SIES College of Arts, Science and Commerce,
Jain Society, Sion West,
Mumbai – 400022

SIES
College of Arts, Science & Commerce (Autonomous)
RISE WITH EDUCATION

Environment Quality Audit Report (2022-23)

Audited
By

SIES
Indian Institute of Environment Management
RISE WITH EDUCATION

SIES Indian Institute of Environment Management (SIES IIEM),
ISO 9001: 2015 certified institute for R&D and Lab Testing Services in Environment Area

SIES COLLEGE OF ARTS, SCIENCE & COMMERCE (AUTONOMOUS)
MUMBAI
400 022

SIES College of Arts, Science and Commerce

Internal Audit Committee

Sr.	Name	Designation	Committee Role
1.	Dr. Geeta Paluskar	Associate Professor, Department of Mathematics	Coordinator
2.	Dr. V. Vishnuprasad,	Assistant Professor, Department of Environmental Science	Coordinator
3.	Ms. Pooja Sawant	Assistant Professor, Department of Environmental Science	Member
4.	Ms. Akshaya Bhosale	Assistant Professor, Department of Environmental Science	Member
5.	Ms. Pracheta S. Salunkhe	Assistant Professor, Department of Bioanalytical Science	Member

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Environmental Quality Audit

A good education helps in the formation of character, strengthens the mind and intellect, and hones the skills of the students. Thus, the college believes in imparting education to students for their all-around development to create ideal citizens of the nation.

Educational institutions nowadays are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. Environmental audits can be a useful tool for an educational institution to determine how and where they are using the most energy or water or resources; the institution can then consider how to implement changes and make savings.

The Environmental Audit period was synchronized with the academic year 2022-23.

