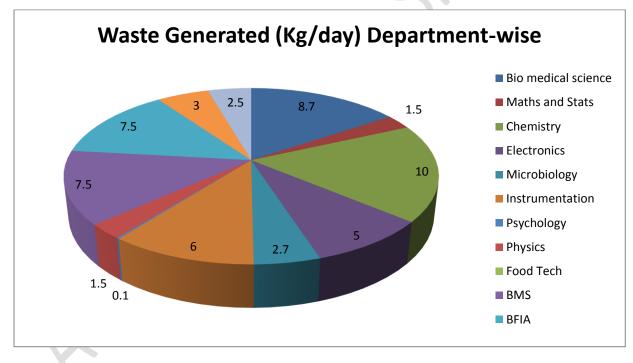
Miscellaneous: 2.30%

## 4.4 Waste Management Audit: <u>WASTE GENERATED IN VARIOUS AREAS OF COLLEGE</u>

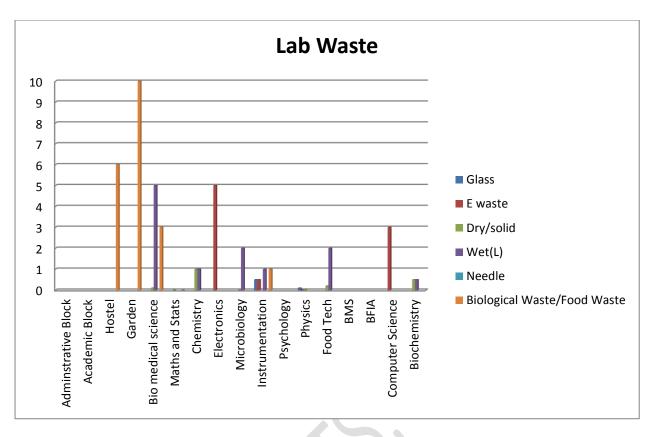
5. Location/	Waste Pa	Paper	Sanitary	Plastic	Others	Lab waste					
Department	Generated	waste	waste	waste		Glass	E	Dry/solid	Wet(L)	Needle	Biological
	(Kg/day)						waste				Waste/Food
	Total										Waste
Adminstrative	3.5	1.5	2								
Block											
Academic Block	10	6	2	1	1						
Hostel	10	2	2					C			6
Garden	10										10
Departments											
Bio medical	8.7	0.1		0.5				0.1	5		3
science											
Maths and Stats	1.5	1.0		0.5				0			0
Chemistry	10	7		1				1	1		
Electronics	5						5				
Microbiology	2.7	0.2		0.5		5		0.001	2		
Instrumentation	6	2		1		0.5	0.5		1		1
Psychology	0.1	-	-	-		-	-	-	-	-	-
Physics	1.5	0.1		0.1			0.01	0.04			
Food Tech		0.1		0.05	50			0.2	2		
BMS	7.5	2.5		2.5	2.5						
BFIA	7.5	2.5		2.5	2.5						
Computer	3		$\bigcirc$				3				
Science											
Biochemistry	2.5	1.0		0.5				0.5	0.5		



The above graph indicate that the total waste generated in all departments cumulative is maximum with 56 Kg/day, while it is least in Academic block with 3.5 Kg/day.



The above graph indicate that the total waste generated in Chemistry department is maximum with 10 Kg/day, while it is least in Psychology department with 0.1 Kg/day.



The above bar chart indicate that the biological waste generated in garden is maximum with 10 Kg/day. Further E-waste generated in Electronics department and Computer Science department are 5 Kg/day and 3 Kg/day respectively.

## 5. Conclusions and Recommendations:

All the indicators of Environment audit were properly studied and information about the indicators were collected, analyzed and followed with the conclusions, recommendations and solutions.

In its first attempt to conduct Environment audit of the college by eco-club, SRCASW we have recorded the details, and the green practices conducted by the college.

- LPG is handled in science building section for Physics, Chemistry and in the canteen area for practical purposes. Per unit consumption is still less.
- Electricity consumption is more in some sections that have instruments. Other departments have minimal usage of electricity.
- There are a several trees and plants of different varieties and species that serves to the greenery of the college. Trees including ornamental, fruits, timber and several local varieties Bottle brush, Michelia (Champa), Neem, Peepal, Ashok, Kachnar, Jasmine (Chandni), Fruit trees: Amla, Guava, Zizyphus (ber), Mango (aam), Pomgrenate (Anaar), Jamun, etc. have increased the aesthetic value of the college.
- College takes efforts to dispose majority solid waste by proper composting and ensures recycling and reuse of classroom waste, office paper waste etc. College also ensures to supply waste to registered vendors.
- Students and staff of the college are encouraged on using public or pool sharing minimize fuel energy consumption for daily work. However on an average most percent of students travel using feeder buses, CNG buses, e-rickshaw and metro. Staff travelling long distance also prefer coming by public transportation.
- Waste bins and dustbins are placed throughout campus and in toilets. Toilets and bathrooms, in office, academic sections avoid wastage of water.
- Air quality on the campus is good.

## **Recommendations:**

- CFL lamps can be used in all sections to minimize the usage of fluorescent tubes
- Waste water management still needs to be practiced and designed in the campus.
- Drips and sprinklers can be used for watering the gardens and lawns.
- Roof top rain water harvesting is functional. More such rain water harvesting pits can be designed and constructed.

- Special days like, Teachers Day, Guru poornima, van mahotsav can be celebrated by plant donations.
- E-waste segregation, handling and disposal can be deployed at the campus.
- More composting pits can be prepared for proper disposal of garden waste and kitchen wastes from canteens.

