FINAL REPORT

2022

GREEN AUDIT REPORT

Mehr Chand Mahajan DAV College for Women, Sector 36-A, Chandigarh

As part of NAAC assessment compliance

The Ridge Environment Consultants

ISO 9001: 2015 Certified for Green Environment Audits

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Principal Environment Auditor

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7/27/2022

The Ridge Environment Consultants
Agency for Green Environment Audits
An ISO 9001:2015 Certified Organization
ISO Certificate No. – MS1AGT2ACFC

No. CERT/2022/07/01

GREEN AUDIT CERTIFICATE

Is issued to

MEHR CHAND MAHAJAN DAV COLLEGE FOR WOMEN, SEC 36-A CHANDIGARH

for successful completion of Green cum Environment Audit of the College for the Period FY 2020-21, conducted by M/S The Ridge Environment Consultants. This Environment Audit included Sectoral Audits in these sector, i.e. Water, Energy, Waste cum Material & Resource recovery, Air Quality & Noise, Bio-diversity, Infrastructure & outdoor environment, Health & well-being, I.E.C. Activities and Institutional management.

The College is certified to have done exceptionally well to conserve environment and ensuring sustainable development for the assessment period till 31/07/2021.

Duration of Audit	:	July 2021 to Feb 2022
Date of Issue	:	27/07/2022

(Lead Auditor - Environment)
Gaurav Prakash, Chartered Engineer
The Institution of Engineers (India)
Regd. No. M-1718236

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1. INTRODUCTION

This study has mandated us as an environment auditor to carry out green / environment audit for all the activities/ projects and infrastructure in Mehr Chand Mahajan (MCM) DAV College for Women implemented. The evaluation work has been commissioned by the MCM DAV College and the work order to commence the work was issued on dated 30/07/2021.

Synopsis Inception Report was prepared on 25/08/2021 was submitted on 26/08/2021 to College. Draft evaluation report submitted on 27/02/2022, for comments & feedback was reviewed and received on 20/07/2022 for finalization. Meanwhile data was collected, discussions and unstructured interviews were undertaken at the college and final pre-audit meeting was conducted on 02nd - 04th Feb 2022 and finally post audit meeting was conducted on 04/06/2022.

Er. Gaurav Prakash Raja, Chartered Engineer (Environment), IEI with Regd. No. M- 1718236 was the Principal/ Lead Environment Auditor for this work who is a National Award Winner in Water Sector. Ms. Neha Bansal, M.Sc. (Biotech), Mr. Hitesh Bans, Environment Engg. & Mrs. Moon Thakur, Civil Engg, provided other inputs at appropriate stages. The auditing Agency M/s The Ridge Environment Consultants is ISO 9001:2015 certified agency by Accreditation Body (AB) IAS registered with International Accreditation Forum (IAF) for Environment and/or Green Audits having Regd. No. MS1AGT2ACFC.

It is stated that our team has no conflict of interest in this project and the evaluation was impartial and independent, keeping best interest of the College and its staff and students. Professional due diligence has been done during evaluation & drafting, however any error/ misrepresentation, if any would be purely inadvertently, for which we shall not be liable, since they would be unintentional. But if possible reasonably, we reserve our right to rectify the same. We will not be liable for the consequences arising out of the contents of this report, and submission of this final report is the based on the definite understanding that DAV College shall indemnify us for all liabilities whatsoever, if any. Also we would like to declare that since during this audit various documents, records, offline and online references in addition to one-to-one unstructured interview and discussions with stakeholders has been conducted, and so the relevant details or statements are explicit or implicit part of this report and hence, we acknowledge and declare the same.

Context

In 2006, Government of India had declared the National Environment Policy 2006 and made green audit mandatory to each industry. Thereafter the process of environmental audit was formalized by Supreme Audit Institution (SAI) according to the guidelines given in Manual of Standard Orders (MSO) issued by Authority of the Controller and Auditor General of India 2002. The National Assessment and Accreditation Council, (NAAC), Bangalore has made it mandatory from the academic year 2016-17 onwards that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Good Management Practices of the Higher Educational Institutions to ensure that they contribute towards the Sustainable Development and reducing their Environment and carbon footprint.

In view of the NAAC circular regarding Green Auditing, the College Management decided to conduct an external Green Evaluation by a competent Environment Auditor. This work of audit report was coordinated by the Green Audit Committee of the college which was reconstituted on dated 13/07/2021.

The members of the Green Audit committee who coordinated and provided us with complete information, including one-to-one discussions and with whom we had unstructured interviews are mentioned as below:

Chairperson: Dr. Nisha Bhargava, Principal, Mehr Chand Mahajan DAV College for Women, Chandigarh

Member: Dr. Vibha Sharma, Chief Coordinator, IQAC and In-charge, Green Audit Committee

Member: Dr. Bindu Sharma, Coordinator, IQAC

Member: Dr. Gunjan Sud, Assistant Professor and Head, Department of Botany

Member: Dr. Gurjeet Virk Sidhu, Assistant Professor, Department of Sociology

Member: Dr. Ketaki Dwivedi, Assistant Professor, Department of Sociology

Member: Dr. Aanchal Batra, Assistant Professor, Department of Chemistry

Member: Dr. Shafila, Former Assistant Professor, Department of Environment Science

Basic Concept of Green Audit

Green audit is an initial part of the environment management system, used methodologically for protection and conservation of the environment with the core vision to ensure that sustainable development is ensured.

–Green Auditing‖, is also known as –Environmental Auditing‖. The term ‗Environmental audit' or ‗Green audit' means differently to different people. Terms like ‗assessment', ‗survey', 'evaluation' and ‗review' are also used to describe similar activities. Although there is no universal definition of Green Audit, many leading organizations follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989).

The ICC defines Environmental Auditing as: ―A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects.‖ The European Commission, in its proposed regulation on environmental auditing, has also adopted the ICC definition of Environmental Audit. However, the outcome of Green Audit needs to be established with concrete evidence and the measures undertaken and facilities in the Institution.

Green auditing is a process whereby an organization's environmental performance is tested against its environmental policies and objectives. Green audit is defined as an official examination of the effects a college has on the environment. So according to the needs of the organization, it may be customized and objectives & methodology planned.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plans. Green auditing and the implementation of mitigation measures is a win-win situation for all the colleges, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students a better understanding of Green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus it is imperative that the college evaluates its own contributions

toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the world, the role of higher educational institutions in relation to environmental sustainability is more crucial. A clean and healthy environment aids effective learning and provides a conducive learning environment.

About Mehr Chand Mahajan DAV College for Women

Mehr Chand Mahajan DAV College for Women, Chandigarh popularly known as MCM DAV, was established in 1968 by the DAV College Managing Committee, New Delhi, to commemorate the meritorious services rendered by Justice Mehr Chand Mahajan, former Chief Justice of India, a distinguished legal luminary, great patriot, administrator par excellence, committed educationist, social reformer and humanist. MCM DAV College has become one of the most sought-after colleges in Chandigarh for various courses among female students.

Owing to its excellence in varied fields, the college has been re-accredited with Grade –A‖ by NAAC and awarded the Star Status by Department of Biotechnology, Ministry of Science and Technology, Government of India. MCM DAV is also the first private-aided college in the city to be approved as a Research Centre in the subject of English by Panjab University, Chandigarh. The teaching methodology at MCM College follows a student-centric and holistic learning approach and is extremely adaptive keeping in view the requirements of the times.

The College is actively engaged in carrying out various social, environmental and educational outreach activities through committees like Ek Bharat Shreshtha Bharat, Swachh Bharat Abhiyan and Unnat Bharat Abhiyan besides the NSS and NCC. The College has been awarded first rank in India under Swachh Bharat Abhiyan 2018 (In Residential College Category) by MHRD, Govt. of India. The College has also been awarded third rank in India in Swachh Sarvekshan 2019 (under Citizen Led Initiatives) by MoHUA, Govt. of India. Besides this, Mahatma Gandhi National Council of Rural Education (MGNCRE), MHRD (under the Swachh Bharat Mission- Gramin), selected MCM DAV College as one of the Higher Education Institutions among 40,000 existing in India to transform the infrastructural and unhygienic socio-cultural habitat of its neighbourhood villages through community engagement activities. The College was also nominated by MGNCRE, MHRD, Govt. of India, as a Swachhta Action Plan Institution in the year 2020, in addition to various other awards and recognitions over a period of

time. For example, the College received Best Herbal Garden and Best Eco-Club award from the Department of Environment, Chandigarh Administration in the year 2022.

Objective of the Green Audit

Audit is mainly an examination of the present state of environment footprint and impact of the College. Green auditing is a process whereby an organization‘s environmental performance is tested against its environmental policies. Since the institute does not have a documented environment policy or environment management system in place and green audit is being conducted for the first time, so accordingly we have defined the scope and objective of the current green audit as below:

1. To review on a basic level, the activities and operations of the College and identify main sources of resource utilization, and their environmental impacts.
2. Understand the sustainability related initiatives undertaken.
3. Identify the gaps, best practices or initiatives undertaken by the college.
4. As part of the audit report - share audit observations and findings along with suggestions and recommendations for the future.

2. KEY FINDINGS

This chapter summarizes the key findings and highlights the same. It is based upon site survey, inspection of documents and unstructured interviews with stakeholders as documented in next Chapter No. 3, and conclusions drawn as per best national and international practices.

