Report on

Energy assessment, Green /Environment Audit

(2021-2023)

Prepared For

SRI AUROBINDO COLLEGE (Morning)
Shivalik, Malviya Nagar,
New Delhi-110017, India

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CHAPTER 1
PREAMBLE, OBJECTIVES & METHODOLOGY

1.1 Preamble

Sri Aurobindo College was established in 1972, the birth centenary of the philosopher, patriot-poet, Sri Aurobindo, as a constituent college of the University of Delhi. The College inculcates the ideals of Sri Aurobindo and believes that an active commitment towards excellence is fundamental to the process of education.

The College, popularly referred to as "Aurobindo", offers liberal education in humanities, commerce and science to more than 3000 students. It offers B. A. Honours in English, Hindi and Political Science, B.A. Programme, B.Com. (H) and B.Com., B.Sc. Honours Electronics, B.Sc. Programme Life Sciences and Physical Sciences.

Besides catering to students from Delhi, particularly South Delhi, a large number of students come from diverse parts of the country including Bihar, UP and North Eastern India.

The College has seen remarkable growth over the years. The quality of the incoming students and the University results has shown a progressive upward movement. Continual addition and updation of essential amenities and facilities has made the College a prestigious institution for academic and co-curricular pursuits. Student engagements in extracurricular activities like Sports, NCC, and Cultural Societies are encouraged under the able guidance of skilled faculty. The college is committed to a student-centered environment and the college is dedicated to education covering a broad spectrum.

Indohaan Technologies Pvt Ltd offers a comprehensive Health, Safety, Environmental and Risk management consultancy services for commercial buildings, manufacturing units, large industrial plants, educational institutions and office premises. Our key services include consulting and training in:

- Process /Personal and Fire Safety
- Risk Analysis
- Process Hazard Analysis
- Occupational Health
- Energy and Environment
- Sustainability
- Gender Audit

1.2 Study Objectives

Upon request from Sri Aurobindo College, a desk top cum field study has been carried out for the Academic year(s) 2021-23 with the following objectives -

- To present a recap of the Green features and practices already in place as recorded in the previous Audit(s) & report any new addition to the same, thereby ensuring continuity of good environmental performance of the college campus

- To evaluate contribution of Solar energy to the total Energy consumption for both the Academic years ie 2021-22 & 202-23 & thereby establishing that the college has upheld its continued commitment for achieving higher levels of Sustainability in terms of use of Renewable energy

1.3 Methodology Adopted

To achieve the objectives stated in Para 1.2 above, the following methodology was adopted:

- Physical inspection was carried out in the college campus for assessment of previously available facilities & to collect information on additional features and practices if adopted now
- Data pertaining to the installed facilities like Solar Photo Voltaic Power System (SPVS), Rain water harvesting, Plant & Trees species were reviewed again with respect to the previous information already available
- Relevant information relating to Environment awareness among student's fraternity was obtained through discussion with the academic section for recording in this report.

1.4 Assessment Study Team

Following members visited the college premises on 27th June 2023 for a Walk through audit, data collection and personal interaction:

- Ms. Deepika Soorma
- Mr. Ashok Grover

CHAPTER 2

SALIENT GREEN FEATURES

2.1 General – Green/ Environment Audit

Environment Audit is the most efficient and ecological way to assess& monitor environmental performance and helps to create awareness & sensitize faculty, staff & students on the environmental & sustainability issues.

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/project."

A Green Campus is a place where environmental friendly practices and education combine to promote sustainability in the campus which ultimately offers an institution the opportunity to take the lead in redefining its environmental culture and developing new paradigms by creating sustainable solutions to environmental and economic needs by minimizing wasteful inefficiencies, conserving resources, encourage use of Renewable sources of energy, safe waste disposal, purchase of environment friendly supplies and effective recycling program.

The greening of campus can be defined as the process of reducing the multitude of on- and off-site environmental impacts resulting from campus decisions and activities, as well as raising environmental awareness within the human communities of a college or university (Creighton,1999).