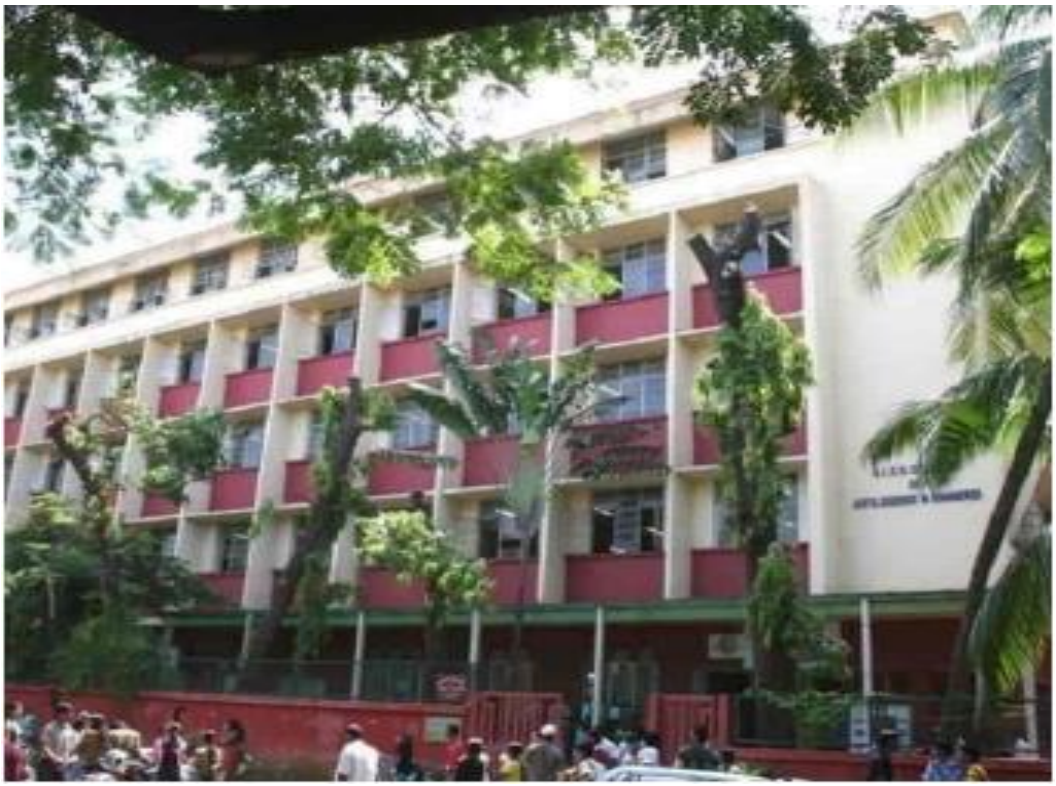
Methodology

Environmental monitoring was done by the team of **SIES Indian Institute of Environment Management (IIEM)**, **an ISO 9001: 2015 certified institute for R&D and lab testing services**. Our institute is recognized by the Department of Scientific and Industrial Research, Government of India. The methodology includes tools such as questionnaires, physical inspection, observation, lab analysis, review of documentation, and interviewing key persons. The study covered the following areas.

1. **Energy Audit**
2. **Environment Audit**
   i. Waste Audit
   ii. Water Audit
   iii. Noise Audit
   iv. Air Pollution Monitoring
3. **Green Audit**

About The College

SIES College of Arts, Science, and Commerce (SIESASC), Sion (West) was established in 1960, to serve the ever-growing educational needs of students from North and Central Mumbai Suburbs and was the gift of the South Indians in Mumbai to the then newly born state of Maharashtra. The Commerce Stream at the Degree level was started in 1980-81. Affiliated with the University of Mumbai, the College was conferred Autonomous status by the University Grants Commission in June 2018. The College offers courses from Junior College to Ph.D. programs in various disciplines. The College has 24 departments and offers 29 UG and 13 PG programs to meet the academic interests of students with diverse backgrounds. There are 10 Ph.D. centers to guide research students. The motto of SIES is to impart value-based and inclusive education. The College has distinguished alumni in different fields such as Major Ramaswamy Parameshwaran, Param Vir Chakra recipient, Padma Shri Shankar Mahadevan, Padma Shri Hariharan, Padma Shri Aruna Sairam, Arjuna Awardee Suma Shirur, MP and Vice President BJP, Vinay Sahasrabuddhe, National Film Award winner Shreya Ghoshal and Latha Venkatesh, CNBC-TV18.



Excellent results at various University and Board examinations and coveted awards and prizes bagged by the students have placed the SIES college among the most outstanding institutions in the city. The college has attained its position of repute due to the efficiency and dedicated service

of the staff, support of non-teaching staff, and encouragement from the management. Apart from conventional UG and PG programs, various skill enhancement courses and various certificate courses are offered by the departments and by the Center of Excellence. The college has installed rooftop solar panels to generate electricity, LED lights for efficient energy usage, a rainwater harvesting system for water conservation, and a strict NO Single Use Plastic (SUP) policy on the campus as a part of green initiatives. Also, vertical wall gardens and herbal gardens beautify the campus.

Students and staff statistics for SIESASC

Total students in college	Total Teaching Staff	Total Non-Teaching Staff
7945	190	106

NAAC Accreditation Status

Cycle	Validity Period	Grade	CGPA
Cycle-1	8th January 2004 to 7th January 2009	B++	2.98
Cycle-2	28th March 2010 to 27th March 2015	A	3.14
Cycle-3	11th May 2015 to 10th May 2020	A	3.51
UGC conferred Autonomy in June 2018. NAAC Accreditation validity extended till 31st December 2023			

The College has constituted its own internal audit committee to evaluate the adequacy of the system on internal controls, recommended improvements in controls and assess compliance with policies and procedures at the institute .

Energy Audit

The Energy audit is an effective tool for defining and pursuing comprehensive energy management programs. It helps in energy cost optimization, pollution control, and safety aspects and suggests methods to improve the operating and maintenance practices of the system. It is instrumental in coping with the situation of variation in energy cost, availability and reliability of energy supply, the decision on appropriate energy mix, and the decision on using improved energy conservation measures and technology.