Highlights:

a. *MCM DAV College has shown consistent and exemplary commitment towards nature, environment conservation and overall sustainability, which is clearly evident by the work done by them which is more than any mandatory or regulatory requirements - year - on - year basis for which they have been felicitated with series of National level awards.*
b. *In terms of variety and number of projects, the college has undertaken and completed nearly all the possible basic activities and projects, which fall under the category of environment sustainability. These projects recognize and make the college green and its operations environmentally sustainable in all fields such as water/ waste/ energy management, institutional operations, IEC programs, overall health and wellbeing, biodiversity and beautification.*
c. *The college has been observed to be nearly 90% more efficient in per capita water consumption as compared to Indian standards IS 1172:1993 (2002), which is approximately 5 liters per person considering 5535 students/staff.*
d. *The sincere and continuous efforts of the college management, staff and students for water conservation over a period of time, has shown results, such as it has been observed during this study that the college campus has successfully achieved nearly 51% Net Zero Water Positive (NZWP) milestone (NZWP being saving or creating & conserving more water for the environment than being actually used or supplied)*
e. *Since June 2020, the college is continuously receiving negative electricity bills till date. The college had a clear saving of Rs. 86.96 Lakhs during this period and would be soon recovering the cost of solar power plant (pay back). It can be evidently claimed that MCM DAV College is nearly Net Zero Energy Campus (NZE) possibly due to Covid-19 restrictions.*
f. *The college was observed to be a pioneer in waste management system practices. Its commitment to the cause of 'Swachhta' is well established since it has achieved 100% reuse*

of food/green waste generated in the college as biogas and fertilizer, focuses on reducing, reusing and recycling waste which is evident from various disposable material gate passes, office register of such materials etc. and has conducted series of workshops, programs and community IEC initiatives in collaboration with other bodies like Mahatma Gandhi National Council of Rural Education (MGNCRE), and government schemes such as Swachh Bharat Abhiyan, Unnat Bharat Abhiyan etc.

g. *There is a good on-ground implementation of waste management practices in the college which is monitored by various concerned committees, and the work of all such committees is compiled in the form of Swachhta quarterly action reports which are uploaded on college website. There is a scope of improvement and strengthening of Institutional mechanism for planning, managing and monitoring of waste management as the information and management of different types of waste, their collection/disposal, recycling and reuse, i.e. the entire value chain from material - waste generation - resource recovery is somewhat scattered among various concerned people and committees. This may be improved by implementing regular compilation of data and implementing MIS policies.*

h. *Though the institute has constituted multiple committees for similar activities such as Eco Club, Cleanliness committee, Swachhta Committee, Plastic free campus committee, Sustainable practices committee, e-waste coordination etc. to comply with various statutory or Government guidelines, all other committees work under the broad framework of Swachhta committee. However, implementation of MIS would help in target oriented synergistic action and data collection for central core outcome.*

i. *The air quality monitoring equipment was found to be physically present but it is suggested to make it operational as air quality data was available until few years back.*

j. *Biodiversity audit was conducted taking its broader definition of all the different kinds of life form in a given area. The Botany and Zoology departments have consistently, in an in-depth manner documented the flora and fauna in the campus.*

k. *Since the college has been properly documenting its biodiversity, in the next step it is recommended that using inter-disciplinary knowledge - analysis of biodiversity through geo spatial technology, tree auditing, awareness through QR codes, calculation of benefits to earth in terms of biomass or carbon sequestration should be taken up in future.*

l. *As part of Vedic Indian Culture of Mutual co-existence, the principles of eco-friendly living were promoted even before the advent of buzz words like global warming, sustainability, zero waste etc. In this regard, the institution has done appreciable initiatives like - Rishi Vatika, Yajashala and Meditation Huts, which help in providing value based education to the students. This should be developed further and incorporated in all policies of the institution, so that students learn the importance of mutual respect and mutual co-existence with nature as a part of life and not just as an environmental or a commercial eco-friendly activity.*

m. *MCM DAV College has been found to provide the right and best atmosphere for developing and sustaining an individual and community health and wellbeing in the best possible way as all basic amenities are easily accessible to all sections of the society involved there. The college undertakes periodic wellness surveys of its occupants by organizing medical check-up camps, gynae OPDs, regular health check-up of food handlers i.e. mess workers of the hostel, awareness sessions on health related topics, and ensures availability of a doctor in the Medical room. The college has MoU with the Healing Hospital in Chandigarh to cater to emergency needs of the students. Apart from this, college has a Geetanjali Counselling Helpline Committee which emphasizes on mental health awareness, identification of problems crucial for psychological diagnosis & treatment. However, the college may undertake a wellness survey among its occupants by collating various activities and to comprehensively document the combined positive effects of various wellness initiatives.*

n. *College should make a clear environmental policy with concrete and time bound targets for next 3 years to 50 years and restructure its environmental working through Process Based Management (PBM) for e.g. consider water management as one process, waste and recovery as one process, biodiversity as one process.*

o. *Though students are encouraged for entrepreneurship through Innovation and startup policies in general however students should also be encouraged to contribute in a professional and income generating way to priorities of the college which are specially related to environment, for which necessary changes in startup and innovation policy maybe done.*

p. *Zero waste, eco-friendly and sustainability as a matter of principle should be incorporated as part of all purchase policy to ensure more impactfulness at institutional level.*

q. *The institute should move towards modern concepts like zero waste, net water positive etc. in future since it has undertaken slew of successful initiatives in all fields possible.*

r. *As evident through AQAR from year 2010-11 to 2019-20, various appreciable ecofriendly initiatives have been taken by the institute however integrated process, functions of several committees, monitoring, etc. are areas which need strengthening. An integrated approach will help in overcoming gaps and bring more coherence in the efforts. A result-oriented Environmental Policy and process outcome based management will go a long way in showcasing efforts of the college in a quantitative and exemplary manner.*

s. *The projects executed comply with normally accepted green practices across the country, the working of the institute is in compliance to local rules and regulations of Municipal Corporation, Environment department, Pollution Control department etc. and also partly fulfill categories under Green buildings criteria under National Green building rating.*

t. *It is evidently visible based upon on ground reco survey or semi-structured interviews with the staff of the Institute that the college campus has various well maintained sustainable campus initiatives, staff - students - institute in general is committed to have a green campus and the staff is dedicated to ensure sustainability of the campus to the best of their abilities and available resources. This physical and visual assessment adequately co-relates and with the information publicly shared by the institute through various official documents such as AQAR SSR, Swachhta, RUSA reports etc. including information mentioned in official website, i.e. https://mcmdavcwchd.edu.in/ - all of which was reviewed as part of this audit evaluation.*

3. PROCESS BASED AUDIT OBSERVATIONS

3.1. The observations have been compiled based upon initial desk review of various communications and documents, and after initially visiting MCM DAV College as part of getting an initial idea on the work done, identify the appropriate methodology and accordingly an initial inception report was prepared and submitted. Subsequently a detailed and comprehensive site visit was undertaken during which the evaluation cum performance audit observations were noted and compiled in this report..

Dates of pre-audit meeting in College:

1. Virtual Session: 02nd February 2021.
2. Pre-Audit review meeting: 31st July 2021 and 1st August 2021.
3. Detailed Audit Inspection/ Review meeting: 02nd Feb, 03rd Feb and 04th Feb 2022
4. Post Audit Meeting on 04th June 2022

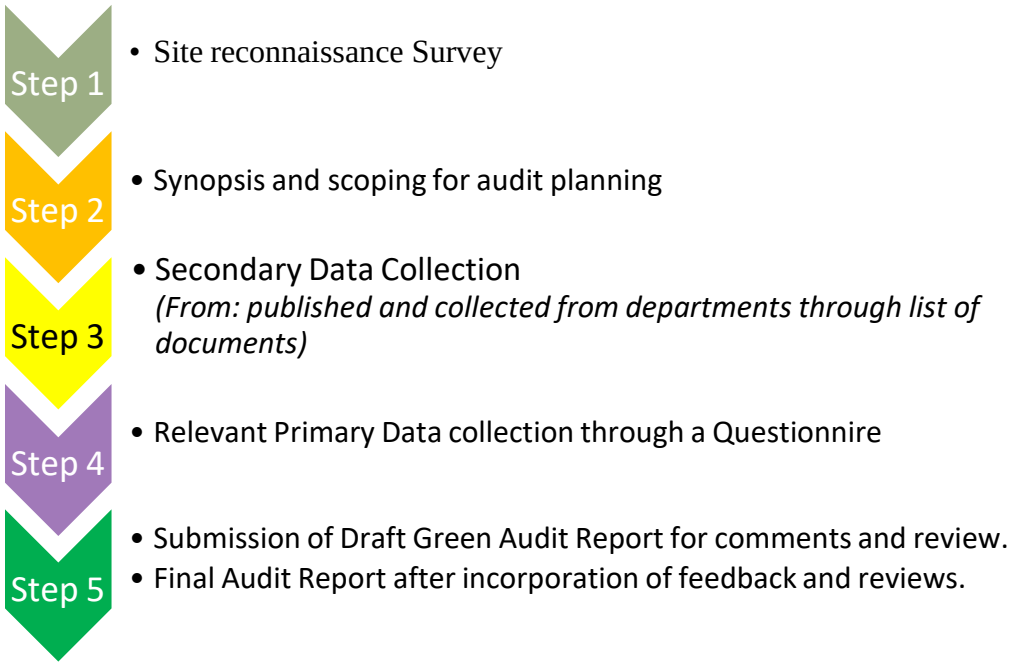
The pictures during Audit review meetings and pre-audit meetings are below:


GPS Map Camera
Chandigarh, Chandigarh, India
ARTS & SCIENCE BLOCK, MCM DAV COLLAGE FOR GIRLS, MCM DAV College Rd, 36A, Sector 36, Chandigarh, 160036, India
Lat 30.734863°
Long 76.75679°
03/02/22 10:58 AM
Google


GPS Map Camera
mehr chand Mahajan DAV College for Women-36, Chandigarh
Lat 30.734909°
Long 76.756498°
02/02/22 04:14 PM
Google

Methodology Adopted

Building upon our strategy as elaborated in the Inception report, the draft audit report was conducted by physically inspecting the college in detail, having unstructured interviews/ discussions with Staff and Students, review of various documents, records, communications and, online information. Accordingly, this report has been divided in several chapters with last chapter mentioning a set of recommendations for way forward.