## 6. Initiatives and activities conducted by the college, Pravridhi, eco-club:

## Green Campus Award

- College is actively involved in the tree plantation drives, planting saplings and motivating students by adopting them. This aims at twofold objective for creating awareness, sensitivity towards plantation, by increasing the green cover of the college. 'Pravridhi' – The Ecoclub of the college is also actively engaged in spreading awareness on eco-friendly way of sustainable living and substitutes.
- Currently college has variety of plant species like Ornamental Trees/shrubs: Bottle brush, Michelia (Champa), Neem, Peepal, Ashok, Kachnar, Jasmine (Chandni), Fruit trees: Amla, Guava, Zizyphus (ber), Mango (aam), Pomgrenate (Anaar), Jamun, Moringa, Neem, Acacia (boundary of the campus), Champa (michelia) etc.
- For its extensive green cover college was recognized with green campus award presented at Delhi on 8<sup>th</sup> March 2017 commemorating the occasion of International Women's Day.
- Incinerators
  - Incinerators were established in 2016 in the washrooms of hostels for discarding sanitary pads. This was one of the good means and an initiative to prevent disposal of sanitary pads. Two incinerators are installed in the washrooms at hostels.
- Sensors for lights in washrooms: In order to prevent wastage of light we use lights that work on the sensors. There are three such sensors washrooms where the functioning of the light occurs only in the presence of some person and gets switched off in the absence. With the success of this installation we are working to convert all the washrooms into 'sensor washrooms'.
- Herbal Garden: College maintains its own herbal garden to create awareness on understanding the importance of herbal species in our daily live. This includes Tulsi, alovera, and Ashwagandha. We are working on increasing the number of species.
- **Solar Panels:** The hostel area of college is installed with solar panels as a substitute for electricity using renewable resources. The project is extended to administrative buildings and the academic block as well.
- **Rainwater Harvesting**: Rainwater harvesting system is installed in the administrative area. The purpose is to utilize the water coming from rain for different purposes like irrigating fields and gardens.

## • Programs and workshops:

## (i) Himalaya Day:

In collaboration with the CMS Vatavaran 'Environment and Wildlife International Film Festival and Forum' an inter-departmental fest was organized by department of microbiology, SRCASW on the theme 'Celebrating Himalayas' on 2<sup>nd</sup> August, 2019. The event was marked with the students participation from different colleges in various events like poster making, sloganeering, model creation, rangoli competition, skits etc.

## (ii) Tree Plantation Drive:

In a continuous effort to enhance the green cover in the campus, 'tree-plantation drive' was organized on the Ozone day, 16<sup>th</sup> September 2019 by Pravridhi, the eco-club of SRCASW in association with 'Harela Foundation' and 'Shakti'. Event showed participation of 350 students and academic and non-academic staff at large. More than 50 saplings of different fruit trees e.g. guava, peach, jamun, amla, mango, lemon etc., ornamental plants e.g. moringa, neem, peepal, ashok, kachnar, champa, bottle brush etc. were planted throughout campus, in herbal garden, fringes of ground etc.

## (iii) Green Month Celebrations:

To sensitize and motivate the students, staff and teachers at large, green month was organized by the eco-club of SRCASW that was divided into four week celebrations:

- 1. WEEK 1. Plastic Free Campus; 1<sup>st</sup> 6<sup>th</sup> October, 2019
- 2. WEEK 2. Stop Energy Waste; 7<sup>th</sup> 13<sup>th</sup> October, 2019
- 3. WEEK 3. Clean Campus; 14<sup>th</sup> 20<sup>th</sup> October, 2019
- 4. WEEK 4. Green and Clean Diwali; 21<sup>st</sup> 27<sup>th</sup> October, 2019

Members of eco-club and students from the different departments participated in spreading the awareness throughout the college through posters, banners, slogans, public displays etc. This served following purpose:

- 1. Motivation and sensitization of the students.
- 2. Implementation of the changes, like preventing unusual wastage of water, electricity etc.
- 3. Plastic utensils used in the canteens like plastic cups, spoons and plates were replaced with steel utensils. Teachers and students brought their own utensils, water bottled and jute/cloth bags.
- 4. Unusual throwing and wastage of papers. Focusing more on reusing and recycling it.
- 5. Home taking message to increase green cover at homes like local gardening.
- 6. Awareness on waste management and segregation.
- 7. Celebrating Diwali with earthen lamps. No to crackers.

## (iv) Workshop on 'Environmental Leadership and Sustainability':

Awareness on how Environmental Studies can bring entrepreneurship, can create jobs and can cover different fields from clothing, to waste management etc. a one day workshop was organized on 21<sup>st</sup> October, 2019. The workshop was organized by the eco-club of SRCASW in association with 'Sashakta Bharat', an NGO that works at bringing out the innovation and creativity out of waste. The event was graced by the presence of joint director, IARI, Dr. J. P Sharma. Event covered discussion and talks by several eminent speakers and young innovators on 'Eco-Entrepreneurship', 'Sustainable Business', 'Creating Sustainable Alternatives for Better Future' and the 'Role of Doodlage as an industry leader of fashion'. The event showed participation of more than 150 students from various departments.

## Gallery:



Green Campus Award



Incinerator Units



Plantation drives, sloganeering, and adoption



Glimpses of green cover of campus premises.



Students working in herbal garden





Workshop on 'Environmental Leadership and Sustainability'



Acknowledgement: The Environmental Audit Report is the hard work and dedication of all the members, student council and members of Pravridhi, eco-club SRCASW under the able guidance, motivation and constant support of college and experts.