Methodology

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, and appliances. The use of Energy is clearly an important aspect of campus sustainability and thus requires no reason for its inclusion in the assessment.

- The methodology adopted focuses on understanding the existing energy consumption by various electric appliances in the college.
- A walk-through survey was carried out to understand the nature of the installed energy devices (fans, tube lights, AC, etc.)
- A total count of all the energy-consuming devices/equipment was done.

Energy Assessment

The energy source utilized by all the departments and common facility center is electricity and Solar energy. The total electricity utilization of the college for different purposes is approximately **3042.83 kWh/day**. Annual Energy consumption during 2022-23 is **778964.48 kWh**.

Energy assessment details for the year 2022-23

Average monthly electricity consumption (2022-23)	79113.58 KWh
Annual electricity consumption (kWh/year) for 2022-23	778964.48 KWh
The average power factor for electricity consumption (2022-23)	**≥ 0.95**

The average **power factor (P.F.)** is found to be **≥ 0.95** (as per the electricity bills) during the year 2022-23, which shows efficient usage of energy with minimum wastage.

Energy saving is achieved through the replacement of tube lights with LED lights which have been proven to be good energy management for the institute. The CFL tube lights were reused on the college campus by replacing them with the damaged tube lights. All Computers are used with power saving mode. Staff, students, and the housekeeping team are encouraged to switch off the lights, monitors, and other equipment when not in use. All the computer labs have been facilitated with fans for reducing the use of Air Conditioners. Regular maintenance of Air Conditioners is carried out. Awareness boards are displayed to save energy.

Energy Generated from Solar Panel

SIESASC has installed a solar energy system on the campus (rooftop) with a capacity of 81.25 kW. A net meter was installed at the campus on 24.02.2019 to monitor the generation of energy. Solar energy systems have generated around 102.51 MWh (102510 kWh) of electrical energy during 2022-23 resulting in approximate savings of INR 11,27,610 (@ Rs.11/Unit).

Rooftop solar panels installed at the SIESASC campus

Month-wise Solar Power Generation

Month and Year	Reading In MWh
April 2022	9.91
May 2022	9.75
June 2022	6.88
July 2022	5.32
August 2022	5.66
September 2022	6.08
October 2022	7.67
November 2022	7.45
December 2022	6.79
January 2022	7.40
February 2022	7.66
March 2022	9.89
April 2023	11.85

Observations and Recommendations:

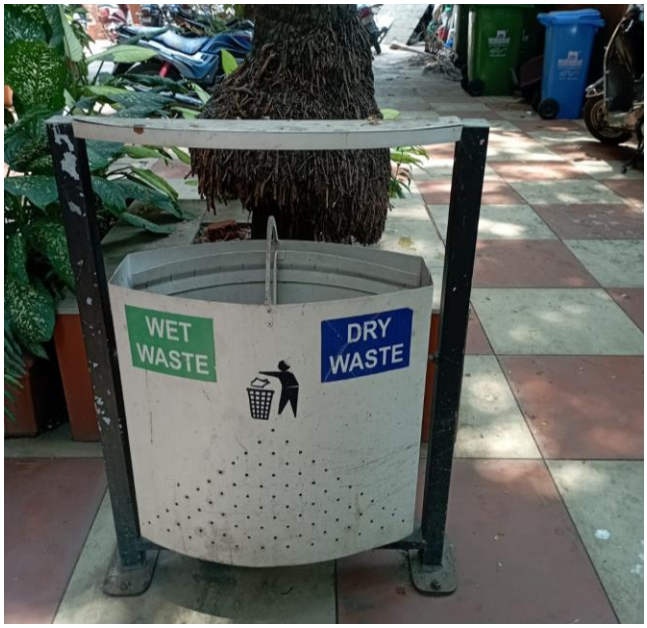
i. Energy consumption is well under control.
ii. The facility and appliances wise energy consumption data will help in the identification of areas of excess energy consumption for proper management.