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Following the above methodology, we have hereby compiled our Audit Report and Sector wise sub-process based reports, below with our observations.

However, since this is the 1st time green audit is being conducted, hence the study had its own constraints, but if observations of this report are read and recommendations of this report are followed the benefits of the same shall accrue to the institute & it would be much better streamlined to carry out green audit in future.

3.2. Water Audit

Water is one of the most critical aspect for life to exist and fresh water is a precious natural national resource. With continuous growth in population, per capita availability of utilizable water is going down, whereas the demand is ever increasing primarily due to life style changes and decreasing awareness on water management. It is clearly visible in the society, that due to unsustainable use of water resources there is contamination and depletion of the natural water sources which is an alarming situation. Therefore, it becomes paramount to conserve protect and manage the water resources availability and usage so that it is sustainably used within the college campus. Water auditing is conducted to evaluate the quality, availability and usage of water; the facilities available and methods adopted to revitalize and use it so that the resources are intact without leading to deterioration.

The audit team assessed local Government regulations like NBCC 2016 and IS 1172:1993 (2002) and calculated the actual fresh water usage as compared to standards, waste water generated, annual rainwater precipitation in the campus, amount of harvesting done and surface runoff. The results have been analyzed by finding out water balance or water budget of the college and understanding the flow of water to highlight observations, find gaps and suggest recommendations.

3.2.1. Observations and findings/conclusion:

1. The water consumption and demand of the college has been observed and estimated to be nearly 90% more efficient as compared to Indian standards IS 1172:1993 (2002), which is approximately 5 liters per person considering 5535 teachers and students and even in a high per capita usage condition, considering 50% attendance still the consumption is 10 liters per person which is nearly 77% more efficient than as per the standards, i.e., 45 liters/person/day. This is evident of good overall water management practices of the college.
2. It has been observed that the Institution has been actively promoting through various awareness programs and has invested to implement rainwater harvesting inside its campus. Accordingly, the college has one functional ground water recharge system of theoretical total capacity of 89 KL of groundwater recharge per hour. The injection well consists of a

400mm pipe to a depth of about 30 mtrs average as per documents. Open well in the college is not functional due to technical issues.

3. The capacity of ground water recharge needs to be enhanced in coming years since there is a mismatch between maximum rated recharge capacity of the injection well and the average to peak rainfall received on the catchment rooftop areas. The capacity of injection well is 89 KL rainwater recharged/ hour, which is suffice to handle max. 20mm of rainfall intensity per hour over approx. 6,000 Sq..mtrs of building area assuming there is no choking of groundwater structure. Since Chandigarh witness rainfall intensity up to 50mm/hour, hence, the excess water overflows as surface runoffs, which needs to be also be harvested and either recharged or recused/recycled.
4. To conserve waste water, the sincere intent of the college is clearly visible for environment conservation since it has spent its own funds on installation of Sewage Treatment Plant (STP) of 50 KLD capacity for the college building on its own, without any statutory or legal compulsion. The theoretical capacity of the STP required was approx. 20 KLD based upon waste water generated in the college campus, however the institution has gone a step ahead, considering futuristic requirement, has commissioned higher capacity STP.
5. College is using reclaimed water supplied by Municipal Corporation Chandigarh and treated water from 50 KLD Sewage Treatment Plant installed in College campus for garden irrigation purpose.
6. The sincere and continuous efforts of the college management, staff and students for water conservation is evident since it has been observed during preliminary study that the college campus has successfully achieved nearly 47% Net Zero Water Positive (NZWP) milestone *(NZWP being saving or creating more water than being actually used or supplied).*
7. The Net Water Balance or Water Budget of the institution campus reflects that out of the 100% of water received/supplied at the college campus approx. 95,633 KL/annum, 47% of water i.e. 44,988 KL/annum is generated or replenished back to nature, 17% of water i.e. 15,780 KL/annum is non-controllable losses/consumption and 36% i.e. 34,864 KL/annum are losses of water which can be minimized or reduced.
8. College gets its entire water supply from Municipal Corporation Chandigarh and does its own water quality microbiological testing periodically by qualified microbiologists, and therefore no third party laboratory testing conducted.

9. It was observed that the college campus has various sign boards, banners sharing message of water conservation around the campus. Based upon document review and interaction with stakeholders it has been found that in addition to sensitization tips; various physical and online awareness and community programs and initiatives to increase the general awareness and give hands-on idea to staff and students on the significance of water as a precious natural resource are being regularly conducted.

3.2.2. Assessment basis and reasons for finding:

The actual water meter readings and water received by various segments of the college was reviewed, compiled for past 3 years as below:

FY Year	College Campus MC Water KL		Hostel Campus MC Water KL		Reclaimed MC Water KL	
	Annual Water Supply	Generated/ day	Annual Water Supply	Sewage Generated/ day	Water annual consumption	Water daily consumption
2018-19	7,170	16	39,160	86	11,027	30
2019-20	11,201	25	39,535	87	7,701	21
2020-21	7,945	17	16,303	36	6,050	17
TOTAL	**8,772**	**19**	**31,666**	**86**	**8,259**	**26**
	Sewage Generated annually	**7,018**	**Sewage Generated annually:**	**25,333**		

Thereafter, in the below table operational efficiency of water is calculated between actual sewage generation and as per Govt. of India Standards as per table below. It was observed the college campus is nearly 90% more efficient.

Fresh water consumption and waste water generation as per Indian Standards for the college					
Area of the Campus	No. of Users (Student/ Staff)	Indian standards (liter / person)	Fresh Water Consumption	Sewage/ waste water generated	% Efficiency (Actual vs Standards)
College	5,535	45	249.075	72729.9	**90.4%**
Hostel	1000	135	135	39420	**35.7%**
Garden	40195	3	120.5858834	22006.92372	**31%**

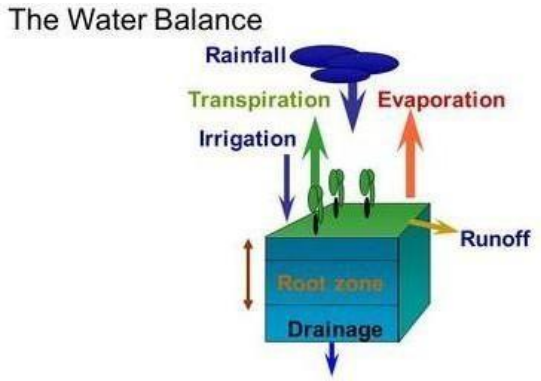
In the below table total rainwater falling on rooftops, open/parking concrete areas and green/ open areas has been calculated.

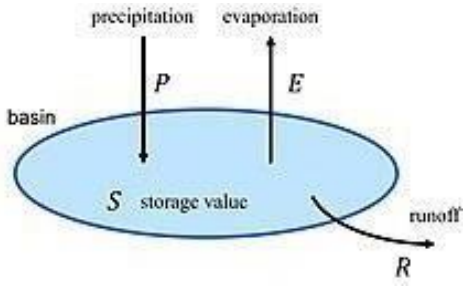
Ground water recharge Harvesting System of the College: -

S.No.	Name of Catchment Area	Area of Catchment in Sq.mtrs	Annual rainfall in Chandigarh mm / year	Rainwater precipitation in catchment area (Liters/ year)	Rainwater precipitation in catchment area (KL/ year)
1	Total Building area	11,763.44	720.00	8,469,675.20	**8,469.68**
2	Total Open Paved/ Parking Area	13,229.44	720.00	9,525,200.26	**9,525.20**
3	Total green/ porous area	40,195.29	720.00	28,940,612.01	**28,940.61**
TOTAL RAINFALL IN CATCHMENT AREA					**46,935.49**

Using the above 3 tables, which have been tabulated based upon actual date on the site as per information provided by the Institution and it has been compared with the standards to assess the water budget of the college.

Water Budget is a hydrological tool used to quantify the flow of water in and out of a system. The law of water balance states that the inflows to any water system or area are equal to its outflows plus change in storage during a time interval *(Ref: Wikipedia)*. In hydrology, a water balance equation can be used to describe the flow of water in and out of a system.





WATER BALANCE / WATER BUDGET OF CAMPUS

Total Water Supplied to College (IN)		Total Water Saving/ Conservation (OUT	
WATER IN		**WATER OUT**	
Source of Supply	**KL Water/ Annum**	**Point of discharge**	**KL Water/ Annum**
Rainwater precipitation on rooftop	8,470	Groundwater recharge by one injection wells	3,738
Stormwater on roads etc.	9,525	Stormwater Sub-surface recharge	5,715
Rainwater on green areas	28,941	Green area Sub surface recharge	20,258
MCC Fresh water metered supply	40,438	MCC Reclaimed water use in gardens	8,259
MCC Fresh water metered consumption	8,259	Recycling by 50 KLD STP Installed in College Campus	7,018
		A	**44,988**
		Evapotranspiratin Losses from Stormwater	1,905
		Evapotranspiratin Losses from Green areas	5,788
		Stormwater run off losses preventable	1,905
		Green/ open areas run off losses preventable	2,894
		Overflow losses due to undercapacity of injection wells	4,732
		Hostel Sewage generated - possible recycling by a STP	25,333
		Miscellaneous lossed in sewage/ drainage systems	8,088
		B	**50,644**
TOTAL WATER IN	**95,633**	**TOTAL WATER OUT (A+B)**	**95,633**

3.2.3. Recommendations:

1. The institute should work to reduce the 36% losses of water as per water balance/ water budget table by installing STP in hostel block.
2. Rainwater harvesting system should be doubled to cover all rooftop areas - recycling rainwater for potable use may also be explored in addition to ground water recharge.
3. Water metering should be strengthened and smart water usage monitoring system should be installed at appropriate locations.
4. Water management plan and drawing of the existing infrastructure of the institute should be prepared.
5. Sewage Treatment Plant should be augmented to recycle waste water from hostels.
6. A DEWATS waste water model system may be implemented near the botanical garden/pond in collaboration with botany department for natural waste water treatment.
7. The institute should promote use of biodegradable detergents and cleaning agents in college and hostel, preferably through designed dispensing units after consultation with relevant experts of this field, however at laboratory scale institute is promoting the use of biodegradable cleaning agents in college and hostel-like eco enzymes, the natural eco-friendly disinfectants.

