Shri Sarda Education Society's
(A Linguistic Minority Educational Institute)

SMT RADHABAI SARDA ARTS, COMMERCE & SCIENCE COLLEGE ANJANGAON SURJI

Daryapur Road,Anjangaon Surji Dist – Amravati 444705 (MS) India

Affiliated to Sant Gadge Baba Amravati University, Amravati

GREEN AUDIT REPORT

2019-2020

Prepared by
Green Audit Committee

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CERTIFICATE OF GREEN AUDIT

This is to certify that Green Audit Committee has conducted the ***'Green Audit '****of* ***Smt Radhabai Sarda Arts, Commerce and Science College*** *campus for the academic session 2019-2020. The audit is conducted sincerely by applying requisite parameter and the report is prepared scientifically. This report consists of pages 1 to 66.*

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Forwarded through

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GREEN AUDIT REPORT

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Introduction

Green audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. Green auditing is a means of assessing environmental performance (Welford, 2002). It is a systematic, documented, periodic and objective review by regulated entities of facility operations and practices related to meeting environmental requirements (EPA, 2003). This includes all water, Solid waste, energy status of examination.

It aims to analyze environmental practices within and outside of concerned sites, which will have an impact on the eco-friendly ambience. Green audit can be 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 recycling project or to improve minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. 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 nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background, it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time to reduce a sizable amount of atmospheric carbon dioxide from the environment. In recent time, the Green Audit of an institution has been becoming a paramount important for self assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

Objectives

The green audit committee focused on Material issues pertaining to college which have the highest influence on the Green Attributes of the College.

1. To conduct the baseline survey to know the reality status of green practices.
2. To develop a green policy (vision document) and framework for the college.
3. To examine the current practices which can have impact on environment such as of resource utilization, waste management and energy conservations.
4. To analyze the Floral and Faunal diversity in college campus.
5. To increase environmental consciousness throughout the campus among all the stakeholders.
6. To analyze and suggest solution for problems identified in audit.
7. To give the direction to work on some local environmental issues.
8. To motivate staff as well as students to optimize sustainable use of available natural resources.
9. To identify strengths and weaknesses in green practices conducted in college premises.

About the College

Smt Radhabai Sarda Arts, Comerce and Science College, a multi-faculty, grant-in-aid institution, offering UG, PG and PhD programmes, affiliated to Sant Gadge Baba Amravati University, Amravati was started by Shri Sarda Education Society with a vision to make higher education available to the underprivileged sections of society in the vicinity of Anjangaon Surji. It has three major streams- Arts, Commerce & Science with a distance mode centre of YCMO University, Nasik and HSC (Voc.). The competent, efficient, dedicated and well-qualified staff with the highest academic degree, a farsighted visionary management and good infrastructure have contributed to making it an excellent centre of higher education. Keeping in mind the contemporary global and national context, the college strives continuously to make success a way of life not only in academics but also in extra-curricular activities. It has always been the prime focus of the college to provide students the best possible ambience for learning and personality development. Since its inception, the college has been instrumental in catering to a variety of educational interests and aspirations of the people of the area. Today, the college is recognized as one of the well-known centers of higher education in this rural area of Amravati district in Maharashtra.

The Science Faculty saw the light of the day in the college in 2006 with Physics, Chemistry, Mathematics, Botany, Zoology, Computer Science and Electronics as Physical Sciences incorporated therein. The college has a rich infrastructure developed on the premises admeasuring 13.5 acres. Besides, it has a Botanical garden exhibiting nearly 100 well-groomed medicinal & ornamental plants. Obviously, it serves as a Health Hub for nearly thousand people.

Photograph of the College

Aerial view of campus

Main building

Science building

Library

Library

Topography of Anjangaon Surji

Geographically Anjangaon Surji , District Amravati is located at 21.163 N 77.3094 E and has an average elevation of 374 meters which occupies an area of 3,169.22 km². The taluka comprises of 128 villages, some of the villages are situated at the foot hills of Melghat. Korku, Bhill, Nihal, Govari etc. are the tribals inhabiting these villages. It is technically made up of two main zones, Anjangaon and Surji, on either side of Shahanur River, and is called Anjangaon-Surji in combination. It is called a Banana Hub of Vidarbha as it is famous & largest banana producer of bananas and Hub of medicinal plants - *Piper longum* and Safed musali. Anjangaon Surji is an ancient town having religious and historical importance The Devnath Math in Surji was established in 1754 AD. In Surji area Dwarkeshwar Yatra is a major event which is held every year on the second day of Pola festival. Among the Various religious functions Kathichi Jatra is a fair cum festival of the town. The fair is organised on every Monday from Nagapanchami to Pola Festival. As of 2011 India census, Anjangaon had a population of 56,380. It is the third most populous city in Amravati District after Amravati and Achalpur(Paratwada). Shahanur dam is built using soil and has a hydroelectricity generation project and water supply project for nearly 156 villages and 2 cities based on gravitation without using electricity. The dam is located in the north of the city in the ranges of Satpuda.

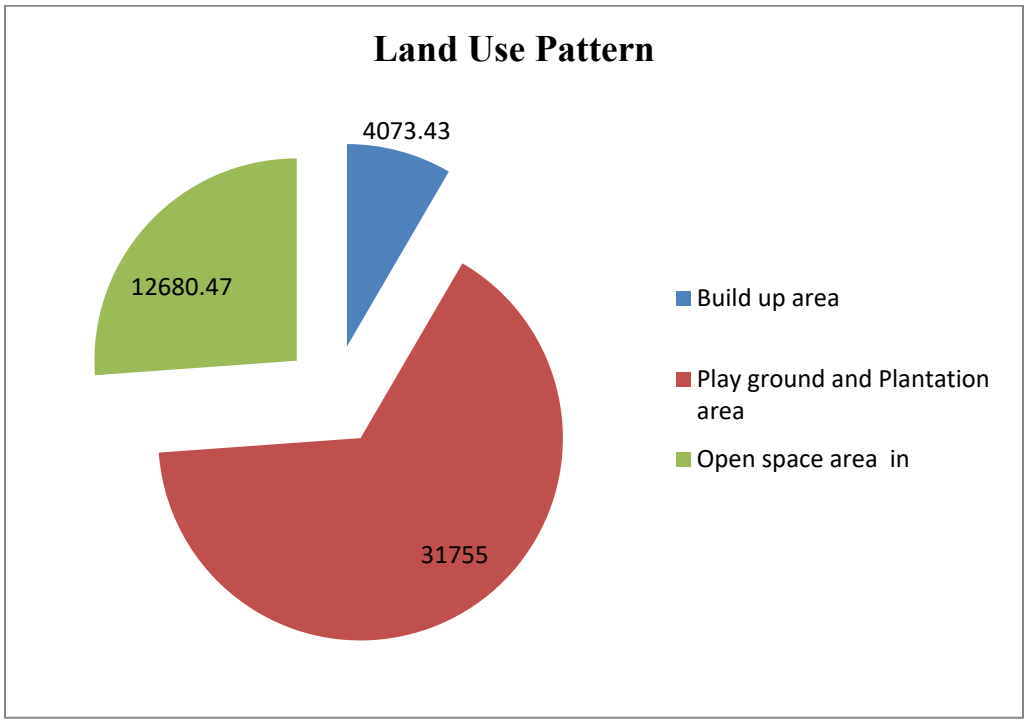
The soil of Anjangaon Surji region can be classified as sandy, brown and black soil.

Land Use Data

Smt Radhabai Sarda Arts, Commerce & Science College is situated at Anjangaon Surji, within the geo-position Latitude 21.1670988 longitude 77.3152116 a rural Tehsil place of Amravati district in Maharashtra, India. It encompasses area about 48528.47 sqmeter. The college has following land use pattern.

Categories Land Use	Area in Sq.m
Build up area	4073.43
Play ground and Plantation area	31755
Open space area in	12680.47
Total area	48528.47

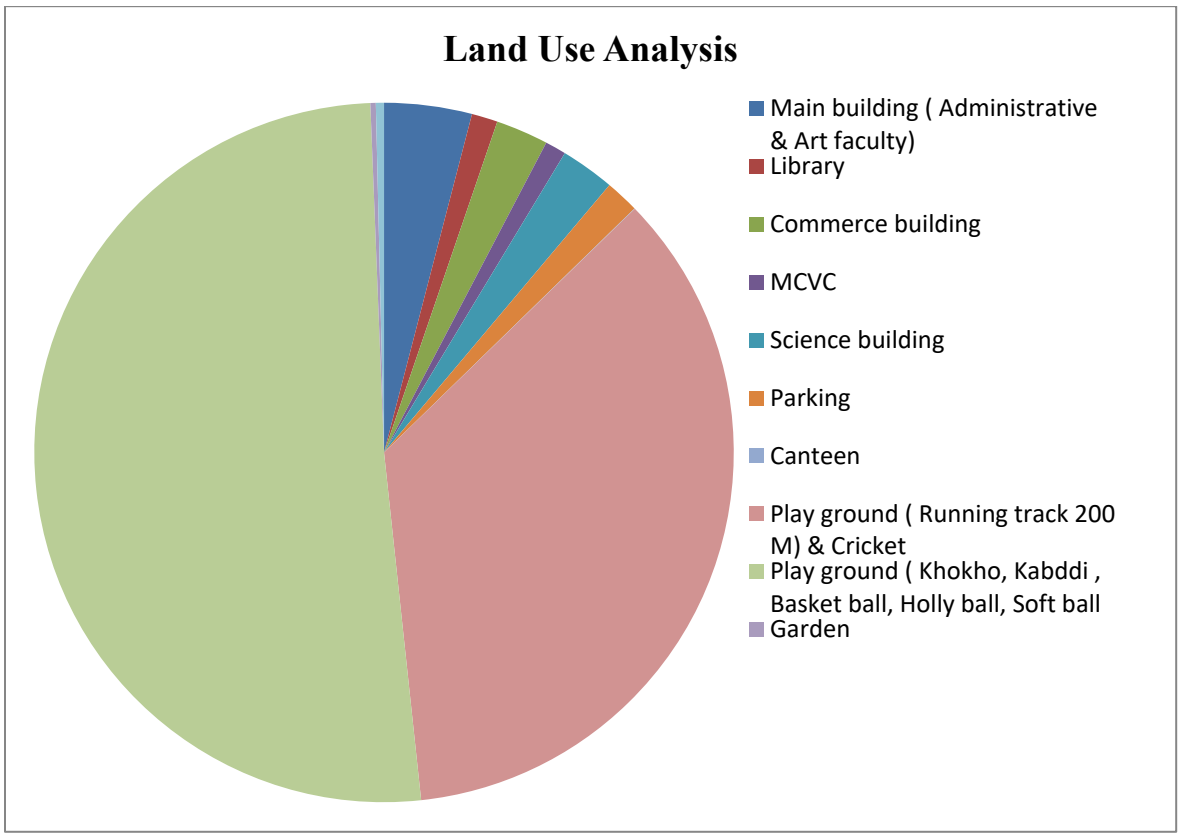
The total area of Smt Radhabai Sarda Arts, Commerce & Science College is 48528.47 sqm out of which the build up area is 4073 sqm and open space area is12680.47 sqm.