Audited by: Dr. Seema Mishra
Director, SIES IIEM

Environment Audit

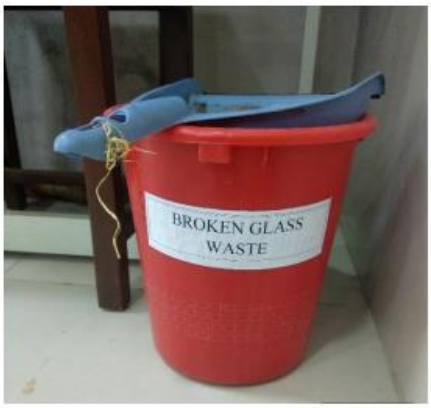
1. Waste Audit

Waste is generated out of all sorts of routine activities on campus, including garden waste, garbage, paper, e-waste, etc. The generated waste is segregated at the campus. As per norms, green and blue garbage bins are provided within the campus for wet and dry waste, respectively. There are 8 big garbage bins, and 33 small garbage bins are provided in the campus common area and staff rooms for collection of dry waste, and 3 big garbage bins are provided for wet waste. The segregated waste is handled according to their categories and is handed over to municipal corporations, twice a day.



The biodegradable waste from the college campus is collected in **3 big** waste bins and handed over to the municipal corporation for treatment. Earlier, before covid, the composting facility was operational but at present, the composting facility is not working. At regular intervals, organic waste from college premises, and vegetable and fruit waste collected from the teachers and students, are collected and sent to the municipality for further treatment.

Metal, wood, glass, and plastic scrap generated at the college campus is collected and given to scrap dealers for recycling**.** Signboards/Posters are displayed on the college campus to encourage ideas of a plastic-free environment.



E-waste collection and disposal

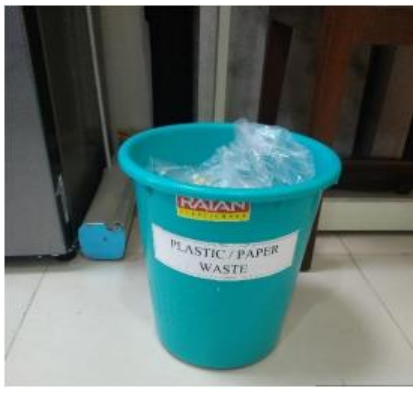
Waste electrical and electronic equipment, whole or in part or rejected from their manufacturing and repair process, which are intended to be discarded.

With the upgradation in technology, a huge number of electronic devices are used and discarded regularly. Bulky computers, TV sets, Fax machines, Printers, and CD Players top the list. These devices contain harmful materials such as beryllium, cadmium, mercury, and lead which can pose a threat to the environment if not disposed of properly.

The E-waste is collected from all the departments in the college. Approximately, 20 kg of e-waste was collected and sent to NGO-startup recycling SUN during the academic year 2022-23.

Plastic Waste Management

The institute follows standard plastic waste management practices. The SIES management is also having a policy for the complete ban of single-use plastic as per the Plastic Waste Management Rule amendment, 2022. Collected and segregated plastic waste is handed over to the recycler.



Details of different categories of waste generated at the SIESASC campus.

Sr.	Waste Type	Sources	Approx. waste Quantity (in Kg/day)	Action
1	Paper waste	Office, library, Exams, etc.	40	Shredding and Recycling through a vendor (once every 4 months)
2	MSW collected from dustbins	Classrooms, office, library corridor	175	Disposed of through BMC for further treatment (daily)
3	Other solid waste (Glass metal, wood, etc.)	Computer labs damaged furniture from campus	15	Collect separately and sent for recycling (once every 4 months)
4	Biodegradable waste (Garden waste)	Garden and temple waste	120	Handed over to Municipality for further treatment (daily)
6	Sanitary solid waste	Ladies' washroom	200	Disposed of through BMC for further treatment (daily)

Waste management within laboratories

As part of our Green Initiatives and implementing measures towards Zero-waste Campus, efforts are being taken to keep the campus environmentally sustainable by staff and students. Attempts are made to reduce produce waste of all kinds. Laboratory materials are discarded after proper segregation. For safe disposal of unused hazardous chemicals, the staff connects with industries periodically. Used/ spoiled papers are shredded regularly in the premises.