3.3. Energy Audit

Energy cannot be seen, but we know it is there because we can see its effects in the forms of Heat, Light and Power. All these require natural resources to generate. An energy audit establishes the baseline for improvements in an organization‘s energy use. According to Energy Conservation Act, 2001, Energy Audit is the verification, monitoring, and analysis of the use of energy including submission of a technical report containing recommendations for improving energy efficiency with cost-benefit analysis and an action plan to reduce energy consumption.

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. In the specific case of an educational institution is to determine ways and means to move the institution towards net zero energy consumption while ensuring that the stakeholders have necessary awareness and appreciation for the energy management process.

After pre-audit survey it was identified that the college was having large solar power generation and its sufficiency was required to be assessed for audit purpose. Hence, the energy audit strategy mostly focused on macro level analysis at campus level rather than micro level assessment of energy efficiency at point of usage level.

3.3.1. Observations and findings/conclusion:

1. The total sanctioned load of the college campus was found to be 421.39 KWhr.
2. The college has installed total of 1153 of grid and 36 off grid solar panels – comprising 583 on grid and 15 off grid solar panels in college campus, 570 on grid and 21 off grid solar panels in hostel campus.
3. The total capacity of solar power generation is 365 kWh and college is fully harnessing renewable energy in terms of solar electricity. The electricity generation through Solar power was 943664 KWH in Apr 2020 - March 2021.
4. Since June 2020, the college is continuously receiving negative electricity bills till date. The college had a clear saving of Rs. 86.96 Lakhs during this period and would be soon recovering the estimated Rs. 1.25 crore cost of installation of solar power plant shortly in approx. 4.5 years of time.

5. Seventeen solar lights have also been installed in college & hostel to save energy[1].
6. Based on review of monthly electricity consumption and solar energy generation net metering bills, college is 100% neutral in energy consumption. It is generating equal or more energy than it is consuming. Thus, as per preliminary assessment it may be claimed that the college has achieved Zero energy or Zero Net Energy (ZNE) campus status, as per table and graph below based upon documents shared by the institution, the college is having negative Electricity Bill June 2020 – January 2022 (*still continuing)*.
7. The college had conducted several energy efficiency awareness programs for sensitizing staff and students on energy efficiency, renewable energy, and monitoring.
8. Mess and canteen has been outsourced by the college, hence the usage data of no. of LPG cylinders has not been compiled, however it is recommended to be collected in future.

3.3.2. Assessment and reasons for finding:

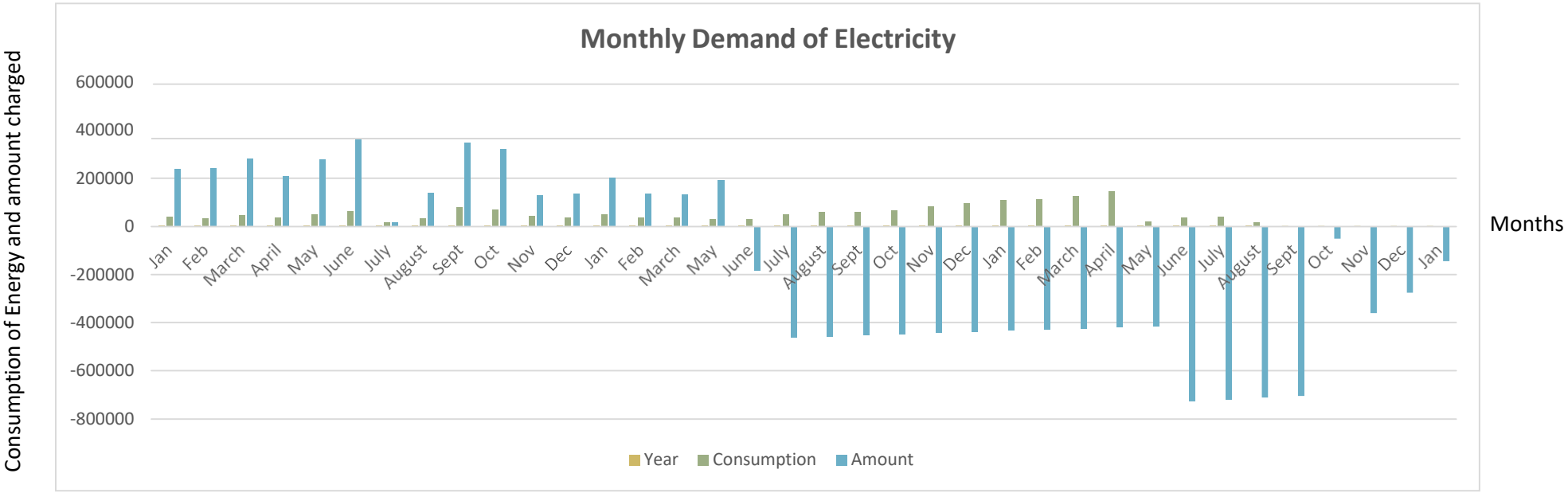
1. The net zero energy bills being achieved by the college may partly be considered due to Covid – 19 restrictions since past 2 years, however due to massive scale, i.e. 360 kWh of solar energy generation and energy efficiency measures in the college it may be reasonable assumed that the college may continue to save electricity due to solar.
2. In the present study micro level inventory review was done based upon the information available with the institution in documented form of electricity consuming equipments such as instruments, fans, air conditioners, computers etc. At macro level total electricity generation and consumption was reviewed and verified from energy bills, and semi-structured interviews was held with various teaching and office staff concerned with these activities. Most of the primary and secondary data as provided by the staff of the institution was reviewed based upon which this assessment has been done.
3. The monthly electricity bills from Govt. Electricity department were studied based upon electricity reading register maintained by the college administrative department *as per table and graph below and* accordingly the negative energy bills being received by the

[1] *Ref. AQAR 2019-2020*

college from June 2020 to till date was identified as evident from the negative graph also below:

Table: Recorded electricity bills data to compile benefits due to solar panels at MCM DAV during the years 2019-2021 based upon bill wise actual data.

Month	Year	New Electrical Reading	Old Electrical Reading	Electrical consumption without solar	Net Electrical Bill Amount Rs.	Trend
Jan	2019	217,931	213,034	39176	236,843	
Feb	2019	222,111	217,931	33440	241,667	
March	2019	228,025	222,111	47312	282,215	
April	2019	232,690	228,025	37320	209,300	
May	2019	238,985	232,690	50360	277,129	
June	2019	246,778	238,985	62344	362,430	
July	2019	249,012	246,778	17872	17,130	
August	2019	253,117	249,012	32840	140,957	
Sept	2019	263,032	253,117	79320	347,056	
Oct	2019	272,043	263,032	72088	321,154	
Nov	2019	277,307	272,043	42112	128,052	
Dec	2019	281,837	277,307	36240	134,926	
Jan	2020	288,220	281,837	51064	203,806	
Feb	2020	292,890	288,220	37360	134,935	
March	2020	297,562	292,890	37376	133,645	
May	2020		297,562	Average basis	194,296	
June	2020	303,772	297,562	Solar Generation 32232	(182,592)	Negative
July	2020	305,193	303,772	Solar Generation bank Unit 49464	(461,853)	Negative
August	2020	306,727	305,193	Solar Generation bank Unit 59920	(457,190)	Negative
Sept	2020	308,428	306,727	Solar Generation bank Unit 61296	(452,480)	Negative
Oct	2020	309,820	308,428	Solar Generation bank Unit 66136	(447,770)	Negative
Nov	2020	310,936	309,820	Solar Generation bank Unit 83680	(443,060)	Negative
Dec	2020	311,958	310,936	Solar Generation bank Unit 95776	(438,350)	Negative
Jan	2021	313,215	311,958	Solar Generation bank Unit 109560	(433,734)	Negative
Feb	2021	314,503	313,215	Solar Generation bank Unit 112664	(429,165)	Negative
March	2021	315,719	314,503	Solar Generation bank Unit 127064	(424,549)	Negative
April	2021	317,096	315,719	Solar Generation bank Unit 145872	(419,886)	Negative
May	2021	318,632	317,096	Solar Generation bank Unit 19696	(415,270)	Negative
June	2021	320,112	318,632	Solar Generation bank Unit 37552	(725,656)	Negative
July	2021	321,134	320,112	Solar Generation bank Unit 39307	(718,856)	Negative
August	2021	322,811	321,134	Solar Generation bank Unit 18397	(711,580)	Negative
Sept	2021	324,156	322,811	Solar Generated Net Banked Units	(704,440)	Negative
Oct	2021	327,536	324,156	Solar Generated Net Banked Units	(50,365)	Negative
Nov	2021	330,064	327,536	Solar Generated Net Banked Units	(360,806)	Negative
Dec	2021	332,013	330,064	Solar Generated Net Banked Units	(275,058)	Negative
Jan	2022	334,165	332,013	Solar Generated Net Banked Units	(143,835)	Negative



Graph Net monthly electricity bills at MCM DAV during the years 2019-2021 based upon above table

3.3.3. Recommendations:

After having achieved the significant milestone of Net Zero Energy Building since past 1.5 years, the college should henceforth focus on sustaining and maintaining this achievement in years to come.