Land Use Analysis

Following are the land use analysis of Smt Radhabai Sarda Arts, Commerce & Science College :

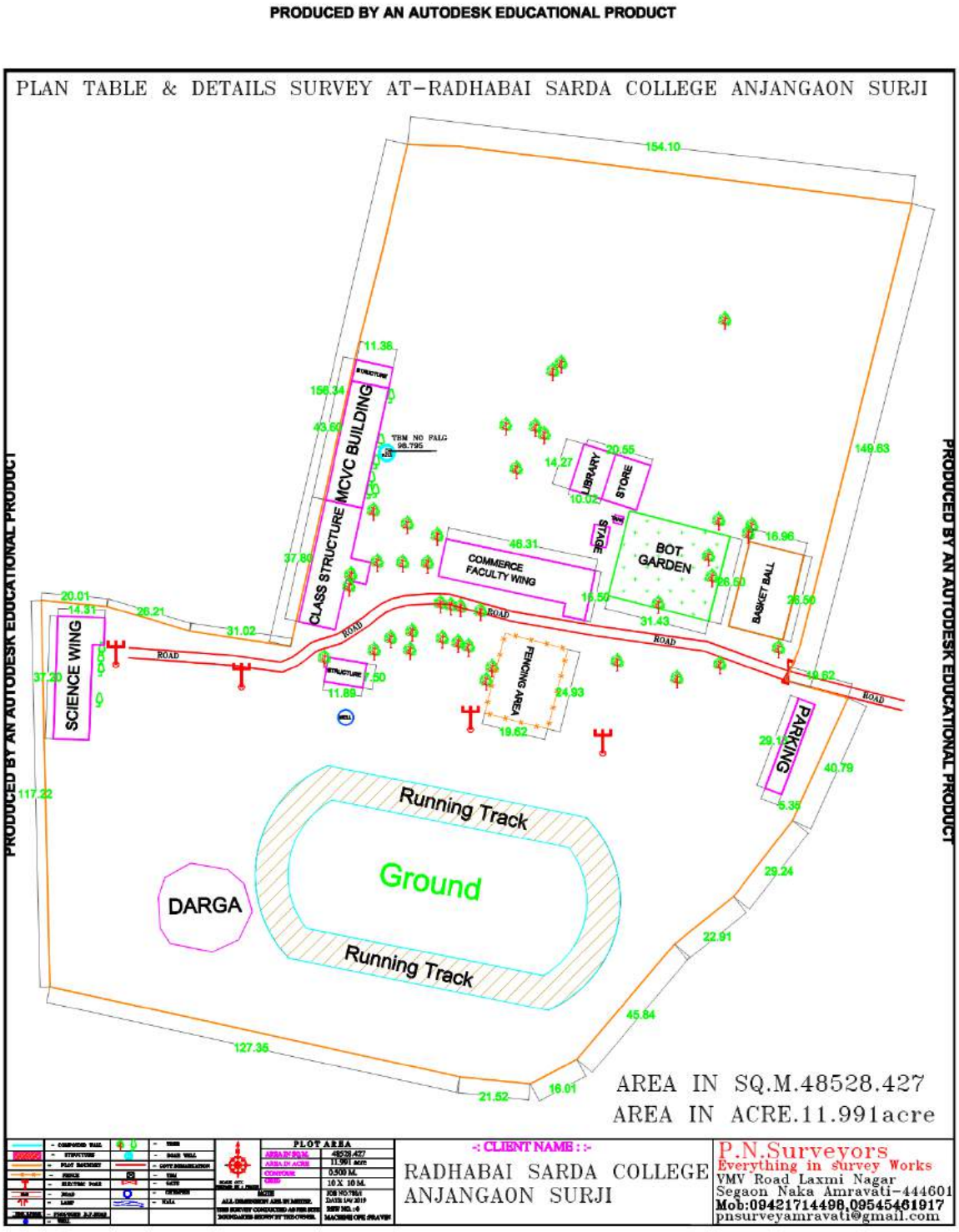
S.N.	Category of Land Use (Name of building)	Area in Sq.m
1	Main building (Administrative & Art faculty)	1620.42
2	Library	481.06
3	Commerce building	971.96
4	MCVC	388.33
5	Science building	999.99
6.	Parking	625
7	Canteen	07.43
8	Play ground (Running track 200 M) & Cricket	14240
9.	Play ground (Khokho, Kabddi , Basket ball, Holly ball, Soft ball	20440
10	Garden	100
11	Plantation area	150
12	Rest rooms	99.0



For performing green audit of college campus is divided in to following pattern i.e. Main building, Library, Commerce building, Science building, MCVC building, Botanical garden,

play ground, canteen and parking etc. All building and classrooms are equipped with furniture and have all adequate facilities on each floor. The spacious classrooms, administrative office, well equipped laboratories, parking facilities are the main feature of this campus.

College Layout Plan



METHODOLOGY:

Following methodology was adapted for conducting the audit of the college for the academic session 2019- 2020.

Steps:

1. Systematic and comprehensive data collection required for green audit.
2. Collection and reading of documents with physical evidences.
3. **Pre-audit activities –**
    - The site and area that are to be audited need to be determined and selected.
    - The green audit scope and objectives were identified.
    - The audit team collects the entire document which is essential for performing green audit.
    - Audit team and assignment for responsibility were established.
    - The background information on the facility including the facility organization, layout and processes, and the relevant regulations and standards were collected.
4. **Onsite audit activities-**
    - Collect information about land use pattern and use analysis of the college campus.
    - Gathering audit evidence
    - Evaluation of audit evidence against the objectives of the audit.
    - Monitor the water parameter is performed.
    - Collection of site inspection of data regarding the solid waste, liquid waste, e-waste.
    - An exit meeting to explain the audit findings

Observations and Recommendations

Floral Diversity of the College

Smt Radhabai Sarda College, which was established in the year 1966, has eco-friendly environment. It has long legacy of healthy environmental practices periodic plantation, their preservation and maintenance. Its land use is about 30 % of total area is occupied by open land and plantation that generate better campus environment. Every year various department like Botany, NSS, NCC and Environmental Awareness committee organize the plantation programme with the help of faculty and students. College has well maintained botanical garden enriched with Medicinal Plants. The campus maintains the biodiversity of plants.

In total, based on data collected by Botany department there are 127 plants in the college campus including tree, shrubs and herbs during the academic session 2019-2020. There are 90 plants present in the college Botanical Garden representing different family.

Vegetative propagation :

To learn how to propagate the garden vegetation , garden visit and garden work is organized for botany students and students learn various propagation techniques like cutting and grafting.

Use of medicinal plants:

There are many Medicinal Plants planted in college Botanical garden. Students don't have knowledge how to use and identify the particular plants therefore faculty members of the botany department help them to identify and use these plants. Every year botany department organizes Medicinal Plant Exhibition for local people, students and faculty members.

List of plants in college campus

Sr. No	Botanical Name	Common name marathi	Family	Number
1	***Pongamia pinnata*** (L.) Pierre	Karnj	Leguminosae	60
2	***Azadirachta indica*** A.Juss.	Kadunim	Meliaceae	4
3	***Bougainvillea spectabilis*** Willd.	Boganvel	Nyctaginaceae	4
4	***Senna siamea*** (Lam.) H.S.Irwin & Barneby	Kashid	Leguminosae	6
5	***Dalbergia sissoo*** Roxb. ex DC.	Shisav	Leguminosae	2
6	***Eucalyptus globulus*** Labill.	Nilgiri	Myrtaceae	2
7	***Polyalthia longifolia*** (Sonn.) Benth. & Hook.f. ex Thwaites	Ashok	Annonaceae	9

8	***Tectona grandis*** L.f.	Sag	Verbenaceae	3
9	***Acacia nilotica*** (L.) Willd. ex Delile	Babhul	Leguminosae	1
10	***Senegalia polyacantha*** (Willd.) Seigler & Ebinger	Babhul	Leguminosae	1
11	***Citrus limon*** (L.) Osbeck	Lemon	Rutaceae	1
12	***Roystonea regia*** (Kunth) O.F.Cook	Palm tree	Arecaceae	28
13	***Peltophorum pterocarpum*** (DC.) Backer ex K.Heyne	Sonmohar	Leguminosae	6
		Total		**127**