Waste management procedures and practices followed within the institute and laboratories

Sr.	Type of waste	Method of Disposal
1.	Dry waste and wet waste	Separate bins are provided to collect dry and wet waste
2.	Laboratory Solid waste: Broken glassware waste, Paper and Plastic waste	Segregated and disposed of in separate bins. Papers are shredded and discarded in bins and containers reused for pots and plants
3.	Laboratory Liquid wastes	Diluted before discarding
4.	Laboratory Strong acids	Neutralized before discarding
5.	Laboratory Carcinogenic chemicals like Ethidium bromide	Disposed after treating it with Potassium Permanganate

6.	Laboratory Bacterial cultures	Autoclaved and then disposed
7.	Laboratory Biomedical wastes Blood and Blood products	Treated with Dettol/savlon, taped in RED and disposed
8.	Laboratory Animal waste (Fish, Prawns etc)	These are packaged and disposed of immediately on the same day to avoid putrefaction.
9.	E-waste	NSS and NCC units of the college regularly organize e-waste collection drives and they hand it over to the NGOs for further recycling.
10.	Waste Recycling	The Department of Bioanalytical Sciences is planning to implement steps for establishing a waste recycling system in the institution.

As a part of our environmentally responsible behavior, SIES management came up with an initiative "Mission 6 R Campaign" for promoting effective solid waste management and a plastic-free campus. This mission has emphasized activities like awareness campaigns, workshops, and training not only for our students but also extending our efforts for the benefit of the communities.

Recommendations:

i. An annual MOU with service provider organizations for waste management will help in maintaining the quality of the process as well as a certificate from recyclers (third party) will help in the identification of waste management as per the compliance.
ii. Revival of On-site composting of biodegradable waste on campus is recommended.

Audited by: Dr. Seema Mishra
Director, SIES IIEM

2. Water Audit

The study observed that Municipal water supply is the major source of water in the Mumbai region. Water is used for drinking purposes, toilets, cleaning, and gardening. On average, the total use of water in the college is **86250 L**/day, which includes **85990 L/day** for domestic purposes, and **260 L/day** for gardening.

Water consumption details at the SIESASC campus

Activity	Average water used per activity (L)	Average Number of times activity done each day	Total water used by a person each day (L)	Number of people in the College using water	Total water consumption per day (L)
Wash hands/face wash	1.5	2	4	8167	32668
Drinking	0.5	2	1	4000	4000
Toilet flush	3	2	6	8167	49002
Gardening	320	1	320	-	320
Cleaning/Mopping of floor	260	1	260	-	260
Total (L)					**86250**

Drinking water analysis report

UV water filters are used for drinking water. Two drinking water samples from water coolers were analyzed to check the potability of water as per IS 10500:2012.

Parameter	Water Cooler Common	Water Cooler Staff	Acceptable Limit as per IS 10500: 2012
Odor	Agreeable	Agreeable	Agreeable
pH	6.7	6.8	6.5 - 8.5
Conductivity	91.4	114.3	300
Turbidity (NTU)	0.7	0.9	1.0
Total Dissolved Solids (mg/L)	150	170	500
Total Suspended Solid, TSS (mg/L)	<1.0	0.2	500

E coli. (/100ml)	Absent	Absent	0

Drinking water, as per the given specification, is observed to be **safe for Drinking.**

College management had a contract with **Expert Engineers** for the annual maintenance (AMC) of water coolers for the period 2022-23. **Ace Hygiene Products Pvt. Ltd.** is hired for annual maintenance (AMC) of both the water coolers during the period 2023-24.