1. It is recommended that solar energy capacity be increased to atleast match the connected load of the college, i.e. 421 kWh to ensure negative electricity bill is maintained and campus continues to remain net zero campus even after full physical functioning of the college after removal of Covid-19 restrictions.
2. The replacement of Geysers maybe done in hostels and the college maybe fitted with energy efficient water heating equipment, such as heat pumps etc.
3. Smart sub-energy meters should be installed at various buildings to monitor building level electricity consumption with smart metering.
4. Explore other model energy generation technologies and other energy efficiency measures on continuous basis, including regular maintenance of solar power systems.
5. Continue with energy saving programs, and sensitization campaigns.
6. Periodically carry of energy assessment both on institutional basis.
7. Actively document and publish the net zero energy saving milestone achieved by college in national and international journals, magazines and programs both internally and on third party basis.
8. The college should explore alternatives to use of LPG with other renewable sources.

3.4. Waste Audit or Material and resource recovery audit

Solid Waste Management refers to the collection, segregation, storage, transport, processing, and disposal of solid waste. Today waste is not only what we throw in our garbage bags; it includes all forms of resources that are used in excess to the actual requirements.

The basic principle being to facilitate and encourage waste segregation at source and ensure reuse or recycling of materials, thereby avoiding waste being sent to landfills and gradually increasing dependence on zero waste purchases, local purchases etc.

3.4.1. Observations:

1. It is clearly observed and evident that the college has exemplary commitment for sustainable waste practices which is reflected in the entire process of waste management, i.e. waste segregation, collection, recycling and disposal of all kinds of waste.
2. The college has achieved 100% reused of wet or food/ green waste generated in the college as biogas and fertilizer.
3. Minimal quantity of hazardous waste is generated in the college through varnishes/paint products. No biomedical waste is generated in the campus as no clinical samples or tests are done in any laboratory. Construction and demolition waste is managed by the concerned contractors. However, there is scope of Improvement in monitoring and data collection on hazardous waste and C&D waste.
4. College is undertaking several best practices in the field of waste management which is evident after perusal of institutional records and discussions with stakeholders which includes actions such as management of organic waste through composting, vermicomposting and biogas plant generation. Individual committees or persons responsible look after various practices and keep relevant records as well. For e-waste disposal, the college has signed an agreement with a private company and a dedicated committee looks after the collection and transportation of e-waste from the campus to the concerned company. However, there is a lack of proper coordination and outcome based quantitative data for full process of waste management system which makes it difficult to assess the progress made by the college in waste management on year on year basis; for regular and smooth monitoring and collecting/ disseminating information including generating wealth from waste.

5. The college is also reusing certain waste materials inside the campus, as planters, other decorative items, developed a model of mushroom cultivation from domestic and agro waste to produce edible mushrooms.

3.4.2. Audit Assessment and reasons for finding:

1. The college was observed to be a pioneer in waste management system practices. Committed to the cause of _Swachhta', the college has undertaken slew of initiatives inside the campus as well as with the community. This clearly was evident during physical survey of the college and interactions with staff and students. After complete assessment, it is beyond iota of doubt that the institutional commitment towards waste management is sincere, well documented, exemplary and most importantly sustained and institutionalized over a period of time as the college has been awarded in year 2018 with 1st Prize for the Cleanest Residential College in the Country in National Swachh Campus Rankings by MHRD, Government of India, in year 2019 awarded with all India 3rd rank in Best citizen led innovation in the Swachh Sarvekshan by MoHUA, Govt. of India, felicitated with Best Management/Maintenance of Wet Waste on the occasion of 70th Republic Day Celebrations in 2019 by Municipal Corporation, Chandigarh Administration, in addition to several appreciable activities in the field of waste management being recognized by local and national print media and departments.
2. In the field of Information, Education & Communication (IEC), the college has regularly organized and participated in plethora of programs, exhibitions, campaigns, events, competitions, interactive knowledge sessions while ensuring that participants and beneficiaries are adequately made aware about Solid and Liquid Waste Management practices. Even during Covid-19 lockdown and restrictions thereafter, several online events have been regularly conducted, which have been properly documented in various reports and publications. After reviewing the variety and quantum of the IEC activities being conducted, the positive impact of these IEC activities is clearly reflected in the increased concern and awareness about waste management and environment conservation in general among staff and students of the institution.
3. *Solid Waste Management*: The existing solid waste management practice in the campus has been found to include segregation of waste at source into organic and non-organic through color coded dustbins (blue and green) at most places in college and hostels.

The dustbins have been permanently labelled by paint depicting wet and dry waste on them and few are ready made procured dust bins. The waste thus generated within the campus is collected from community bins kept/constructed at various locations and transported from community bins to disposal site located outside the campus. Finally, the waste is dumped into the municipal dumping site. The contract is given to the local agency M/s Saarthi Security to provide housekeeping services including waste management. Their work also involves to carry the waste from the community bins inside the campus and dump them to the municipal dumping site outside the campus. At the building level, waste is collected daily and dumped into the community bins. From these community bins, waste is collected twice a week. Waste collectors called local-vendor (Kabadiwalas) also collect waste like glass bottles, newspapers, metal scrap, etc. from residences of staff and hostels. The institute ensures that all the recyclable materials are recycled and only the most non reusable items are sent to MC dust bins by their outsourced housekeeping agency. For this, they maintain gate passes for scrap items sold or tendered and regular register entries of sweepers cleaning the institution. In nutshell, the college was found to have a sincere intent and action to adhere to all the norms and guidelines for waste management. The college takes regular initiatives to reduce and eliminate single use plastics.

4. *Wet or Biodegradable Waste:* The college was found to be 100% Zero waste for food/ wet waste since it fully utilizes the mess food waste for the production of biogas which is used for cooking and everyday about 30-40 kg of green waste generated in the college is fed to the 3 composting units of 10 ft x 15 ft dimension each, with which the slurry from biogas plant is mixed to augment the degradation of garden waste. This has estimated to save purchasing about 2500 kg of manure per annum from open market while also ensuring that food waste does not end in landfill and gets converted in a natural way as energy and fertilizer. This has also enabled a proper use of digested slurry from biogas which would otherwise be polluting if left open in the environment.
5. *E-waste:* The college has signed an agreement, which is valid as of date, for periodically collecting E-waste from the campus. The college has dedicated bins to put e-waste and also periodically put notices for students and staff to deposit their e-waste. Apart from that it was found that the college periodically organizes seminars, workshops and programs related with electronic waste to sensitize the stakeholders in order to improve the e-waste management system in college.

6. *Hazardous waste:* Most departments do not generate large quantities of hazardous waste and can be classified as conditionally exempt small quantity generators (generation of less than 100 gms of hazardous waste per month) as per Hazardous waste (Management, Handling, and Trans-Boundary Movement) Rules, 2008 amended from time to time. During the study it was found that stakeholders are not adequately aware of the regulations that may apply to them or they may have unintentionally chosen to ignore the regulations, believing they do not have to comply. Household and office cleaners such as tiles and floor cleaners, pesticides, wood preservatives such as varnishes and paint products which are disposed of in very low quantity. The small quantity of hazardous waste generated in science laboratories is usually treated by a neutralization method before disposal. The stakeholders despite having an understanding of hazardous waste, were mostly found to be uncertain of disposal of disposal of hazardous waste. During the study it was noticed majority of stakeholders were confident of their obligations regarding hazardous waste, and since ideally proper handling, collection, and transportation of hazardous waste begins with understanding the potential hazards related to their use hence it is recommended that training and sensitization session for stakeholders be conducted for disseminating information on hazardous materials being used in the college. The dissemination of information can involve discussions on the toxicity, reactivity and possible detrimental health effects. Simultaneously to improve overall waste management system of the college, the college should implement a proper collection and management of hazardous waste across the campus, even though based upon the unstructured interviews and discussions conducted with staff, it was found that household batteries are collected and transported to a private firm for their disposal
7. Institutional mechanism for planning, managing and monitoring of waste management is required to be strengthened as the information and management of different waste streams, their collection/disposal, recycling and reuse, i.e. the entire value chain from material - waste generation - resource recovery is vary scattered among several people and lacks organized information based upon bills, receipts, registers, awareness programs.
8. *Construction and demolition (C&D) waste:* Though there does not happen to be a lot of construction activity inside the campus, however it was observed that there is no standards SOP or policy to be followed for construction and demolition waste, including that is generated during various maintenance activities of the college

infrastructure. C&D waste at present is managed by contractors, however to improve overall environment footprint and waste management, a sustainable C&D policy be implemented in contracts to improve the life cycle footprint of waste generated in the college.

9. *Biomedical waste:* Since dissections have been banned by UGC a long time back, no animals are used for any academic or research purpose. Secondly no biomedical waste is generated in the health centre / sick room of the college.

3.4.3. Recommendations:

1. The campus should work towards zero waste by eliminating generation of waste. Accordingly, a zero waste plan for the institute should be created and implemented.
2. Ensure use of biodegradable solid and liquid products in place of chemical/plastic products, for daily use items.
3. Biogas system should be expanded, possibly to also get external green waste and thus ensuring energy security for the campus also.
4. Disposal of biomedical waste should be streamlined.
5. Waste management monitoring and information should be streamlined, and appropriate management information system MIS should be implemented.
6. Multiplicity of committees and individuals dealing with waste may be streamlined at least to the extent of sharing of information.
7. Disposal of hazardous waste should be streamlined, especially considering life-cycle costs of for e.g. old and discarded solar panels made up of harmful metals.
8. Resource recovery should be ensured for all types of non-biodegradable waste.
9. A detailed solid waste management plan may be prepared for the college, if required with help from solid waste management expert to ensure proper flow, quantification and monitoring of entire waste management system with focus on resource recovery and waste elimination aiming to zero waste.

3.5. Air and Noise assessment

Air quality assessment

Both indoor and outdoor air quality is an indicator of the state of surrounding environment and also affects the health of the people both in long and short term. In outdoor environment PM10, particulate matter, airborne pollen concentration etc. are important indicators of air quality. In indoor environments people require fresh air because people spent most of the time inside the dwelling (Lingnel 2008, Ayanbimpe et al. 2010). Most atmospheric air, whether indoor or outdoor, contains certain varieties of some fungal spores, and seasonal atmospheric pollen (Chadeganipour et al. 2010). Certain pollens are a health hazard especially for allergic people and also is an indicator of air quality from health perspective (Kobzar, 1999).