List of plant in Botanical Garden

Sr. No	Botanical Name	Family	Common Name	Habit
1	*Aloe vera* (L.)Burm.f.	Asphodelaceae	Korfal	Shrub
2	*Cissusquandrangularis*L.	Vitaceae	Kandwel	Climber
3	*Argyreia nervosa*(Burm.f.) Bojer	Convolvulaceae	Samudrashok	Climber
4	*Iphigenia stellata*Blatt.	Colchicaceae	Jangalilasan	Herb
5	*Piper longum*L.	Piperaceae	Pimpari	Climber
6	*Justiciaadhatoda*L.	Acanthaceae	Adulsa	Shrub
7	*Curcuma longa* L.	Zingiberaceae	Halad	Herb
8	*Psidiumguajava*L.	Myrtaceae	Jambh	Tree
9	*Phyllanthusemblica*L.	Phyllanthaceae	Awala	Tree
10	*Boerhaviadiffusa*L.	Nyctaginaceae	Punarnava	Climber
11	*Withaniasomnifera*(L.) Dunal	Solanaceae	Ashwagandha	Shrub
12	*Ocimumamericanum*L.	Lamiaceae	Rantulas	Herb
13	*Lawsoniainermis*L.	Lythraceae	Mehandi	Tree
14	*Croton tiglium*L.	Euphorbiaceae	Jamalgotha	Shrub
15	*Nerium oleander* L.	Apocynaceae	Kanher	Shrub
16	*Hibiscus rosa-sinensis*L.	Malvaceae	Jaswand	Shrub
17	*Daturastramonium*L.	Solanaceae	Datura	Herb
18	*Syzygiumaromaticum (L.)* Merr. &L.M.Perry	Myrtaceae	Lawang	Tree
19	*Tridaxprocumbens*L.	Asteraceae	Kambarmodi	Herb
20	*Andropogoncitratus*DC.	Poaceae	Gavatichaha	Herb
21	*Alpiniagalanga*(L.) Willd.	Zingiberaceae	Kulinjan	Herb
22	*Bixaorellana*L.	Bixaceae	Shendri	Tree
23	*Aeglemormelos* (L.) Corr.	Rutaceae	Bel	Tree
24	*Ocimumtenuiflorum*L.	Lamiaceae	Tulas	Herb
25	*Coleus ambionicus*Lour.	Lamiaceae	Panacha ova	Herb
26	*Rauwolfia vomitoria*Afzel.	Apocynaceae	Sarpagandha	Shrub

27	*Bacopamonnieri*(L.) Wettst.	Plantaginaceae	Bramhi	Herb
28	*Vitexnegundo*L.	Lamiaceae	Nirgund	Shrub
29	*Euphorbia neriifolia*L.	Euphorbiaceae	Shund	Shrub
30	*Barleriacristata*L.	Acanthaceae	Blue Koranti	Shrub
31	*Barleriaprionitis*L.	Acanthaceae	Yellow Koranti	Shrub
32	*Putranjivaroxburghii*Wall.	Putranjivaceae	Putranjiva	Tree
33	*Andrographispaniculata*(Burm.f.) Nees	Acanthaceae	Kalmegh	Herb
34	*Helleniaspeciosa*(J.Koenig) S.R.Dutta	Costaceae	Kewkand	Herb
35	*Kalanchoepinnata*(Lam.) Pers.	Crassulaceae	Panfuti	Shrub
36	*Murrayakoenigii* (L.)Spreng.	Rutaceae	Godnimbh	Tree
37	*Chlorophytumborivilianum*Santapa u&R.R.Fern.	Asparagaceae	Safedmusali	Shrub
38	*Adenantherapavonina*L.	Leguminosae	Ratangunj	Tree
39	*Nyctanthes arbor-tristis*L.	Oleaceae	Parijatak	Tree
40	*Tinosporacordifolia*(Willd.) Hook.f. & Thomson	Menispermaceae	Gulwel	Climber
41	*Asparagus racemosus*Willd.	Asparagaceae	Shatavari	Climber
42	*Tabernaemontanadivaricata*(L.) R.Br. ex Roem. &Schult.	Apocynaceae	Tagari	Shrub
43	*Polianthestuberosa*L.	Asparagaceae	Nishigandha	Shrub
44	*Canna indica*L.	Cannaceae	Canna	Herb
45	*Tageteserecta*L.	Asteraceae	Marigold	Herb
46	*Cupressus sp.*	Cupressaceae	Cupressus	Shrub
47	*Hymenocallislittoralis*(Jacq.) Salisb.	Amaryllidaceae	Spider liy	Shrub
48	*Thuja sp.*	Cupressaceae	Thuja	Shrub
49	*Passifloracaerulea* L.	Passifloraceae	Krishnakaml	Climber
50	*Passifloraedulis*Sims	Passifloraceae	Krishnakaml	Climber
51	*Hemidesmusindicus*(L.) R. Br.	Apoynaceae	Anatmul	Climber
52	*Pentaslanceolata*(Forssk.) Deflers	Rubiaceae	Pentas	Shrub
53	*Pentasarvensis*Hiern.	Rubiaceae	Pentas	Shrub
54	*Coleus barbatus*(Andrews) Benth. ex G.Don	Lamiaceae	Mainmula	Herb
55	*Ixoracoccinea*L.	Rubiaceae	Rukhmini	Shrub
56	*Plumbagozeylanica* L.	Plumbaginaceae	Chitrak	Shrub
57	*Mirabilis jalapa*L.	Nyctaginaceae	- Four ‘O’ clock plant	Herb
58	*Lagerstroemia indica*L.	Lythraceae	Jarul	Tree
59	*Ricinuscommunis*L.	Euphorbiaceae	Castor plant	Tree
60	*Jatrophacurcas*L.	Euphorbiaceae	Chandrajyot	Shrub
61	*Euphorbia pulcherrima*Willd. ex	Euphorbiaceae	Lalpatti	Shrub

	Klotzsch			
62	*Tecomastans*(L.) Juss. ex Kunth	Bignoniaceae	Sonpatti	Tree
63	*Cascabelathevetia*(L.) Lippold	Apocynaceae	Thevetia	Tree
64	*Dianthus chinensis*L.	Caryophyllaceae	Dianthus	Herb
65	*Nephrolepisbiserrata* (Sw.) Schott.	Nephrolepidaceae	Fern	Shrub
66	*Bougainvillea spectabilis*Willd.	Nyctaginaceae	Bougainvillea	Vine
67	*Euphorbia tirucalli* L.	Euphorbiaceae	Satala	Tree
68	*Santalum album* L.	Santalaceae	Sandwood	Tree
69	*Hibiscus cannabinus* L.	Malvaceae	Lalambari	Shrub
70	*Pongamiapinnata* (L.) Pierre.	Leguminosae	Karanj	Tree
71	*Calotropisprocera*(Aiton) W.T.Aiton	Apocyanaceae	Rui	Tree
72	*Chrysanthemum indicum* L.	Asteraceae	Ashtak	Herb
73	*Hamelia patens*Jacq.	Rubiaceae	Hamelia	Shrub
74	*Dendrocalamusstrictus*(Roxb.) Nees	Poaceae	Bamboo	Tree
75	*Zinnia elegans*Jacq.	Asteraceae	Zenia	Herb
76	*Allamandacathartica*L.	Apocynaceae	Allamanda	Shrub
77	*Zamia furfuracea*L.f. ex Aiton	Zamiaceae	Zamia	Shrub
78	*Cycasrevoluta*Thunb.	Cycadaceae	Cycus	Shrub
79	*Bignonia capreolata* L.	Bignoniaceae	Bignonia	Vine
80	*Azadirachtaindica*A.Juss.	Meliaceae	Neem	Tree
81	*Boswelliaserrata*Roxb.	Burseraceae	Salai	Tree
82	*Boerhaviarepens*L.	Nyctaginaceae,	Punarnava	Herb
83	*Eucalyptus globulus*Labill.	Myrtaceae	Nilgiri	Tree
84	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Tanhan	Tree
85	*Pentaslanceolata*(Forssk.) Deflers	Rubiaceae	Pentas	Shrub
86	*Pongamiapinnata* (L.) Pierre	Leguminosae	Karanj	Tree
87	*Vitexnegundo* L.	Lamiaceae	Nirgudi	Shrub
88	*Jasminumauriculatum*Vahl	Oleaceae	Jui	Climber
89	*Jasminumcalophyllum*Wall. ex G.Don	Oleaceae	Jai	Climber
90	*Jasminumofficinale*L.	Oleaceae	Chameli	Climber

List of Medicinal Plants provided and distributed in college programmes

Sr. No	Botanical Name	Family	Common Name	Habit
1	*Aloe vera* L.	Asphodelaceae	Korfal	Shrub
2	*Cissus quandrangularis* L.	Vitaceae	Kandwel	Climber
3	*Argyreia nervosa* L.	Convolvulaceae	Samudrashok	Climber
4	*Adhatoda vasica* N.	Acanthaceae	Adulsa	Shrub

5	*Withania sominifera* L.	Solanaceae	Ashwagandha	Shrub
6	*Andropogon citratus* L.	Poaceae	Gavatichaha	Herb
7	*Andropogon citratus* L.	Poaceae	Gavatichaha	Herb
8	*Bixa orellana* L.	Bixaceae	Shendri	Tree
9	*Ocimum sanctum* L.	Lamiaceae	Tulas	Herb
10	*Coleus ambionicus* Lour.	Lamiaceae	Panacha ova	Herb
11	*Andrographis paniculata* Wall.	Acanthaceae	Kalmegh	Herb
12	*Bryophyllum pinnatum* Lam.	Crassulaceae	Panfuti	Shrub
13	*Adenanthera pavonnia* L.	Fabaceae	Ratangunj	Tree
14	*Tinospora cordifolia* Miers.	Menispermaceae	Gulwel	Climber
15	*Asparagus recemosus* Will.	Asparagaceae	Shatavari	Climber
16	*Hemidesmus indicus* L.	Apoynaceae	Anatmul	Climber
17	*Pongamia pinnata* (L.) Pierre	Leguminosae	Karanj	Tree

Recommendations:

To maintain green and eco-friendly college campus, more trees need to be planted. A thick green belt development along the fence is strongly recommended. The plant diversity shall be maintained. The plant species that are found suitable are suggested for plantation and greenbelt development. In addition to above, some flowering plants, shrubs, herbs and climber plant species suggested for beautification in the college campus.