A Green campus management program with auditing at regular intervals & through continual improvement of green practices can open the pathway to obtain prestigious Green rating & /or accreditations to either IGBC or GRIHA rating system, both of which are reputed National benchmark standards of excellence in this field & well recognized at the Global level.

The rating systems are generally based on accepted energy and environmental principles and will seek to strike a balance between established practices and emerging concepts, both national and international.

Our audit has covered following target area generally in line with good environmental and green practices followed by academic institutions in the country –

- Site planning & Green cover
- Water Management
- Energy Management
- Waste Management
- Health & Well-being
- Green policies, awareness & education

2.2 Recap of Salient Green Features

Following is a brief re-cap of salient Green features, which as per our latest physical verification are continued to be maintained in a most professional & efficient manner, thereby upholding the commitment and focus accorded by the college management on Environment consciousness

2.2.1 Green cover, Trees

- A pleasant Green cover of minimum 25% is in place as presented in Table 1
- The periphery of the campus is dotted with several Native, drought resistant Trees, Shrubs, hedges and fruit plants together with very eye pleasing & large lawn cover are planted in earmarked zone aesthetically design as per good landscaping practices.
- Listing of trees and other plant species which continue to provide a cool, natural look to the campus is presented in Table 2
- Large open spaces are provided between the blocks allowing natural ventilation which makes the campus fresh and airy.
- Pervious / permeable walkways are provided within blocks for catching surface water
- Latest photographs of the campus greenery are appended in Figures 1 & 2 on next pages

Table 1 Green cover area calculations

	Total Campus area in m2	13150
Species	Approx. Area m2 (deduced from visual assessment & Tree canopy calculations)	% Coverage of Total campus area
Tree	850	6.5%
Shrub	700	5.3%
Lawn	1800	13.7%
	Total	25.5%

Table 2 Tree & Plant Species at the campus

	Common Name	Botanical Name		Qty
Trees	Arjun	*Terminalia arjuna*		4
	Ashok	*Saraca asoca*		80
	Palm	*Arecaceae*		25
	Peepal	Ficus religiosa		8
	Neem	*Azadirachta indica*		8
	Champa	*Michelia champaca*		10
	Shehtoot	*Morus alba*		
	Molashri			
	Safeda			
Flowers (in pots & beds)	Dahlia			
	Petunia			
	Geranium			
	Salbiya			
	Genda			
	Jafri			
	Gulab desi	*Rosa indica*		
	Chandni			

Fruit plant & herbs	Nimbu	*Citrus limon*		
	Jamun	*Syzygium cumini*		
	Anjeer			
	Anaar	*Punica granatum*		
	Chickoo	*Manilkara zapota*		
	Aam	*Mangifera indica*		
	Aawla	*Phyllanthus emblica*		
	Amrood	*Psidium guajava*		
	Laung			
	Elaichi			
	Heeng			
	Tej patta			
	Tulsi			
	Lemongrass			
Shrub	Bougainvillea	*Bougainvillea spectabilis*		

Figure 1 Periphery trees

Figure 2 Campus greenery

2.2.2 Water management

The Drinking water requirement is met by water supply from the Municipal Corporation after necessary softening/ purification in the RO plant.

The other requirement for Flushing in washrooms, floor washing, Laboratory use and for gardening /horticulture is met by Bore wells, which have been recently deepened to 350 feet to ensure adequate supply.

Roof top rain water harvesting system (RWH) has been constructed in compliance to CPWD norms for recharge of water table for which the connected underground pipe network & pit is in place appropriately in an open lawn space.

Drip irrigation is practised as a good measure for water conservation. See photo appended below (Figure 3 &4) for the RWH pit & typical hose network laid for irrigation

Figure 3 RWH pit

Figure 4 Drip irrigation

In accordance to public health regulations, the sewage line is directly connected to the main municipal sewer lines in the vicinity for disposal for which the Municipal Corporation levies additional 6% charges for handling this service (as verified from the Water supply bills)

2.2.3 Renewable Energy Installation / Energy efficient light fixtures

It was very encouraging to note that good initiative has been taken by the College to harness the Solar Energy (as a renewable source) & usage of energy efficient LED lights as good measures for Energy conservation.