Ambient Noise levels

Under the Air (Prevention and Control of Pollution) Act, 1981, noise is regarded as a pollutant. There are two major settings where noise mostly occurs; these are - community noise and industrial noise. Community noise is also called environmental noise and is defined as the noise emitted from all the sources except the noise from the industrial sources. As far as community noise is concerned the WHO guidelines recommend less than 30 dB(A) in bedrooms during the night which is essential for good quality sleep. Again, it should be less than 35 dB(A) in classrooms which is important for good teaching and learning conditions.

3.5.1. Observations:

1. Air quality monitoring stations were physically found, recorded data was made available till 2017, however the data till date was not available.
2. There was no noise monitoring equipment present inside the college campus, and no third party testing had been done.

3.5.2. Recommendations:

1. The air quality monitoring stations to be made operational and data collected.
2. Ambient Noise testing to be carried out, in house or by 3rd party laboratory.
3. Air borne fungal concentration testing for assessing indoor air quality and air borne pollen concentration for outdoor air maybe be carried out.

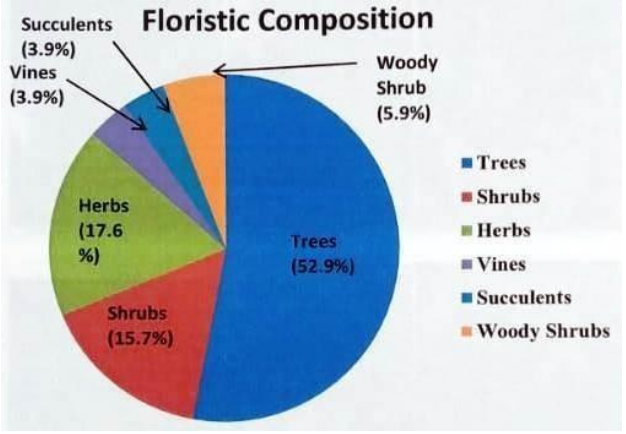
3.6. Biodiversity Audit

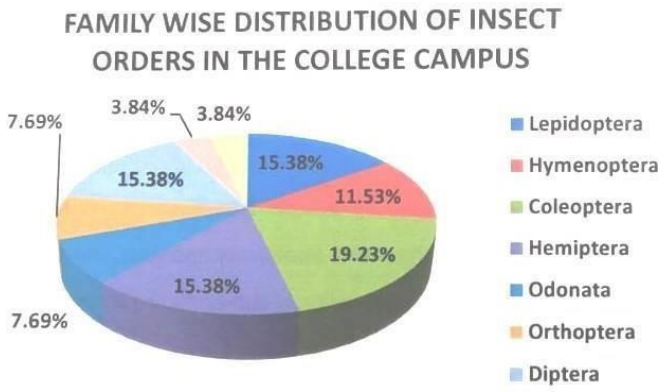
The objective of biodiversity audit is to assess the extent of activities undertaken and how well overall ecological environment is maintained. Ideally it should be a periodic yearly activity and efforts of the all stakeholders should be involved. Here a broad definition of biodiversity has been considered, i.e. Biodiversity is all the different kinds of life form available in a given area—all the variety of animals, plants, fungi, microorganisms like bacteria and large flora & fauna that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. Presently, work done by the institution was reviews, w.r.t all flora, fauna, horticulture, landscaping and overall ecological environment on the campus. At the outset it was observed that the college has involved its staff and students in several knowledge programs, sessions related to biodiversity from time to time, which is commendable.

3.6.1. Observations:

1. It was clearly visible that the extremely unique characteristic of the College Campus is its lush green environment with rich flora and fauna biodiversity.

2. The Botany and Zoology department have prepared a comprehensive directory of species (both flora and fauna) found in the campus as part of biodiversity audit, which is updated year-on-year basis. The documentation by botany department had carried out with 2nd and 3rd year students where it was observed that 52.9% are trees and rest are shrubs, herbs, vines & succulents (as below). Documentation by zoology department had carried based visual observation during 6 months period and accordingly family wise distribution of insects was identified (as below).





3. The Botany department has created a first of its kind Artificial Forest, and a ecologically rich biodiversity pond, and botanical garden which after physical inspection is a living micro-ecosystem in itself, and is an excellent location for learning opportunity for students and other people.
4. The college has a densely-foliaged nallah running at its rear, which bears a rich biodiversity. During the biodiversity audit conducted by Botany and Zoology department during Covid 19 lockdown a rare owl species Brown Hawk Owl or Brown boobook was identified to be part of the campus's biodiversity. Apart from this lone, rare owl, the Zoology department's team had recorded 33 avian species on the campus, including the Indian Scops owl, Indian Paradise flycatcher, White-throated kingfisher and the Crimson sunbird.
5. The college has been practicing Sustainable Urban Farming (SUF) since 2018 with an aim to create awareness about environment sustainability and biodiversity. Various crops and vegetables that consume less water are grown in the college campus using compost and vermicompost prepared in-house. The produce is distributed amongst the staff and thus they are gifted health in a way. Staff members and students are encouraged to grow some organic food at home also, thus creating a cascading effect in community. The College conducts ‗Be a Health Manager'- an annual 7-10 days' workshop that focuses on eating chemical free healthy food while protecting the Nature.

3.6.2. Assessment and reasons for findings:

The Institute has done periodic and detailed documentation of biodiversity within institution. In addition, regularly many conservation practices are taken up by the College so that anthropogenic impact on the biodiversity components and ecosystems are minimized.

Different conservation practices also have been applied for better and sustainable campus ecosystem. The observations have been based on the biodiversity audit conducted by the institute which is well documented and published online:
https://mcmdavcwchd.edu.in/sustainable-practices/#1561628614938-5b68e80b-279ev

3.6.3. Suggestions and Recommendations

1. Institute in future should build upon their biodiversity database by mapping biodiversity using Geospatial Technology, since satellite data has emerged as one of the vital sources in the study of biodiversity, which today can be done using open-source software like Open Data Kit or ODK. Such special purpose maps developed using Geospatial open source software, help in identifying the pattern of distribution of trees, demarcating the faunal zones on the basis of floral and faunal coexistence, taking decision about the future plantation drives and species of plants to be planted.
2. The Botany department should install Quick Response Code (QR Code) or RFID for each tree, as the next step in spreading awareness about biodiversity and regularly conduct tree audit and/or plantation auditing system.
3. As part of biodiversity, contribution of MCM DAV Campus in carbon sequestration or biomass should be regularly calculated as a key ‒feature‖ of a tree is that trees sequester carbon from atmosphere.
4. MCM DAV campus can be converted as an important site for educational tours by developing permanent galleries on biodiversity, ecological conservation, etc.
5. The effort of documenting and collecting detailed information of flora and fauna in the Campus has emerged as one of the innovative endeavors of approaching the current challenges relating to ecology and environmental deterioration. The need to create awareness about various environmental problems, maybe be fulfilled by involving more stakeholders in the biodiversity audit survey.
6. The campus already has one botanical garden. This garden can be developed and expanded to have more diverse plants.
7. The biodiversity audit survey must be conducted every five years to update the information.
8. Horticulture and landscaping should be done to ensure biodiversity is maintained.

3.7. Infrastructure, Site planning & outdoor Environment Audit

This sub-sector audit related to infrastructure particularly focused on reviewing the below activities or process of the institute:

1. Overall site planning and layout.
2. Infrastructure of the institute including building design, green buildings inside the campus, urban heat island effect etc.
3. Transport and mobility.
4. Promotion of traditional Indian - Vedic concept mutual co-existence.

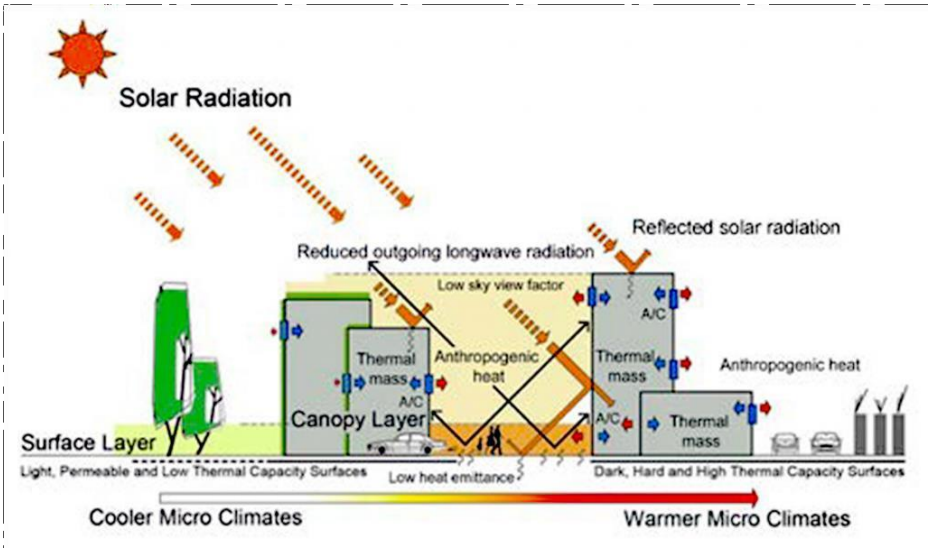
3.7.1. Observations:

1. The college campus has sufficient green area, i.e. and rest 38% being concrete building or paved/road area.
2. The topography of the college is such that on the back side of the academic block the natural slope leads to, where the rainwater drainage rushes during high rainfall event.
3. Buildings and the campus is designed in such a way that it is quite airy during summers and has sufficient plants to keep the building cool naturally.
4. The internal campus mobility is pedestrian friendly and college even has e-rickshaw for internal transport of goods.
5. There is a focus on promoting Mutual Co-existence concept from ancient Indian culture, even though Climate change, global warming etc. have become buzz words recently in past few decades with globalization. This is one of the best practices for value based education, which are evident as the institution has built Rishi Vatika**,** Yajashala and Meditation Huts.