Garden of the college

Garden side view

Plants in Botanical garden

Medicinal Plants in Botanical Garden

Ashoka plants in front of science wing

Karanj tree plantation near the cycle stand

Palm tree plantation at the entrance

Green practices

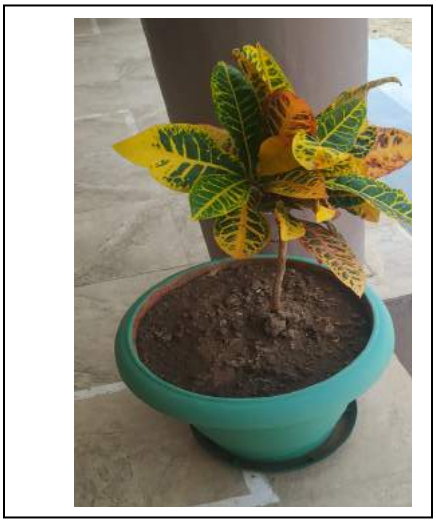
Students participation in gardening techniques

Medicinal Plant saplings provided by the Botany department prepared in garden

Medicinal plant saplings distributed to students

Medicinal plant exhibitions organized by Botany department

Students participation in plantation programme



Indoor plant kundi prepared by Botany department of Environment Awareness committee

Quality planting material prepared by Botany department – Giloy plant sapling

Faunal Diversity

Smt. Radhabai Sarda Arts, Commerce And Science College Anjangaon Surji with 13 acres of land is located in the Anjangaon Surji Region, Dist. Amravati, Maharashtra, India (Latitude N $21^0$9'19.4868'', Longitude E $77^0$49.6584''). The college established in 1966, comprises five major areas i.e. Main building, Library building, Commerce building, Science building and Botanical garden. The college campus supports an immense diversity of plants and animals including native species as well as some rare species. A total 81 animal species were observed in the college campus including invertebrates and vertebrates (different groups like Beetle, Moth, Bug, Bird, Ant, Spider, Wasp, Millipede, Slug, Louse, Earthworm, Snail, Butterfly, Dragonfly, Grasshopper etc.). The floral diversity in the campus serves as a roosting place for the different species of the bird, it also acts as a habitat for a variety of insects, variety of flowering plants in the botanical garden supports a wide variety of butterflies and birds. The window shades of college building serve as a resting place for the birds like rock pigeon. The college environment has rich and abundant faunal diversity enlisted as below.

SN	Scientific Name	Common Name	Family
BEETLE			
1	*Aspidimorpha sanctaecrucis*	Golden tortoise beetel	Chrysomelidae
2	*Carpophilus freemani*	Freeman sap beetle	Nitidulidae
3	*Acritus*	Clown beetle	Histeridae
4	*Zygogramma bicolarata*	Mexican beetle	Chrysomelidae
5	*Tropisternus lateralis*	Scavenger beetle	Hydrophilidae
6	*Copelatus haemorrhoidalis*	Diving beetle	Dytiscidae
7	*Chrysolina herbacea*	Mint beetle	Chrysomelidae
8	Oulema melanopa	Ceral leaf beetle (lema)	Chrysomelidae
9	Chrysomela scripta	Cotton wood leaf beetle	Chrysomelidae
10	*Harmonia axyridis*	Ladybird	Coccinellidae
MOTH			
1	*Spodoptera exigua*	Beet armyworm	Noctuidae

2	*Spodoptera frugiperda*	Fall armyworm	Noctuidae
3	*Achyra rantalis*	Garden webworm	Crambidae
4	*Spodoptera eridania*	Southern armyworm	Noctuidae
5	*Orvasca subnotata*	Tussock moth caterpillar	Erebidae
6	*Hypena scabra*	Green cloverworm	Erebidae
BUG			
1	*Halyomorpha halys*	Brown marmorated stink bug	Pentatomidae
2	*Artipus floridanus*	Little leaf notcher	Curculionidae
3	*Dysdercus cingulatus*	Red cotton bug	Pyrrhocoridae
4	*Halyomorpha halys*	Brown marmorated stink bug	Pentatomidae
5	*Armadillidium vulgare*	Roly poly	Armadillidiidae
6	*Coridius janus*	Red pumpkin bug	Dinidoridae
7	*Chinavia hilaris*	Green shink bug	Pentatomidae
BIRD			
1	*Bulbulcus ibis*	Cattle Egret	Aedeidae
2	*Columba livia*	Rock pigeon	Columidae
3	*Streptopelia senegalensis*	Laughing Dove	Columidae
4	*Streptopelia orientalis*	Oriental Turtle Dove	Columbidae
5	*Pycnonotus cafer*	Red vented bulbul	Pycnonotidae
6	*Passer domesticus*	House sparrow	Passeridae
7	*Turdoides striatus*	Jungle Babbler	Leiothrichidae
8	*Sturnia pagodarum*	*Pagodarum*(Brahminy Starling)	Sturnidae
9	*Acridotheres tristis*	Common myna	Sturnidae
10	*Halcyon smymensis*	White Throated Kingfisher	Alcedinidae
11	*Eudynamys scolopaceus*	Asian Koel	Cuculidae

12	*Cuculus canorus*	Common cuckoo	Cuculidae
13	*Corvus splendens*	Crow	Corvidae
14	*Centropus sinensis*	Greater coucal	Cuculidae
15	*Phaethontidae psittaciformes*	Parrot	
16	*Dicruves macrocercus*	Black Drongo	Dicruridae
17	*Merops orientalis*	Green bee-eater	Meropidae
ANT			
1	*Camponotus consobrinus*	Banded sugar ant	Formicidae
2	*Solenopsis geminata*	fire ant	Formicidae
3	*Camponotus pennsylvanicus*	Black carpenter ant	Formicidae
4	*Camponotus ocreatus*		Formicidae
5	*Camponotus floridanus*	Florida carpenter ant	Formicidae
SPIDER			
1	*Steatoda grossa*	False widow	Theridiidae
2	*Eratigena atrica*	Giant house spider	Theridiidae
3	*Pholcus phalangioides*	Longbodied cellar spider	Theridiidae
4	*Pardosa amentata*	Wolf spider	Lycosidae
5	*Hasarius adansoni*	Jumping spider	Salticidae
6	*Plexippus paykulli*	Jumping spider	Salticidae
7	*Heteropoda venatoria*	Hunt's man spider	Sparassidae
WASP			
1	*Apidae apis*	Honey bee	Formicidae
2	*Mischocyttarus Mexicanus*	New world paper wasp	Formicidae
MILLIPADE			
1	*Anoplodesmus tanjoricus*	Yellow-spotted millipede	Polydesmidae
2	*Orthoporus ornatus*	Desert millipede	Spirosdtreptidae

SLUG			
1	*Laevicaulis alte*	tropical land slug	Veronicelloidae
LOUSE			
1	*Oniscus*	Common woodlouse	Oniscidae
EARTHWORM			
1	*Aporrectodea calignosa*	Earthworm	Lumbricidae
INSCET			
1	*Acheta domesticus*	House cricket	Gryllidae
SNAIL			
1	*Planorbarius corneus*	Great ramshorn	Planorbidae
DRAGONFLY			
1	*Sympetrum flaveolum*	Yellow winged darter	Libellulidae
2	*Diplacodes trivialis*	Blue percher	Libellulidae
3	*Trithemis festiva*	English–Indigo dropwing	Libellulidae
4	*Trithemis aurora*	Crimson marsh skimmer	Libellulidae
5	*Crocothemis servilia*	Scarlet skimmer	Libellulidae
BUTTERFLY			
1	*Graphium agamemnon*	Green spotted triangle	Pailoinidae
2	*Byblia ilithyia*	Jokers	Nymphalidae
3	*Papilio demoleus*	Lime butterfly	Pailoinidae
4	*Junonia lemonias*	Lemon pansy	Nymphalida
5	*Cynthia cardui*	Painted lady	Nymphalida
GRASSHOPPER			
1	*Pterophylla camellifolia*	Comman katydid	Tettigoniidae
2	*Scudderia furcata*	fork-tailed bush katydid	Tettigoniidae
3	*Melanoplus packardii*	Packard's grasshopper	Acrididae
4	*Acrida conica*	Giant green slantface	Acrididae
5	*Hieroglyphus banian*	Rice grasshoppers	Acrididae
AMPHIBIANS			

1	*Duttaphrynus melanostictus*	*Asian Common toad*	Bufonidae
REPTILES			
1	*Calotes versicolor*	Indian garden lizard	Agamidae
MAMMALS			
1	*Herpestide*	Mangoose	Herpestide
2	*Ratus ratus*	Rat	Muridae
3	*Funambulus palmarum*	Indian palm squirrel	Sciuridae

PHOTOPLATE

Bulbulcus ibis

Passer domesticus

Acridotheres tristis

Halcyon smymensis

Streptopelia orientalis

Corvus splendens

Camponotus consobrinus

Eratigena atrica

Anoplodesmus tanjoricus

Plexippus paykulli

	
Hasarius adansoni	***Pardosa birmanicus***
	
Junonia lemonias	*Chrysolina herbacea*
	
Harmonia axiridius	*Acritus*

 *Diplocodes trivialis*	 *Trithemis aurora*
 *Scudderia Furcata*	 *Acrida conica*

Data and photographs collected from Zoology department

Energy Audit

Introduction:

An energy audit is an inspection, survey and analysis of energy consumed in a system in order to identify opportunities for reducing energy expense and carbon footprints.

Energy Audit Objectives:

- To study the present pattern of energy consumption
- To identify energy saving measures for energy optimization
- To implement the acceptable and feasible measures for energy conservation.

Methodology:

- **Historical data Analysis:**

  This step involves collection and study of electricity bills of college in order to established base line data on energy consumption and its variation with change in production volume. Energy audit team collected energy bills of college for session 2019-2020 and analysis them.