Rainwater Harvesting System

One, the rainwater harvesting unit was also functional for recharging groundwater before covid period. Due to some technical issues, the municipal corporation (BMC) advised college management to stop the rainwater harvesting system.

Recommendations:

i. The college is maintaining a record of water demand and supply.
ii. The quality of drinking water is under control. The maintenance record of water coolers should be maintained.
iii. The operational rainwater harvesting system will further support reducing the consumption of borewells and municipal supply water.

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Director, SIES IIEM

3. Noise Environment

The noise level measurements were carried out using a Noise level meter. The noise level survey was carried out at thirteen locations (including the entrance, office, and classroom). The college is located adjacent to two commuting roads (RL Kelker Road and Road No. 25). The measured noise levels were found to be higher than the permissible limit.

Noise levels measured at various locations within the campus

Sr.	Location	Minimum Reading in dB	Maximum Reading in dB	Standard Limits* dB
1	Location	59.7	62.7	50
2	Main gate	50.9	55.9	50
3	Back gate	57.7	61.6	50
4	Admin Office	62.2	63.4	50
5	Canteen	65.4	70.1	50
6	Staffroom	50.6	53.9	50
7	Seminar room	58.7	63.9	50
8	Ground floor	65.8	72.7	50
9	Ground floor Classroom	57.3	64.7	50
10	First floor	55.4	63.5	50
11	Second floor	64.7	68.2	50
12	Third floor	62.2	67.4	50
13	Third-floor Classroom	55.4	59.2	50

***Standard limits for Noise level as per The Noise Pollution (Regulation And Control) Rules, 2000 50dB (During daytime)**

Recommendations:

1. The noise level near the entrance, office, and corridor is a bit high. The placement of potted plants and rotation of students and faculty as per time will help in reducing the noise level near the office.
2. The noise barrier facade on the boundary walls of the college will help to reduce the noise level in the campus.

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Director, SIES IIEM

4. Air Quality Assessment

The air quality assessment at the campus was carried out using a personal sampler. The air quality monitoring was carried out at 2 locations, the Front Gate and the Back gate of the college, by assessing the suspended particulate matter (SPM). The air quality on the campus is very good as the SPM level is found within permissible limits (140 ($\mu g/m^3$).

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Green Audit

The college attempts to maintain an eco-friendly atmosphere on campus; the number and variety of plant species help to maintain an eco-friendly ambiance. There are 42 different types of plants on campus. The college has undertaken various activities like plantation and beautification of campus through various drives. A green wall is maintained inside the campus comprised of 440 plants. Almost 150 potted plants are present on the campus. A total of 25 trees are existing within the territory of campus.

Pot Plants and Tress at the SIESASC campus

List of Plants/Trees at the Campus

Sr.	Name of the Tree/Plant	Habit	Family
1.	*Syzygium cumini*	Tree	Myrtaceae
2.	*Typhonium trilobatum*	Herb	Araceae
3.	*Tabernaemontana coronaria*	Shrub	Apocynaceae
4.	*Dieffenbachia* spp.	Herb	Araceae
5.	*Cocos nucifera*	Tree	Palmae
6.	*Aglaonema* spp.	Herb	Araceae