3.7.2. Recommendations:

1. The college should get green building certification.
2. The Vedic ancient Indian cultural concept of mutual co-existence with nature should be developed further and incorporated in all policies of the institution, so that students learn the importance of mutual respect and mutual co-existence with nature as a part of life and not just as an environmental or a commercial eco-friendly activity in this age of consumerism.

3. Chandigarh city IMD has mentioned that the average minimum temperature of the city has gone up by 1.78 degrees Celsius, while the maximum temperature has gone up by 0.63 degrees Celsius over the past seven decades primarily due to Urban Heat Island (UHF) effect. In the college UHF effect is suspected to be quite less since 62% is green area, but UHF effect inside campus should be calculated and work



towards reducing its impact on the 38% built area be done.

3.8. Health and Wellbeing Assessment

The World Health Organization (WHO) defined health with a phrase that modern authorities still apply. ‒Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.‖ In 1986, the WHO again updated definition of health as ‒A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities".

Health and well-being is a critical component of any green or environment audit. Overall health and well beings of occupants is the most important aspect of Indian Green Building Congress - Campus rating system also.

The observations in health and wellbeing covers areas as below:

1. Providing clean ambient atmosphere to the occupants
2. Ensure that the campus design caters to differently abled and senior citizens
3. Provide access to all basic amenities, so as to encourage walking and thereby improve quality of life
4. Provide health & well-being facilities, so as to enhance physical, emotional and spiritual well-being of campus occupants - Health & well-being facilities include, but not limited to, aerobics, gymnasium, swimming pool, yoga, meditation, indoor games, outdoor games, playground, etc. Additionally, provide healthcare, emergency & security facilities within the campus such as first-aid/ clinic, pharmacy, emergency alarm, surveillance system etc., in the campus
5. Promote welfare of the construction workforce by providing safe and healthy work conditions.
6. Work for other personal, inter-personal and community issues like mental health, anti-ragging, hygiene etc.

3.8.1. Observations:

1. MCM DAV College has been found to provide the right and best atmosphere for developing and sustaining an individual and community health and well-being in the best possible way.
2. The institute campus is complete friendly to differently abled and senior citizens.

3. All facilities inside the campus are easily and conveniently available.
4. The institute regularly conducts seminars, workshops, and community programs in addition to having counseling and helpline nos. through various clubs, committees and associations related to mental health through Geetanjali helpline, hygiene, anti-ragging initiatives, balanced diet etc.

3.8.2. Recommendations:

1. Carry out specific survey on general health and wellbeing of the occupants of the campus to assess the gaps, and check the overall impact of all the programs, support group sessions, overall living and working environment on health and wellbeing of the staff and students.

3.9. I.E.C. Activities and Institutional, Planning and Management Audit

For a successful environment system in place having a right institutional system for environment management and appropriate number of Information, Education and Communication (I.E.C.) activities and communication thereof is important.

Here the below was reviewed:

1. Quantum of no. of IEC activities undertaken and the nature of activities was reviewed.
2. Institutional management information system or MIS was reviewed, particularly w.r.t. of various committees/cells.
3. The Policy framework of the institute pertaining directly and indirectly to environment was studied. The following policies were reviewed:-
    a. Swachhta Policy
    b. Green Campus Policy
    c. Policy & Procedure for mobilization of funds.
    d. Purchase procedure and policy.
    e. Procedures and policies for maintaining and utilizing physical, academic and support facilities.
    f. Gender Sensitization Policy
    g. Innovation and Startup policy

3.9.1. Observations:

1. The institution has undertaken several activities year on year basis. After perusal of various reports, the below activities were registered:

Year	Environment Activities	Environment Awards
2021-22	Several	04
2020-21	Several	03
2019-20	39	02
2018-19	24	02
2017-18	09	02

In addition to above several Individual Awards have been received by staff and faculty of the institution due to their work, they include:

Principal Dr. Nisha Bhargava - 6 awards

Dr. Vandana Sharma - 6 awards

Dr. Sandeep Kaur - 5 awards

Dr. Neetu - 1 award

Dr. Purnima - 1 award

Dr. Meenakshi Rana - 1 award

Dr. Shafila - 1 award

2. It has been observed that the college has total of 123 different committees out of which 18 committees, which are given below; are directly working in the field of environment:

S.No.	Date of Constitution	Name of the Committee / club
1	23.11.2019	Environment Committee
2	22.07.2021	Horticulture & Landscaping Committee
3	01.07.2021	Disaster Management Cell
4	05.02.2020	MIS Committee
5	31.01.2020	Bio Gas & Compost Units Maintenance Committee
6	08.08.2020	Renewable Energy Committee
7	13.09.2021	Swachhta Committee
8	19.03.2018	Rain Water Harvesting Committee
9	24.07.2021	Social Responsibility Committee
10	25.08.2021	Sustainable Practices
11	04.09.2021	Unnat Bharat Abhiyan
12	24.07.2021	Swachhta Core Committee
13	05.11.2019	Committee for 'Plastic Free Campus'
14	-	Cleanliness Committee
15	13.07.2021	Green Audit Committee
16	-	Eco Club
17	-	RUSA committee
18	01.04.2021	EAT Right Campus initiative Committee

3. Several committees are undertaking similar environment related activities as per Government guidelines but it has led to multiplicity of the work and repeated information. Compiled data from various sources is not available at central location leading to gaps in monitoring the overall year on year progress, w.r.t. environment and sustainability footprint in particular only.

4. The policies are quite comprehensive documents, and the fact that so many policies have been made shows the commitment and micro level focus of the institute in sustainable activities.
5. Swachhta Policy - It is a brief but a comprehensive policy document, however it should develop a framework for develop of sub-policies and should have a clear mechanism to ensure that this policy is being followed and implemented in all the functioning of the institution in concerned committees or activities.
6. Though it is good there are policies for various activities but on detailed review of the policies it was found, that the policies have some shortcomings related to detailed framework relating to environment which can be improved to ensure all - round sustainability. Such as the startup policy should have a specific component to encourage environmental ideas, construction policy should have mandate to encourage purchase of eco-friendly materials, sustainable disposal of C&D waste etc., green campus policy should entail all green activities since it reflects all green activities of the college including some of them being undertaken by various committees etc.

3.9.2. Recommendations:

1. The institute should strengthen green education, and collaborate with eco-friendly individuals, companies and organizations while developing sustainable academic-industry partnership in the field of sustainability and Indian - Vedic principles of benefit to society.
2. The extensive number and nature of IEC activities undertaken by the institution should be maintained in future as well; however, documentation and MIS of the same should be streamlined at one central location or central committee of MIS particularly related environment.
3. The institute has large no. of committees, i.e. 123 out of which 18 are directly involved in environmental activities, apart from some environment activities happening in other committees as well. Even though some of the committees have been formed to comply with various mandatory guidelines, however to streamline data collection, MIS and to decrease overlapping activities and enhance synergistic common outcome based results, certain committees from MIS point of view maybe

restructured. So it is recommended to restructure and streamline the number and function of environment related committees.

4. It is suggested to restructure institutional planning and execution system of committees based upon Process or Complete Activity. The purpose is to develop synergies and have central quantified data collection to monitor improvement in outcomes on year on year basis. For example, Swachhta Committee, Eco Club, Plastic Free Committee, Environment Committee, Sustainable Practices committee, Cleanliness committee etc. all have a deeply overlapping Core mandate and working on waste management or cleanliness which may be combined at least for data collection point of view under one central committee to look over a single function of waste management- material management to resource recovery to achieve the final common outcome of zero waste or waste elimination. Similarly, IEC activities may be done by any cell/ club/ committee or body but the MIS especially for environment related programs, be handled by core environment information system committee.
5. The functioning of environment activities may be streamlined to Process Based Management (PBM) - with process focusing on water management, material & resource recovery (*waste management/cleanliness),* Energy management, Information systems, IEC activities etc.
6. Green Campus Policy - This policy needs to be updated to develop a framework on how to achieve a green campus, rather than only mention list of initiatives, which may be suggestive in nature but not absolute.
7. It is recommended that environment conservation principle for e.g. elimination of single use plastic, biodegradable materials, reduction of waste, energy/ water efficiency etc. as the case maybe should be made a core part of evaluation before taking in purchase, fund generation, construction and maintenance decision. Therefore, zero waste and other environment principles should be made a part of: - 1. Policy for mobilization of funds, 2. Purchase policy and 3. Policy for construction & maintenance. The policy should have a specific framework of measuring of doing eco-friendly purchases and ensuring that resource saving and funds generation through eco - friendly activities are part of finance system also.
8. ***Startup and innovation policy*** - The College should modify the startup policy to specifically incorporate environment related mandate in the policy. College should actively encourage students to take up innovations and startups related to

environment, and particularly those which are in line with institutional priorities or activities. For this, the college may periodically put in notice boards the eco-friendly business idea it wishes to implement which students may undertake, for e.g. waste management, housekeeping, building designing, landscaping, gardening, horticulture etc. This would be helpful to budding innovators as they can test their eco-friendly idea, receive payment from college and since the innovation with be in line with the activities of the college it would help the college reduce its use of resources and help in developing career alternatives of the students while ensuring the college itself transforms to be a place of sustainable and eco - friendly innovations and startups.

4. Audit Conclusions

Overall Conclusion and reasons for findings:

This report can be very evidently concluded based upon the findings of this first green audit conducted at MCM DAV College that - in terms of overall environmental sustainability of the college campus, commitment of the management/staff/ students towards environment and environmental initiatives undertaken; that the college has done exceptionally well to preserve overall natural and built environment and ensure sustainable development. The college has undertaken activities more than what was desirable or mandatory, and impeccably implemented on ground the maximum possible it could do to the best of their abilities and knowledge, which is clearly evident by mere survey of the campus only.