- **Actual measurement and data analysis:**

  This step involves actual site measurement. Energy audit team visited to all units of college campus and collected the data for analysis like number of electrical appliances, their wattage and operating time.

- **Identification of energy conservation opportunities:**

  This step involves the identification of acceptable and feasible opportunities for minimizing energy consumption and their evaluation for implementation. After the complete data analysis, energy audit team finds out the opportunities towards energy conservation and made some recommendations.

Summary of Energy Audit

1) Electrical energy system:

Source of electricity : MSEDCL (BU/1627/ANJANGAON SUB –DN)				
Details of Electricity Meters				
Installation area	Installation Date	Meter Number	Connection Type	Sanctioned Load
Arts Building	17/11/1989	359710030322	LT II	1.00 KW
Library Building	30/5/2014	359710158418	LT II	5.93 KW
Commerce Building	15/5/2015	359718101369	LT II	3.70 KW
Science Building	15/5/2015	359718101377	LT II	0.54 KW
Total Sanctioned Load : 11.17 KW				

2) Electricity Bill Analysis:

Period	Total consumption of Units	Avg. Consumption of units per month
Aug-19 to July-20	**16271**	**1355.91**

3) Connected loads and their consumption:

Total load connected	power requirement per month	Annual power requirement
51.11 KW	**3820.11 KW**	**45841 KW**

4) Assessment of lightening system:

Light Type	Quantity	Total Load (kW)	Annual lightning power consumption	% Annual lightning power consumption
LED bulbs/tube lights	162	3.31	5126.436 KW	100 %
Conventional lights	0	0	0	0
Total	162	0	5126.436 KW	100 %

5) Use of renewable energy sources:

Renewable energy source	Wattage	Quantity	Total Watt	Production per month
Solar street lamp	18	5	90	16.2 KW

6) Use of renewable energy sources:

Period	Total Units Consumption (KWh)	Total CO_2 emitted	Avg. CO2 emitted per month
Aug-2019- July 2020	16271	13.02 MT	1.085 MT

7) Remarks:

- No use of incandescent bulb and CFL bulb
- 100% use of LED for lightening system.
- Good initiative towards use of renewable energy source through solar street lamp
- Maximum use of natural light.
- AC and refrigerator used are of three stars.

Thus, very good initiatives are taken by college for energy conservations.

7) Energy conservation opportunities:

- It has been observed that majority of electrical power consumption is through Celling fans having wattage 70 Watt. Therefore it is recommended to replace these celling Fans with 40 Watt Energy Efficient Fans.
- PV solar system is suggested to install in a campus to minimize electricity bill. 15 KV solar panel may generate about 60 units per day which saves Rs 1,25000 per year

Historical Data analysis

1) Source of electrical energy:

Smt Radhabai Sarda Arts, Commerce and Science College, Anjangaon Surji receives electrical energy from MSEDCL (BU/1627/ANJANGAON SUB-DN).

There are four meters installed in the campus. The details of meters are tabulated below.

Sr. No.	Installation area	Installation Date	Meter Number	Connection Type	Sanctioned Load
1	Arts Building	17/11/1989	359710030322	LT II	1.00 KW
2	Library Building	30/5/2014	359710158418	LT II	5.93 KW
3	Commerce Building	15/5/2015	359718101369	LT II	3.70 KW
4	Science Building	15/5/2015	359718101377	LT II	0.54 KW

Total sanctioned load is **11.17 KW**

2) Major Consumers of electricity:

Major consumers of electricity in the college campus are

- AC
- Fan / Exhaust fan
- LED bulb/tube light
- Refrigerator
- Water purifier
- Pumping motors
- Router system
- Computer
- Printer and Scanner
- Xerox Machines
- LCD projectors
- Laboratory equipments
- UPS
- CCTV

3) Study of month wise unit consumption:

Month	**Consumption Unit (kWh)**				
	Office & Arts Building	Commerce Building	Library Building	Science Building	Total Consumption (Monthly)
Aug-19	1157	279	202	248	**1886**
Sep-19	1023	295	213	306	**1837**
Oct-19	991	309	193	306	**1799**
Nov-19	958	239	199	317	**1713**

Dec-19	825	140	134	49	**1148**
Jan-20	686	183	153	46	**1068**
Feb-20	609	140	188	57	**994**
Mar-20	724	119	177	122	**1142**
Apr-20	424	147	109	75	**755**
May-20	67	147	17	75	**306**
Jun-20	67	147	17	75	**306**
Jul-20	2019	304	872	122	**3317**
Total Consumption (Yearly)	**9550**	**2449**	**2474**	**1798**	**16271**
Average Monthly Consumption	**795.83**	**204.08**	**206.16**	**149.8**	**1355.91**
% Energy consumption	**58.69 %**	**15.05 %**	**15.20 %**	**11.05 %**	**100 %**

Observations:

- Total annual consumption of college campus is **16271 kWh.**
- Average monthly consumption of college campus is **1355 kWh**
- Electricity conservation of office and arts building is found to be **maximum (58.69 %)**
- Electricity conservation of Science building is found to be **minimum (11.05 %)**
- The energy conservation for the months April, May and June is observed to be minimum because of lock down imposed by Govt. of India due to COVID-19 pandemic.

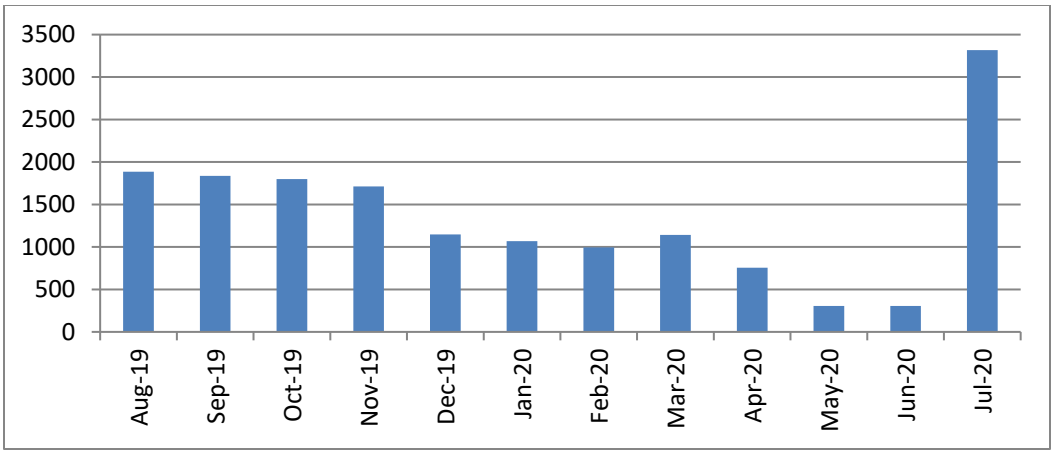


Figure 1 Month wise total units consumption in college

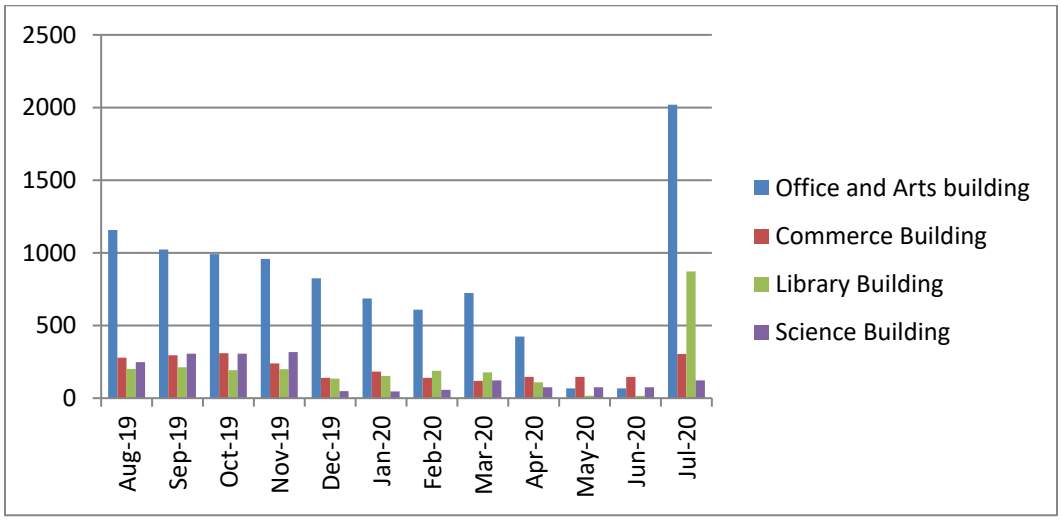


Figure 2 Month wise and building wise units consumption

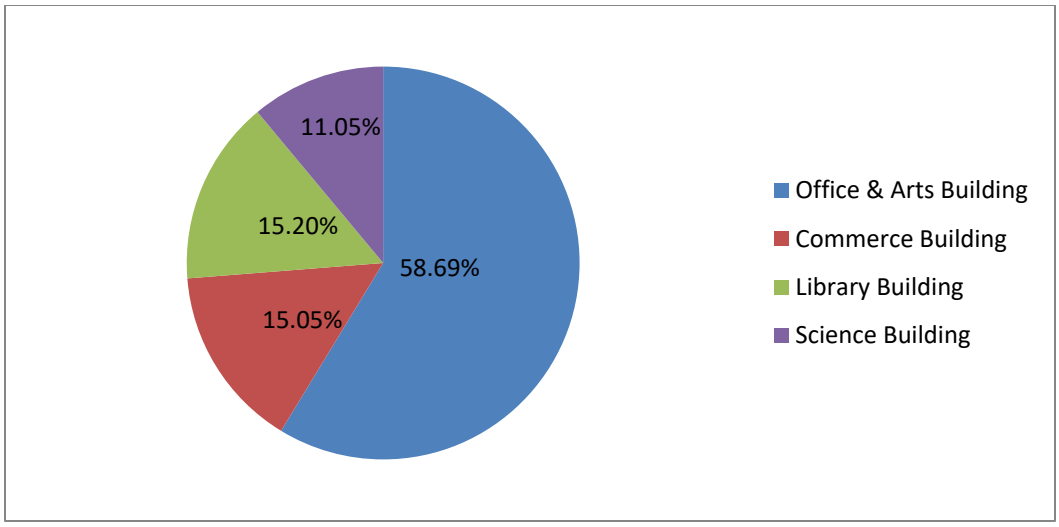


Figure 3 Building wise % unit consumption

Actual measurement and data analysis

1) Total Load consumption in college:

Electrical Appliance	Power Rating (Watt)	Quantity	Power consumption in 1 Hr (kWh)	Operating Hours (Hours)	Operating days per month	Power consumption per month (kW)	% consumption per month
AC	1400	1	1.4	5	21	147	3.85%
Fan	70	192	13.44	5	21	1411.2	36.94%
Exhaust Fan	15	11	0.165	4	21	13.86	0.36%
Water Cooler	240	7	1.68	1	21	35.28	0.92%
LED tube bulb	23	15	0.345	6	21	43.47	1.14%
LED tube light	22	29	0.638	6	21	80.388	2.10%
LED tube light	20	54	1.08	6	21	136.08	3.56%
LED POP bulb	15	40	0.6	6	21	75.6	1.98%
LED POP bulb	10	7	0.07	6	21	8.82	0.23%
LED POP bulb	6	3	0.018	6	21	2.268	0.06%
LED POP bulb	3	3	0.009	6	21	1.134	0.03%
LED Street Light	45	4	0.18	10	30	54	1.41%
LED Street Light	30	4	0.12	10	30	36	0.94%
LED Focus (150 W)	150	1	0.15	10	30	45	1.18%
LED Focus (50 W)	50	2	0.1	10	30	30	0.79%
Computer	100	52	5.2	5	21	546	14.29%
Printer	300	12	3.6	1	21	75.6	1.98%

Scanner	45	2	0.09	0.5	21	0.945	0.02%
Xerox Machine	650	3	1.95	0.5	21	20.475	0.54%
Lamination Machine	620	1	0.62	1	21	13.02	0.34%
TV	85	2	0.17	5	21	17.85	0.47%
UPS	1500	5	7.5	2	21	315	8.25%
CCTV	10	38	0.38	24	30	273.6	7.16%
LCD Projector	270	5	1.35	3	21	85.05	2.23%
Refrigerator	50	3	0.15	1	30	4.5	0.12%
Cofee Machine	1300	1	1.3	0.5	21	13.65	0.36%
Wifi Router	15	3	0.045	8	21	7.56	0.20%
Hot air oven	1500	2	3	2	21	126	3.30%
Furnace	2000	2	4	1	21	84	2.20%
Pumping motor 1HP	750	4	1	1	21	21	0.55%
Electric Bell	5	2	0.01	6	21	1.26	0.03%
Water Purifier	750	1	0.75	6	21	94.5	2.47%
Total			**51.11**			**3820.11**	100%

This is the total load consumption in college calculated approximately. Actual load consumption might be different according to actual use of power for a particular time period.

Observations:

- Maximum power requirement per month is **3820 KW**
- AC, Fan, Computers, UPS and CCTVs are the major consumers of electricity in college.
- Consumptions for lightning system is minimum because of use of LED type lights.

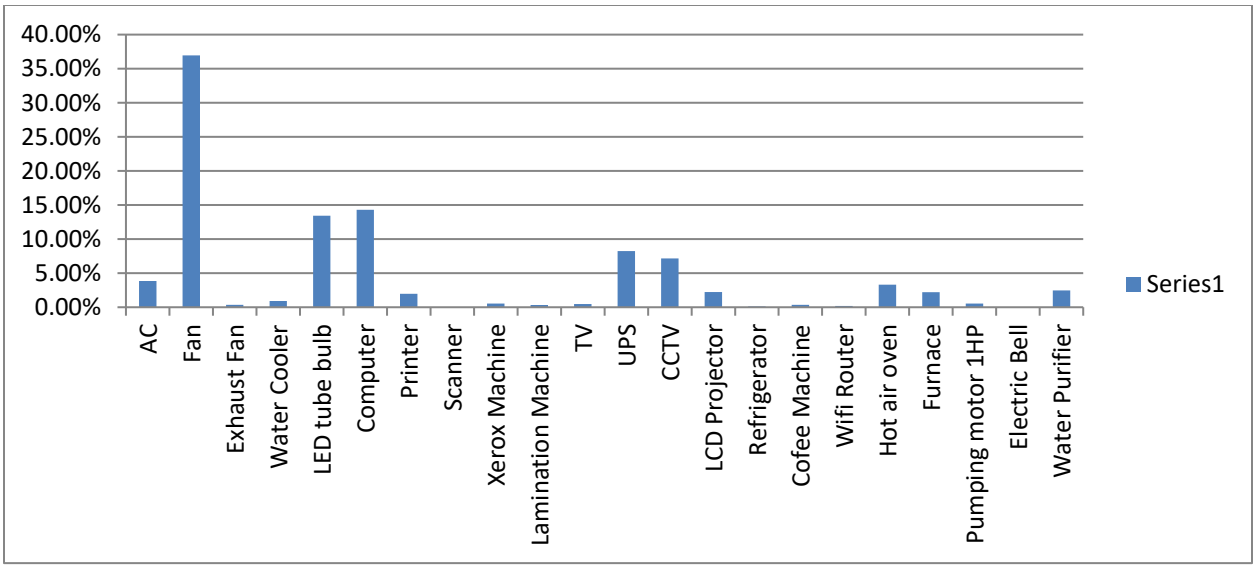


Figure 4 % consumption of electrical appliances

2) Performance assessment of lighting system:

Unit	Area	Light Type	Wattage	Quantity	Operating Hours	Power consumption per day (kWh)	Power consumption per month (kWh)
Administrative and Arts Building	Principal Cabin	LED tube light	22	1	6	0.132	2.772
		LED POP bulb	15	4	6	0.36	7.56
		LED POP bulb	10	4	6	0.24	5.04
		LED POP bulb	6	3	6	0.108	2.268
		LED POP bulb	3	3	6	0.054	1.134
	Administrative office (Room 6)	LED POP bulb	15	11	6	0.99	20.79
		LED POP bulb	10	3	6	0.18	3.78
	Administrative office (Room 7)	LED tube light	22	2	7	0.308	6.468
	Seminar Hall	LED POP bulb	15	15	3	0.675	14.175
	IQAC office	LED POP bulb	15	6	7	0.63	13.23
	Computer Lab	LED tube light	22	6	6	0.792	16.632
		LED bulb	15	4	6	0.36	7.56
	Porch	LED tube light	22	8	4	0.704	14.784
		LED Street light	45	3	10	1.35	28.35
		LED Street light	30	2	10	0.6	12.6

	Staff Room/Exam Office	LED tube light	22	2	6	0.264	5.544
	Class Room 14	LED tube light	22	1	6	0.132	2.772
	Porch	LED tube light	22	4	4	0.352	7.392
	English Department	LED tube light	22	2	6	0.264	5.544
	Marathi Department	LED tube light	22	2	6	0.264	5.544
	Porch	LED tube light	22	1	4	0.088	1.848
Commerce Building	YCMOU office	LED tube light	20	1	6	0.12	2.52
		LED bulb	23	1	6	0.138	2.898
	Physical Education	LED tube light	20	2	6	0.24	5.04
	Home Science	LED bulb	23	6	6	0.828	17.388
	Porch	LED bulb	23	1	6	0.138	2.898
		LED tube light	20	1	6	0.12	2.52
		LED Street light	30	1	10	0.3	6.3
	Digital Room	LED tube light	20	2	6	0.24	5.04
	Staff Room	LED tube light	20	1	6	0.12	2.52
	PORCH	LED tube light	20	1	6	0.12	2.52
Science Building	Chemistry Lab	LED tube light	20	3	6	0.36	7.56
	Class Room	LED tube light	20	2	6	0.24	5.04
	Class Room	LED tube light	20	2	6	0.24	5.04
	Class Room	LED tube light	20	2	6	0.24	5.04
	Physics Lab	LED tube light	20	2	6	0.24	5.04
	Dark Room	LED tube light	20	1	1	0.02	0.42
	Porch	LED tube light	20	2	2	0.08	1.68
	Zoology Lab	LED tube light	20	2	6	0.24	5.04
	Botany Lab	LED tube light	20	2	6	0.24	5.04
	Class Room	LED tube light	20	2	6	0.24	5.04
	Class Room	LED tube light	20	2	6	0.24	5.04
	Porch	LED tube light	20	1	2	0.04	0.84
		LED Focus	150	1	10	1.5	31.5
		LED Focus	50	2	10	1	21
	Common Room	LED tube light	20	2	6	0.24	5.04

	Math Department	LED tube light	20	2	6	0.24	5.04
	Staff Room	LED tube light	20	1	6	0.12	2.52
	Class room	LED tube light	20	1	6	0.12	2.52
	Class room	LED tube light	20	1	6	0.12	2.52
	Porch	LED tube light	20	1	2	0.04	0.84
Library Building	Library	LED tube light	20	4	6	0.48	10.08
		LED bulb	23	2	6	0.276	5.796
	Reading Room	LED tube light	20	6	6	0.72	15.12
	room	LED tube light	23	1	6	0.138	2.898
	Room	LED tube light	23	2	6	0.276	5.796
		LED Street light	45	1	10	0.45	9.45
	Store Room	LED tube light	23	2	2	0.092	1.932
MCVC Building	Staff Room	LED tube light	20	1	6	0.12	2.52
	Class Room	LED tube light	20	1	6	0.12	2.52
	Class Room	LED tube light	20	1	6	0.12	2.52
	Class Room	LED tube light	20	1	6	0.12	2.52
	Class Room	LED tube light	20	1	6	0.12	2.52
		LED Street light	30	1	10	0.3	6.3
Total				**162**		**20.343**	**427.203**

Type wise lighting distribution

Light Type	Quantity	Total Load (kW)	Annual lightning power consumption	% Annual lightning power consumption
LED bulbs/tube lights	162	3.31	5126.436 KW	100 %
Conventional lights	0	0	0	0
Total	162	0	5126.436 KW	100 %

observations:

- Maximum lightning power requirement per month is **427.203 KW**
- Annual lightning power requirement is **5126.436 KW**
- **Complete lightning power requirement is met through LED light.**

3) Use of renewable energy sources:

In college campus there are five solar lights each of 18 W. They reduce approximately 16.2 KW electricity per month or in other words they decreases units in bill by 16.