2.2.3.1 *Grid connected Solar Photo Voltaic Systems (SPVS)*

A 50KwP Solar unit with net metering system is installed by **Hero Future Solar Energy Pvt Ltd** and is running since 2018 in the college premise, which is continuing to contribute significantly to the total energy consumption resulting in optimal use of Electrical power from the Grid. See detail worked out in Chapter 3

Latest Geo-tagged photographs of actual installation are appended below as Figure 5 & 6.

Figure 5 SPVS system -Service provider details


110017, Block B, Shivalik
Colony, Malviya Nagar, New
Delhi, Delhi 110017, India
mist
31.0 °C
30 Jun 2023 01:09 PM
Google

Figure 6 Solar panels installed on roof

2.2.3.2 *Energy efficient LED fixtures*

Since a very early stage, the college has been replacing the old Tube lights with energy efficient LED lights and fixtures which besides monetary savings, also demonstrates commitment of the college to adopt energy conservation in the right perspective.

2.2.4 Air pollution control

In addition to environment greening and eco-friendly land use described in previous sections, good health and well-being of all the occupants in the campus can also be achieved by implementing suitable measures for controlling air pollution outside & within the boundary limits of the campus.

Some of the good features covering this aspect are highlighted below –

- The college is located at a walking distance from Malviya Nagar Metro station (*on the Yellow line of Delhi Metro*) & most of the students & staff avail this public mode of transport thus reducing emission of greenhouse gases consequent to burning of less fossil fuel (petrol/ diesel) vis a vis individual commuting.

- The above observation is substantiated based on feedback received in an online survey wherein the majority of respondents have specified that they use public mode of transport for regular commute to the college, which is a commendable action for pollution control.
  See survey results as noted in Figure-7 below

Metro service- 54.7 % **City Bus service -21.6 %**

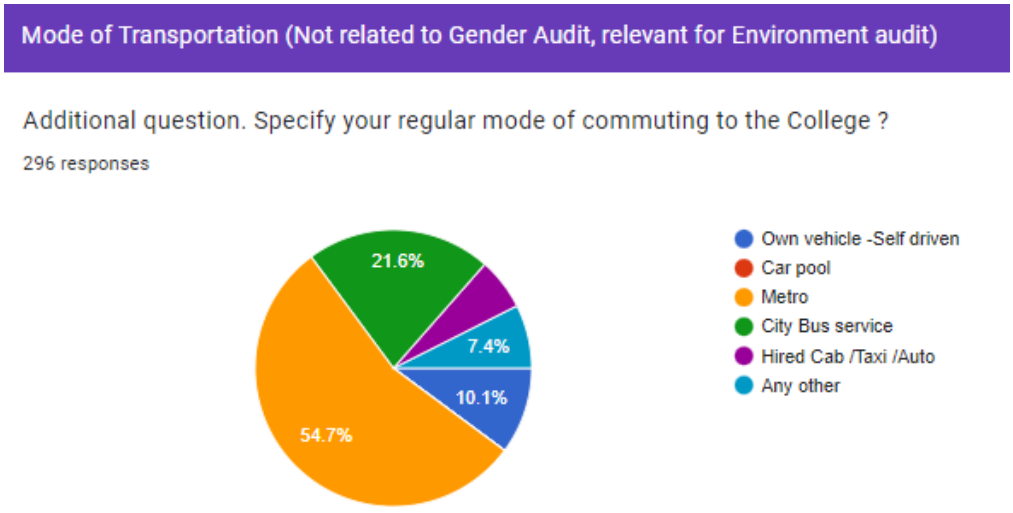


Figure 7 Survey result on Mode of Transportation

- Vehicle movement is restricted inside the campus ensuring that the carbon emissions are minimized to the extent possible and pedestrian friendly footpaths are available to encourage walking between blocks. See photos below (Figure 8)

Figure 8 *Pedestrian friendly pathway*

- In view of enforcement of No Smoking policy, the detrimental effect of the same on respiratory health is fully negated thus ensuring healthy and good social environment especially for young students

2.2.5 Waste Management

The College has an effective waste management system in conformance to Solid Waste Management Rules 2016 and accordingly colour coded waste segregation bins are provided at various locations in the campus.