7.	*Mangifera indica*	Tree	Anacardiaceae
8.	*Polyalthia longifolia*	Tree	Annonaceae
9.	*Dracaena* spp.	Herb	Asparagaceae
10.	*Pothos* spp.	Herbaceous climber	Araceae
11.	*Antigonon leptopus*	Herbaceous climber	Polygonaceae
12.	*Crossandra infundibuliformis*	Herb	Acanthaceae
13.	*Aralia* spp.	Herb	Araliaceae
14.	*Araucaria excelsior*	Tree	Araucariaceae (Gymnosperms)
15.	*Artocarpus heterophyllus*	Tree	Moraceae
16.	*Sansevieria trifasciata*	Herb	Asparagaceae
17.	*Euphorbia tirucalli*	Herb	Euphorbiaceae
18.	*Piper nigrum*	Herb	Piperaceae
19.	*Ricinus communis*	Herb	Euphorbiaceae
20.	*Mimosa pudica*	Herb	Leguminosae
21.	*Ficus hirsuta*	Tree	Moraceae
22.	*Spathiphyllum* spp.	Herb	Araceae
23.	*Murraya koenigi*	Shrub	Rutaceae
24.	*Quisqualis indica*	Herbaceous climber	Combretaceae
25.	*Coleus blumei*	Herb	Lamiaceae
26.	*Phyllanthus niruri*	Herb	Phyllanthaceae
27.	*Schefflera* spp.	Tree	Araliaceae
28.	*Cassia fistula*	Tree	Leguminosae
29.	*Croton tiglinum*	Herb	Euphorbiaceae
30.	*Dendrocalamus* spp.	Tall herb	Poaceae
31.	*Euphorbia milli*	Herb	Euphorbiaceae
32.	*Pandanus minor*	Shrub	Pandanaceae

33.	*Caesalpinia pulcherrima*	Shrub	Leguminosae
34.	*Ixora coccinea*	Tree / Tall shrub	Rubiaceae
35.	*Mussaenda frondosa*	Tall shrub	Rubiaceae
36.	*Ficus elastica*	Tree	Moraceae
37.	*Heliconia* spp.	Herb	Heliconiaceae
38.	*Averrhoa carambola*	Tree	Oxalidaceae
39.	*Azadirachta indica*	Tree	Meliaceae
40.	*Tamarindus indica*	Tree	Leguminosae
41.	*Adenium* spp.	Herbaceous succulent	Apocynaceae
42.	*Portulaca grandiflora*	Herb	Portulacaceae
43.	*Moringa oleifera*	Tree	Moringaceae
44.	*Pisonia alba*	Shrub	Nyctaginaceae
45.	*Bauhinia racemosa*	Tree	Leguminosae
46.	*Carica papaya*	Semi-woody Tree	Caricaceae
47.	*Musa paradisiaca*	Large tree-like herb	Musaceae
48.	*Hibiscus rosa-sinensis*	Shrub	Malvaceae
49.	*Peltophorum pterocarpum*	Tree	Leguminosae
5.	*Samanea saman*	Tree	Leguminosae
51.	*Saraca asoca*	Tree	Leguminosae
52.	*Thunbergia alata*	Herbaceous climbing vine	Acanthaceae
53..	*Achras sapota*	Tree	Sapotaceae
54	*Punica granatum*	Tree	Punicaceae
55.	*Terminalia catappa*	Tree	Combretaceae
56.	*Asparagus racemosus*	Herb	Asparagaceae
57.	*Centella asiatica*	Herb	Umbelliferae
58.	*Bryophyllum* spp.	Herb	Crassulaceae

59.	*Phyllanthus emblica*	Tree	Phyllanthaceae
60.	*Nephrolepis exaltata*	Herbaceous ferns	Nephrolepidaceae
61.	*Selaginella* spp.	Moss-like pteridophyte	Selaginellaceae
62.	*Nephrolepis bifurcata*	Herbaceous ferns	Nephrolepidaceae

Support of Trees in Institute Campus in Balancing Net Carbon Emission

Sr.	Particulars	Observed value	Units
1	Total energy consumption/day	3042.83	KWh
2	Total energy consumption/month	79113.58	KWh
3	Total energy consumption/year	778964.48	KWh
4	Total energy generation from solar panels	102510	KWh
5	Net energy consumption	676454.48	KWh
A	Total carbon emission from electricity	574.99	Tonnes CO_2/year
B.	CO2 sequestration from trees	26.48	Tonnes/year
C.	Net carbon emission (A - B)	548.51	Tonnes/year

Recommendations: i. The college is maintaining the green cover efficiently around the campus.
ii. The C emission is substantially reduced due to installation of solar panels on the campus.
iii. The campus can be net zero by promoting EV vehicles, increasing solar power generation capacity and installing smart switches.

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