1) Percentage of lighting power requirement met through LED bulbs:

Annual total lighting power requirement of college $= \mathbf{5126.43\ KW}$

Annual lighting power requirement met through LED $= \mathbf{5126.43\ KW}$

Therefore, Annual Percentage of lighting power requirement met through LED bulbs

$$= \frac{Annual\ lighting\ power\ requirement\ met\ through\ LED\ bulb}{Annual\ total\ lighting\ power\ requirement} \times 100$$

$$= \frac{5126.43}{5126.43} \times 100$$

$$= \mathbf{100}\ \%$$

2) Alternative Energy Initiative:

Total power requirement of college per month $= \mathbf{427.203\ KW}$

Power requirement met by renewable energy sources $= \mathbf{16.2\ KW}$

Therefore, Percentage of power requirement met by renewable energy sources

$$= \frac{Power\ requirement\ met\ by\ renewable\ energy\ sources}{Total\ power\ requirement} \times 100$$

$$= \frac{16.2}{427.203} \times 100$$

$$= \mathbf{3.80}\ \%$$

Carbon Di-Oxide emission

Here we computed the CO_2 emission due to electricity consumption. In India, 0.8 Kg of CO_2 is emitted for consumption of 1 unit of electricity.

Sr No.	Month	Unit consumption (KWh)	CO_2 Emitted in MT
1	Aug-19	1886	1.51
2	Sep-19	1837	1.47
3	Oct-19	1799	1.44
4	Nov-19	1713	1.37
5	Dec-19	1148	0.92
6	Jan-20	1068	0.85
7	Feb-20	994	0.80
8	Mar-20	1142	0.91
9	Apr-20	755	0.60
10	May-20	306	0.24
11	Jun-20	306	0.24
12	Jul-20	3317	2.65
Total		16271	13.02
Average emission=1.085 MT			

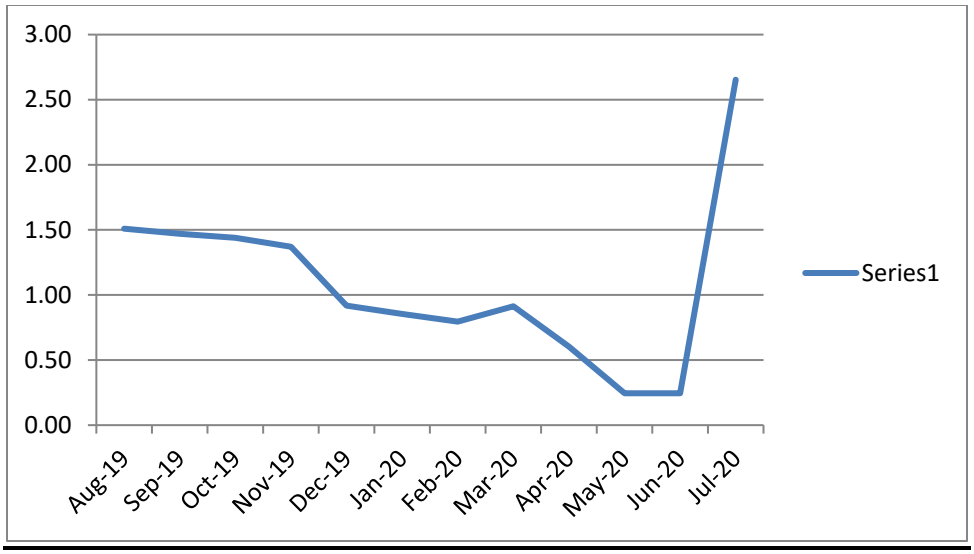


Figure 5 Month wise CO_2 emission

Identification of energy conservation opportunities

After complete data analysis, energy audit team finds scope for energy conservation in some area. Accordingly following recommendations are suggested.

Executive Recommendations:

- It has been observed that majority of electrical power consumption is through Celling fans having wattage 70 Watt. Therefore it is recommended to replace these celling Fans with 40 Watt Energy Efficient Fans.
- PV solar system is suggested to install in a campus to minimize electricity bill. 15 KV solar panel may generate about 60 units per day which saves Rs 1,25000 per year

General Recommendations:

- Use renewable energy sources like solar , wind , biogas energy
- Use power saver circuit for AC
- Connect computer and printers in LAN
- Avoid the unnecessary use of electrical appliances
- Provide cross ventilation to laboratory and class rooms in order to reduce number of fans

- Established college level student community to monitor college campus for energy consumption parameters.

Energy Audit done by Shri R.B. Mankar Head, Department of Physics and External Expert Shri Joshi Power Solution Amravati

Certificate of Energy Audit

This is to certify that Smt Radhabai Sarda Arts, Commerce and Science College, Anjangaon Surji has conducted Energy Audit for year 2019-2020 for knowing the present electrical energy consumption profile of the institution. This audit is also aimed to identify opportunities for reducing energy expense and carbon footprints.

20/6/2021
HEAD
DEPARTMENT OF PHYSICS
SMT.RADHABAI SARDA COLLEGE
ANJANGAON SURJI

Joshi Power Solution Amravati

Water Audit

Water audit is a part of green or environmental audit which are identified with the inspection of work directed inside the organizations whose movement can make risk to the health of inhabitants and environment. Water is basic forever. From the time that primeval species ventured from the oceans to live ashore. Chemically, it is transparent, colorless, tasteless compound of hydrogen and oxygen (H_2O). Water is additionally found in strong state as ice and gaseous state as vapors. All living beings, including humans require water for their survival. Therefore, guaranteeing that sufficient supplies of water are accessible is fundamental for person. A typical clarification is that despite the fact that there is a considerable measure of water on earth, just around 2.5% is fresh water, and in light of the fact that the majority of water is put away as icy masses or profound ground water just a little measure of water is effortlessly available.

In an educational institute's water is used for laboratory, bathroom, urinals, hostel, canteen, etc. This should need to measure balance of input water to output water. This water proportion is low at the end of the water distribution networks because of the leakages, overflow, and losses through valve. So it is need to water audit of this entire water distribution system. This should save the money to unaccounted water flow and this conserve water used in to lesser extent period. An educational institutes need to care about water distribution from start to end. And need to attention at minimum water losses through distribution network. The water audit includes incorporates examination of water assets, its supply, utilization, status and purity of drinking water, disposal and conservation of water and so forth.

Survey

The survey site includes laboratories of botany, zoology, microbiology, chemistry and biotechnology, botanical and other gardens, bathrooms, water coolers (RO and UV system), play ground etc. The auditor was also visited to staff colonies. Survey includes on site observation and discussion with charge staff and officers.

Observations:

Water Resource and Supply

Smt. Radhabai Sarda Arts, Commerce and Science college has own resource of water to supply the entire establishment aside from staff settlement. The water necessity of staff

settlement is satisfied by Municipal Corporation of Anjangaon. The organization asset incorporates one bore well (Lat N 21˚9'17.6868'' and Long E77˚ 18' 47.772'').

Institutional water supply includes laboratories, gardens, library, girls common room, bathrooms, water coolers, auditorium so on while city supply covers staff province phase 1 and phase 2. The water is supplied by galvanized steel (metal) pipe lines; it is about 12,000 to 1,500 meter. The bore well functions from morning 08 am to 04 pm (08hr) to fulfill the 75-80% institutional requirement.

Smt. Radhabai Sarda Arts, Commerce and Science College is facilitated with water coolers with reverse osmosis (RO) and ultra violet (UV) treatment for drinking water. The drinking water facility is accessible in the accompanying areas in college campus.

Table: Source of water supply

Source of water supply:	
Well	1 Number
Bore well	1 Number
Municipal Water supply	1 Number

Table: Water Storage Profile

Location	**No. and capacity of tanks**	**Total capacity (Lit.)**
Arts Wing	1x2000	2000L
Commerce Wing	2x500	1000L
Science wing	2x500	1000L
Toilet Building	2x500	1000L
	Total	5000L

Note: Approximate per capita average consumption and usage per day is 3.5 L of water.

Water Consumption

For the most part institutional water is devoured by laboratory (30-35%) which includes laboratory of chemistry (300 liter/day), zoology (200 liter/day), and botany (200 liter/day),. The botanical garden consume 20-25% of total followed by bathrooms (15-20%), drinking water (10-15%) and sports ground and other (5-10%). According to survey, laboratory and canteen were the most water expending destinations of college.