A Bio-gas plant of 1 cubic meter capacity is installed in the college premises since 2013 which runs on bio degradable waste generated from the college canteen & garden waste (See Figure 9). The biogas generated from this plant provides fuel to the staffroom kitchenette & the waste slurry is used as organic manure in the college lawns and garden

Besides saving of one LPG Cylinder per month, this initiative has been a very useful effort towards making the college a zero emission zone.

Figure 9 Bio gas unit in operation

A stand-alone facility for composting of Garden & Kitchen waste is in place within the campus & the generated bio-manure is used for horticulture purpose within the campus

Figures 10 & 11 provides actual photographs the composting pit & Waste segregation bins.

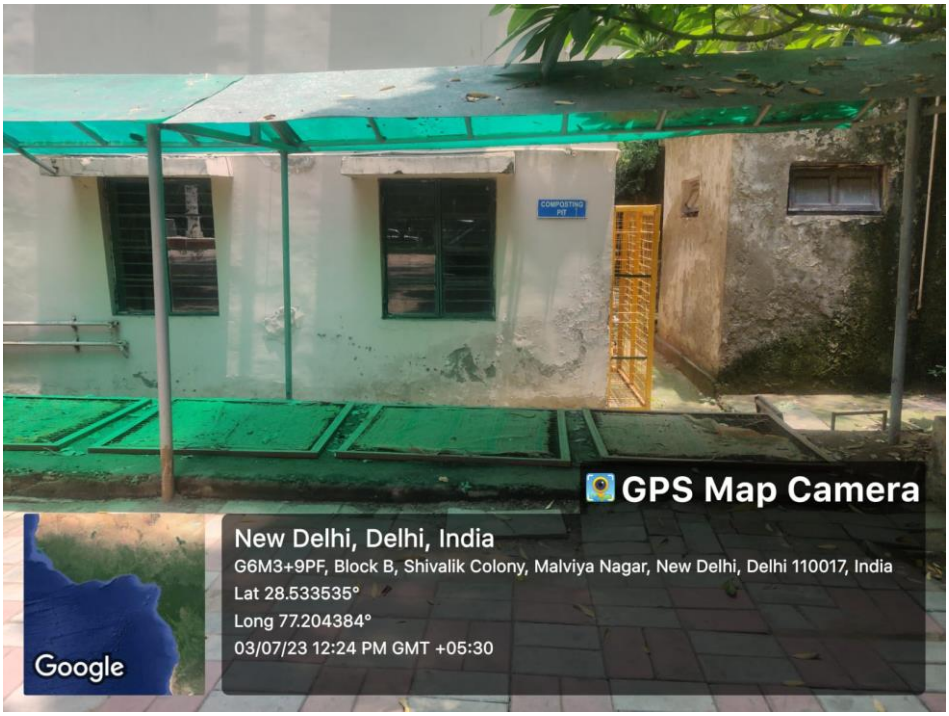


Figure 10 Composting pit

Figure 11 Waste segregation bins

Use of ICT tools is encouraged most of the academic / examination activities to minimize the use of paper. Further, use of a second blank side of an already printed paper is encouraged.

While the waste paper recycling is done-in house (Figure 12), collection & disposal of e-waste is carried out through a contract arrangement with a Third party agency.