Though detailed observations have been listed in sectoral sub-audits as part of Chapter 3 of this report above, however, the eco conscious commitment of the institution can be reliably established since the institution has undertaken several projects and activities-related with water and energy conservation, waste management, Information-Education-Communication (IEC) activities, institutional and community activities etc. NSS and UBA work is having major impact on the adopted villages. Based upon professional assessment, it can be said that in terms of showcase projects, all that could be possibly done by the college, has been done. Above all, these activities have just not remained mere projects but nearly all of them have also been well maintained and sustained over the years, by active involvement of all stakeholders, which is in the end of day directly ensuring the overall health and wellbeing of the occupants in an academic setup and thus ensuring environmentally sustainable.

However, the above fact having completed most of the projects which make a campus be green and ecofriendly, has now become somewhat like a constraint for future endeavors is pretty evident by itself, since the question on what activities to do next so that each activity builds on the previous one is challenging to identify. This is primarily because of two reasons:

1. It brings a limitation on what future activities should be done for bigger socio-environmental impact.

2. How to connect the dots, i.e. various activities so that they coherently move towards some common aim and objective rather than remain good projects in itself.

The above two reasons, have been identified during the green audit study when the entire audit was being planned and done. The Green Audit study for MCM DAV college had been a professionally challenging activity, not because of the task in hand but because of the extensive work done and making sense of humongous amount of data and information on projects undertaken, primarily because of below reasons:

1. It entailed reviewing through 100s of reports going into thousands of pages since past 5-10 years (*Annexure I: References)* and cross linking information in various reports,

2. Data mining through several office records ranging from electricity registers, building drawings, gate passes, invoices, quotations, electricity/water bills etc.

3. Receiving feedback from college staff / management to understanding first-hand experience, rationale, motivation and commitment and

4. Physically inspecting all the projects/activities and studying the beneficial impacts of the same.

The complexity of this task to compile relevant information for purpose of green audit was enhanced due to lots of activities done by various committees on different environment issues to comply with various statutory or Government guidelines. So data collection became a challenge of Big Data or Data Mining, even though the College had done appreciable and impactful work however, to college collect, identify relevant data, structure the information, prioritize and organize the data in a meaningful way to identify future way forward had been typical exercise. Even though the quantum and quality of projects and activities undertaken year on year basis were significant, still it seemed that there were gaps in coherence, unified monitoring structure and a common policy direction due to which the dots representing various activities were not properly able to build one after another to take the organization towards a common vision in a planned way. So even though the projects undertaken were vast and as a consequence benefitted the college and environment by itself. This is critical since the sincere commitment of the college towards environment is clearly visible in its complete functioning and several best practices and it may lead to sustainable future for the institution.

5. Overall Recommendations

Each sectoral audit of each process mentions specific observations and recommendation, based upon gaps assessed. However, from holistic purpose in addition to those recommendations, apart from conclusions, sectoral audit chapter wise observations and reasons for findings, which have been mentioned in Chapter 3 and 4 of this report; the common and overall audit recommendations at organizational level are as below

Overall Recommendations:

1. Formation of an Institute Level Environment policy with a clear policy statement, vision of the institution, with its mission and values, elaborating on what it needs to achieve in targeted time frame of 3 years to 50 years both in qualitative and quantitative terms. This policy should then be divided into sectoral guidelines; which the concerned team members would implement to achieve the vision.

2. Develop an Environment Management Information System (MIS) to streamline, the collection, flow and management of information. The institute may also go for ISO 14001:2015 Certification of the campus with an Environment Management plan.

3. Restructure and reorganize all the main management committees especially related to environment from current Activity based to functional/process based system. The current system of issue or activity based system has limitation since MCM DAV College has successfully undertaken and accomplished most of the desirable projects or activities, and the institute now needs to move to higher level in future. Therefore, it is imperative that the institute should bring synergistic coordination in all activities done by various committees by looking at their common end objective for the benefit of environment and college. It is here that the benefit of Process Based Management (PBM) especially for environmental activities helps in.

4. Information, education and communication (IEC) activities key committee keeping central record/information maybe be centralized as per PBM irrespective of who does or contributes towards IEC projects and activities maybe any committee, group like NSS, club, individual or external organization like Government, CSR agencies etc. This is relevant because the core function of IEC activities is to increase awareness, communicate regarding projects and support any key functional activity for e.g. water, waste,

biodiversity, research etc. and by streamlining MIS in IEC activities the impact of work would be tremendously increased with same or lesser involvement.

5. The institute should plan to get a Green Building Certification through GRIHA.

6. Since the institute has met nearly all statutory and other desirable standards in environmental projects, it is time to move towards advanced sustainability concept of the institute like Zero Waste Campus for which zero waste policy should be formulated**,** Zero Waste Shop, Net Water Positive, Zero Energy Building etc.

7. Since the institute is practicing solid waste management at various levels, the data for the same should be streamlined under one committee or body for coordination and management information sharing purpose including its generation, collection and processing at all levels from academics, hostel to construction. Moreover, since scrutiny of records showed that only a basic solid waste management plan exists which needs to be upgraded into detailed and proper plan.

8. Ensure that basic green audit is done periodically on yearly basis and a detailed audit once in 5 years at least. This should be coupled with each sector wise activities and projects, possibly after regular consultation of a suitable Environmental Expert or Internal Green Committee of the institution on regular basis to monitor/coordinate progress.

9. The College can be a role model for teaching, learning and practicing growing of vegetables and herbs in urban spaces like terraces, balconies or small patches of land. It can serve as an example of urban kitchen garden, from where general public and other institutions can learn. This makes the college a place for community leadership as well. Conduct short term certification courses for outsiders, training sessions, model for commercial deployment etc. this would also help in revenue generation.

10. Staff and students should be encouraged to have startups and career initiatives related with environment, around the universities environmental objectives. If required, the institute should take external professional guidance. Also revenue generation through eco-friendly initiatives which fit the education and academic purpose of the institute should be explored. To strengthen Green Entrepreneurship - the institute should empower environmental startups as part of their policies.

ANNEXURE - I

LIST OF REFERENCES

1. Annual Quality Assurance Report (AQAR)
   I. AQAR 2010-2011
   II. AQAR 2011-2012
   III. AQAR 2012-2013
   IV. AQAR 2013-2014
   V. AQAR 2014-2015
   VI. AQAR 2015-2016
   VII. AQAR 2016-2017
   VIII. AQAR 2017-2018
   IX. AQAR 2019-2020

2. National Institutional Ranking Framework (NIRF) Reports
   I. NIRF Data for India Ranking- 2018
   II. NIRF Data for India Ranking- 2019
   III. NIRF Data for India Ranking- 2020

3. Rashtriya Uchchatar Shiksha Abhiyaan (RUSA) Reports
   I. RUSA Report 2018-2019

4. Swachh Bharat Abhiyan (SBA) Reports
   I. Quarterly Swachhta Report for Session 2018-19
      - July to Sep. - 2018
      - Oct to Dec. - 2018
      - Jan. to March - 2019
      - Annual Action Taken Report session 2018-19
   II. Quarterly Swachhta Report for Session 2019-20
      - July to Sep. - 2019
      - Oct to Dec. - 2019
      - Jan. to March - 2020
      - April to June- 2020
   III. Quarterly Swachhta Report for Session 2020-21
      - July to September 2020
      - Oct- Dec 2020
      - Jan - March 2021
      - April - June 2021
   IV. Quarterly Swachhta Report for Session 2021-22
      - July to September 2021
      - October to December 2021

5. Institution‘s Innovation Council (IIC)
   I. IIC Report 2018-2019
   II. IIC Report 2019-2020

6. Character Building Committee Report

7. Mehr Jyoti - Green Edition - 2019-20

8. Mehr Jyoti - Covid response edition - 2020.

9. Official MCM DAV College website: https://mcmdavcwchd.edu.in/

10. Office records and registers
    I. Various policies and procedures.
    II. Purchase and sale register, gate passes etc.
    III. Invoices, quotations and other contract documents as per requirements.
    IV. Electricity and water metering registers.
    V. Campus layout and other related drawings.
    VI. Various data, excel sheet, documents provided by the staff of the college

11. Unstructured interviews, discussions and feedback from teaching, administrative, engineering and non-teaching staff.

ANNEXURE – II

Certification of Agency

Certificate

This is to certify that

THE RIDGE ENVIRONMENT CONSULTANTS

C/O Er. GAURAV P. RAJA, GROUND FLOOR, OPP. MAHINDRA SERVICE CENTRE, BASAL ROAD, CHAMBAGHAT INDUSTRIAL AREA, BASAL, SOLAN 173213, HIMACHAL PRADESH, INDIA

has been assessed by B4Q Management Ltd. and found to comply with the requirements of

ISO 9001:2015
Quality Management System

For the following scope:

Manufacturing of Water Treatment Equipments & Eco Friendly & Health Products. Consultancy for Water Harvesting & Recycling Solutions, Water and Environment Management Services, Waste Management, Environment/ Green / Water Audits and Information, Education and Awareness Activities Related with Environment and Sustainability.

IAF CODE: 18 & 35

Certificate No. : MS1AGT2ACFC
Issue date : 25-July-2022
1st Surv. on/before : 24-July-2023
2nd Surv. on/before: 24-July-2024
Date of Expiry : 24-July-2025

To check this certificate status visit:
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B4Q Management Ltd.

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MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

ANNEXURE – III

Lead Auditor Chartered Engineer Certificate

022464

The Institution of Engineers (India)

By virtue of Qualification, Professional training and Corporate Membership of this Institution

GAURAV PRAKASH

OF

ENVIRONMENTAL ENGINEERING DIVISION

is hereby authorised to use the style and title of

Chartered Engineer [India]

M-1718236

Dated 23-04-2021

Secretary and Director General

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