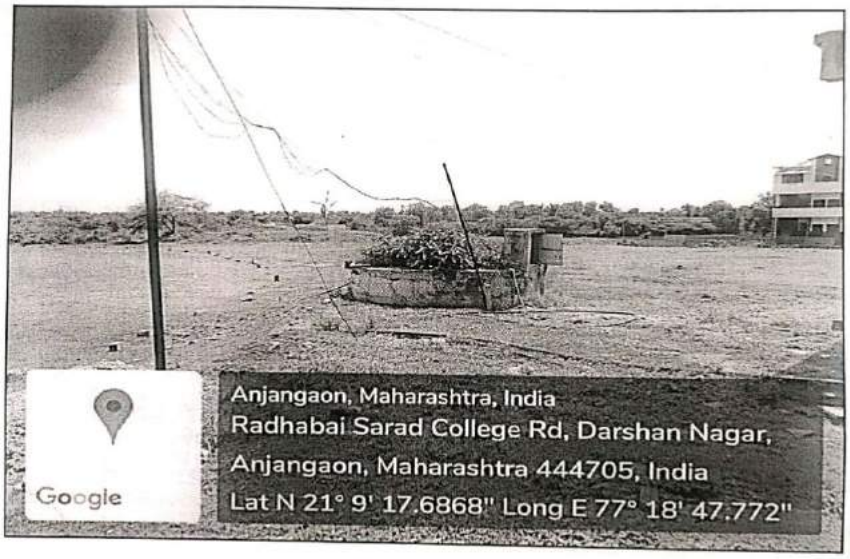
Drinking Water Analysis

The purpose of this study is to assess the drinking water characteristics at different location of college campus. For analysis of drinking water sample collected. Necessary drinking water parameter are periodically analyzed for detection of possible hazardous and microbial contents with the help of expert faculty of our college from department of Chemistry by following the standard procedure. The analyzed parameter included Temperature, pH, Turbidity, Smell, Total hardness, Fluoride, Chloride, Nitrate, Iron and Total Coliforms**.**

Drinking water analysis report

Source of sample: Bore well
Location /area: Smt. R S College, Anjangaon Surji
Received on: 11 January 2020
Completed on: 14 January 2020

Location:



Physico-chemical and microbiological analysis				
Parameters	Unit	Sample ID	NDWQS	Test method
		BW 01		
Temperature	°C	22	–	Thermometer
pH	-	6.4	6.5 – 8.5	Electromeric method
Turbidity	NTU	10	5 (10)	Nephlometric method
Taste	-	Non-objectional	Non-objectional	Organoleptic method
Smell	-	Non-objectional	Non-objectional	Organoleptic method
Total hardness as $CaCO_3$	mg/L	24	500	EDTA Titrimetric method
Chloride	mg/L	ND (< 1)	250	Argentrometric method
Fluoride	mg/L	ND (< 0.5)	0.5 - 1.5	SPADNS method
Ammonia	mg/L	0.1	1.5	Phenate method
Nitrate	mg/L	7.0	50	UV Spectrophotometric screening method
Phosphate	mg/L	ND (< 0.05)	-	Ascorbic acid reducing method
Iron (Fe)	mg/L	1.2	0.3 (3)	Direct air-acetylene flame method (AAS)
Manganese (Mn)	mg/L	ND (< 0.05)	0.2	Direct air-acetylene flame method (AAS)
Total Coliform	CFU/100mL	TNTC	0	Membbrane filteration
E. Coli	CFU/100mL	52	0	Membbrane filteration

NDWQS: National drinking water quality standard (2062)

References: Standard method for the examination of water and wastewater (APHA, AWWA & WEF) 22nd Edition (2012)
ND : Not detected ( ): Maxmimum concentration limit TNTC – Too Numerous to count (> 200)

Remarks:
Among the tested physico-chemical parameters, pH, turbidity and iron content do not meet the NDWQS value at the time of analysis.
Bacteriologically, the provided water sample is found to be free from contamination of Total coliform and E. Coli.

Authorized Signature
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Department of Chemistry
Smt. Radhabai Sarda Arts,
Commerce & Science College,
Anjangaon Surji

Waste Water Disposal and Conservation
Rain Water Harvesting

Due to rapid increase in day-to-day demand for water among fast growing human population, there lies a great opportunity of harvesting rainwater to meet the scarcity of water and avoid destruction of the normal groundwater level. The boon of rainwater harvesting is that the unused or extra water can be sent down the aquifer to charge the groundwater level.

Due to scarcity of water in summer it is needed to save and conserve water in monsoon season. So some intervals of time update the quantity and quality of water use. And take the major action to save water. The best option to measure use and loss of water is to take an audit of water. Water audit for distribution networks in college campus. A water audit determines the amount of water lost from a water supply system and the cost of this loss to the utility.

College has installed rain water harvesting system to increase the ground water level in college campus. The run-down rain water from Arts building roof-tops is gathered through a network of pipes and which is then directed into well.

Rain water harvesting structure on main building

Water collected on terrace is carried through pipes and sunk into Well thus increasing ground water level.

Rain water harvesting from Commerce building (Front view)

Rain water harvesting from Commerce building (Back side view)

Liquid Waste Management

The liquid wastes generated in the campus include Sewage, Laboratory and canteen effluent waste. Waste drinking water is drained to the different plants in the garden.

Waste drinking water is drained to the different plants in the garden

Hazardous Liquid Waste: Different hazardous and toxic chemicals which are used in a Chemistry Laboratory are drained in to a soak pit.

Soak pit for Chemistry laboratory hazardous waste water

Recommendations:

1. Responsibility of monitoring the overflow of water tank is fixed on peon/non-teaching staff in the concerned section.

2. Pipes, overhead tank and plumping system should be maintained properly to reduced leakage and wastage.

3. Garden should be watered by using drip/sprinkler irrigation system to minimize water use.

4. Conduct awareness program for efficient use of water.

Water audit report and related data collected from department of Chemistry.

Solid Waste Management

Solid waste generation is a continually growing problem at global, regional and local level. Solid waste is that organic and inorganic waste material produced by various activities which has lost tits value to the first user. Improper disposal of solid wastes pollutes the components of living environment.

Observations:

The average solid waste generated in the college campus is about 20kg/day. The major solid waste generated from college includes waste from Botanical garden, Tree droppings, Paper waste and laboratory waste. Single sided used papers are reused for writing or printing in all departments. Old Newspapers are sold to the scrap dealer for recycling. There are separate dustbins placed at proper place for collection of bio-degradable and non-degradable waste. The bio-degradable waste from garden, food waste from canteen, Home economics department is recycled in the vermin composting unit located behind the botanical garden. Manure produce from vermin composting unit is used in garden and also distributed among the faculty members. Non-degradable waste like metal waste, glass, wooden waste, e-waste is stored and given to the authorized scrap dealer for recycling for further processing. To minimize the waste generation in college campus students as well as staff members are educated for proper waste management practice through NSS programs, displaying slogans, advertisement on notice board etc and our institution encourages less paperwork by using online mode of correspondence.

Department of Home-Economics emphasizes on practical training of students by providing them first hand training in food processing, preserving, packaging and various steps of food processing. The biodegradable wastage in the form of vegetable waste which remains after the practical training of students not thrown away, rather it is sent to Vermicompst Unit of the college where it is dumped for production of manure. The organic manure that is produced by the vermicompst unit is then used in college garden and other premises for nourishing plants and trees.

Cleanliness drive

Recommendations:

- Sufficient big dustbins need to be placed where essential and monitor periodically.
- Segregate solid waste in to wet, dry, glass and constructional at source and biodegradable should be sent for composting while other solid waste must be sent to recycle or proper disposal.

- Plastic carry bags should be banned and awareness regarding plastic free campus should be created by displaying proper slogans, posters etc.
- If possible Home economics department can organize training for bag making from cotton material and news papers for students.

E-Waste Management

The disposal of E-Waste is a rapidly growing problem because electronic equipment frequently contains hazardous substances which affect the environment and human health.E-waste such as, discarded computers, office electronic equipment, monitors, Hard Disks are disposed off as per their conditions. These wastes are sold to local scrap. Efforts are made to reduce e-waste by making optimum use of electronic devices.

Observations

The college conscientiously works towards generating minimal e-waste, for which the following strategies are adopted: Regular maintenance of electronic equipment and computers by the in-house technician and AMC, ensures longer life. Weeded out computers from the computer science laboratories due to up gradation are transferred to departments, the administration within the college campus.Outdated Computers, servers, monitors, compact discs (CDs), DVD's, printers, scanners, copiers, motherboard, battery cells and other electronic equipment, weeded out from the computer laboratory are used for demonstration of internal parts of the equipment.

Some electronic equipments are replaced with newer models due to the rapid technology advancements and production of newer electronic equipment.

Recommendations:

Electronic equipment may contain heavy metals and other materials. Computers and electronic equipment typically contain:

- **Lead** - Computer monitors contain a picture tube known as a cathode ray tube (CRT). CRT's contain leaded glass, and are the largest source of lead in municipal waste. Solder used in printed circuit boards may also contain lead.
- **Cadmium** - The largest source of cadmium in municipal waste is rechargeable nickel-cadmium (NiCd) batteries. These batteries are found in most desktop and laptop computers.
- **Mercury** - Some electronic equipment also contains recoverable quantities of mercury, which is a toxic metal.

Unwanted electronic equipment must therefore either be donated for reuse or sent for recycling.

E-Waste separated

Data and report collected from Computer Science department expert.

Conclusions

Green audit of Smt. Radhabai Sarda Arts, Commerce and Science College is conducted by Green Audit committee of the college for the academic session 2019-2020. Through the academic session all data, information, monitoring reading etc are collected, analyzed and following conclusions given by expert team.

1. Overall one well located near the running track, one tube well near the well and one corporation tap near the botanical garden in campus ful fill the overall need of water in college.
2. Rain water harvesting unit is installed on all the buildings in the college campus.
3. All the parameters of drinking water were within standard desirable limits of drinking water quality.
4. LED bulbs are used in all sections, buildings and department.
5. Sensor based solar light installed in the college campus.
6. LPG is handled in science building section for Chemistry and by Home Economics department for practical purpose.
7. All the rooms in Arts, Commerce and Science buildings of the college are airy and sunny and don't need electricity during the day time for lightening.
8. Small vermin composting unit is installed in college campus for the management of the biodegradable waste.
9. College arranged the events such as Cleanliness drive, Environmental awareness programme, plantation, Medicinal plant exhibitions to literate the students to minimize the waste production and maximize what is recycled or reused.
10. Waste bins are not placed at solid waste collection spots in different sections.
11. Loss of water through the leakage of tap , pipeline and overflow is observed at some places.
12. Green practices are seen in the college campus and are also confirmed from the reports of the programme organized.