Figure 12 Paper recycling unit

The entire campus is a “No plastic zone” & appropriate signage is displayed at the college entrance. See second photograph below (Figure 13)

Figure 13 No Plastic /No Smoking Zone

2.3 Awareness on Environment conservation

- **Green content in Syllabus**

In order to sensitize the students and inculcate a sense of adopting prudent practices pertaining to good Environmental management, a compulsory course on Environment studies is mandated for all the First year students.

The course structure, curriculum & the topics covered in this course & taught by the Department of Environmental Science is presented as Annexure to this report

- **Green Activities**

The Department of Environmental Science along with PRITHVI society has conducted the following events with large student participation with the objective of creating deeper Environmental consciousness and encouraging students to pursue good practices in their present and future professional and as well as personal lives.

- **Academic year 2022-23**

1. On the occasion **of World Environment Day**, a group of 30 members from the Prithvi society visited the Okhla bird sanctuary.
2. Special lecture on "Environmental sustainability only one earth" in pursuance of **World Environment Day** and Golden Jubilee celebration was held on 20th June, 2022.
3. Seminar organised on **"Sustainable development goals in Indian context- Vision 2030**" on 18th July 2022, wherein the key speakers were distinguished guests from Jawaharlal Nehru University and University of Delhi, who presented their opinions on SDGs and addressed the relevant queries of students.
4. An awareness rally was organised the occasion of **World Ozone Day** on 16th September 2022
5. A **Cleanliness drive** was organised on 28th September 2022 in the surrounding areas and about 4-5 kgs of garbage was collected by the students including plastic waste and other materials, which was safely disposed
6. **Wildlife Week** was celebrated from 2nd to 8th October 2022 and a photography competition was organised on the theme "Exploring the Wild flora and fauna of Delhi".
7. A visit was organised to an Animal shelter on 7th October 2022
8. Seminar organized on 11th October 2022 on "**Protecting the wildlife in unprotected areas**" The guest speaker was Mr. Wasim Akram- from Wildlife SOS established in 1995.
9. On the **National Birds Day**, the society members visited a wetland park on 5th January 2023
10. A thumb-print painting event was organised on **"World Wetland day**" on 2nd February 2023
11. Nature visits to **Neela Hauz Biodiversity Park and Sanjay Van** was organised under project Aves.
12. Inter-college Poster making competition was conducted to celebrate **World Water's day**

- **Academic year 2021-22**

1. Participated in the **National Webinar on *'Water Conservation: Challenges and Strategies'*,** on 7th September 2020,
2. **Wildlife Week** was celebrated by organizing three competitions viz. wildlife journalism, debate and photography competition at an inter college level.
3. Webinar on ***'Biodiversity Conservation: Innovation and Challenges'*** organised on 15th October 2020
4. **Mandala Competition** on 1st November for participants to present their artistic works.
5. **A Diwali Mela** organised from 8th to 15th November 2020, where the focus was to create awareness on celebration of Eco-friendly Diwali. It was followed by two competitions – 'Best out of waste' & 'Photography Competition and an online awareness drive to encouraging the people to decorate their homes with environment friendly material
6. **Meme - making competition,** with the aim of encouraging people to protect environment by using few fun elements was held on 9th December, 2020.
7. A **Plantation drive** was held on New Year day 1st January 2021
8. **World Wetland Day**, was observed on 2nd February, 2021 by organizing photography and debate competitions at an inter college level

CHAPTER 3

ENERGY ASSESSMENT

3.1 Compilation of Energy consumption & Solar contribution

Based on the Energy & Solar bills collected for the respective years, the annual consumption has been worked out along with the contribution of Solar power as tabulated in the Table below

Table 3 Energy consumption& Solar contribution

		April 2021-March 2022	April 2022-March 2023	Units
i) Yearly consumption of units as per BSES Electricity bills		134075	271630	kWH
ii) Break up of above consumption for Summer months (April to Sept)		69390	166149	
iii) Break up of above consumption for Winter months (Oct to March)		64685	105481	
iv) Solar power generation as per bills issued by Hero Future Energies	Summer	34920	33380	
	Winter	27220	28620	
v) % Contribution of Solar power (Renewable energy) to total consumption	Summer	**33.5%**	**16.7 %**	%
	Winter	**29.6%**	**21.3 %**	
	Yearly basis	**31.7%**	**18.6%**	

Notes:	
1.	The Solar contribution for both the years as reported above in substantial & is also consistent with the records of preceding years which were reported in the earlier Audit(s). This is a commendable performance on use of renewable energy on a continual basis
2.	Also see below Table 4 for an evaluation of EPI (Energy performance index) as per Green Rating for Integrated Habitat Assessment (GRIHA), which is a commendable performance on energy conservation
3	On the basis of excellent Performance matrices noted above, it can be concluded with evidence that Sri Aurobindo college is definitely on an accelerated path for achieving higher level of Sustainability on the Energy front.

Table 4 Energy performance Index (EPI)

Evaluation of the Energy Performance Index as per Green Rating for Integrated Habitat Assessment (GRIHA)		
Section wise	Values	Unit of Measurement
Academic building (approx. 2.5 Acre)	10117.15	Sqmt
Annual power consumption	333,630	kWH/ year
Energy Performance Index (EPI)	33	kWH/sqmt/year
GRIHA criteria for EPI for academic buildings for 8 hours of working (Criteria 8 of GRIHA Manual Version 2015)	90	kWH/sqmt/year

CHAPTER 4
RECOMMENDATIONS

4.1 Recommendations based on Audit findings

We suggest following action points in the short, mid & long term perspective in order to move toward greater environmental sustainability for enhanced corporate, academic & social responsibility image among peers.

- ***Inadvertent misuse /wrong use /Lack of awareness****: Internally review possible wrong use, misuse or lack of awareness in switching on-off appliances like lights, fans, ACs, room heaters or any other appliances which are kept on standby mode etc. This can be done through use of visual signs & stickers fixed near the switches/user points.*

- ***Lighting occupancy sensor****: Motion sensors are often used in less used indoor spaces or in areas of short period use (such as Washrooms, Toilets, corridors, passage and Stairs etc.) to control electric lighting. If no motion is detected, it is assumed that the space is empty and thus does not need to be lit.*

- ***Solar operated pumps****: It is suggested to explore possibility of switching to Solar operated pumping system for irrigation and transfer from underground storage to user points using renewable energy*

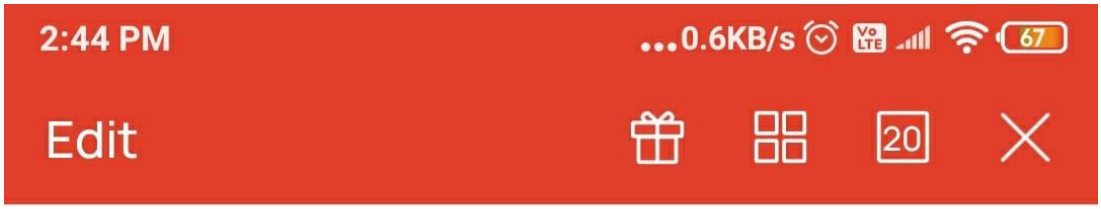
- ***Quantification /Base line calculations:*** *Base line calculations for Water consumption & recovery through Rain water harvesting may be done in the next audit for arriving at a realistic Water balance diagram and subsequent monitoring in definite numerical terms.*

- ***Low flow fixture & Water meters****: It is suggested to consider use of Low flow fixtures while doing replacement for old and defective Faucets and Toilet flushing system etc* to *reduce water usage and have less burden on ground water*
  It will also be a good idea to consider possibility of installing Water meters at suitable user points for accurate monitoring

- ***Use of 4 R's (Refuse, Reduce, Reuse & Recycle)****: It is suggested to formulate a Environment /Green to highlight focus areas & to emphasize use of 4 R's as good tools for greater environmental sustainably.*

CHAPTER 4
ANNEXURE

Annexure 1: Mandatory course –Environmental studies



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