SHRI SHIVAJI EDUCATION SOCIETY, AMRAVATI'S

SHRI SHIVAJI COLLEGE OF ARTS, COMMERCE AND SCIENCE, AKOLA (MS)

Affiliated with Sant Gadge Baba Amravati University, Amravati (MS)

UGC Status- College with Potential for Excellence (Phase II Completed)

DST- FIST (Level "00") Support;

Lead College Status by S. G. B. Amravati University, Amravati (MS)

Website: www.shivajiakola.ac.in

7.1.6

Quality audits on environment and energy are regularly undertaken by the institution

Shri Shivaji Education Society, Amravati's

SHRI SHIVAJI COLLEGE OF ARTS, COMMERCE AND SCIENCE, AKOLA

NAAC Re-Accredited with A grade with CGPA 3.24
UGC Status of 'College with Potential for Excellence', DST-FIST level- 0 Support
Lead College status by S.G.B.A.U. Amravati
Near Shivaji Park, Akola - 444 001 (Maharashtra)
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Late Dr. Panjabrao Deshmukh
Founder President

Hon. Harshvardhan Deshmukh
President

Dr. Ambadas L. Kulat
Principal

No. SSC/AKL/

Date 15|12|2021

Declaration

This is to declare that the information, reports , true copies and numerical data etc. furnished in this file as supporting documents is verified by IQAC and found correct.

Hence this certificate.

Dr. A. S. Raut
Dr. A. S. Raut
IQAC Co-ordinator
Shri Shivaji College of Arts, Commerce & Science, AKOLA

Dr. A. L. Kulat
PRINCIPAL
Shri Shivaji College, of Arts
Commerce & Science,AKOLA
A GRADE C.GPA. 3.24., BY NAAC

7.1.6

Quality audits on environment and energy are regularly undertaken by the institution

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2021

Green Audit Report

EcoShastra

Shri Shivaji Education Society Amaravati's

Shri Shivaji College of Arts, Commerce and Science, Akola (MS)

Green Audit Report

Submitted by

EcoShastra
Consultancy & Services

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Shri Shivaji Education Society, Amravati's

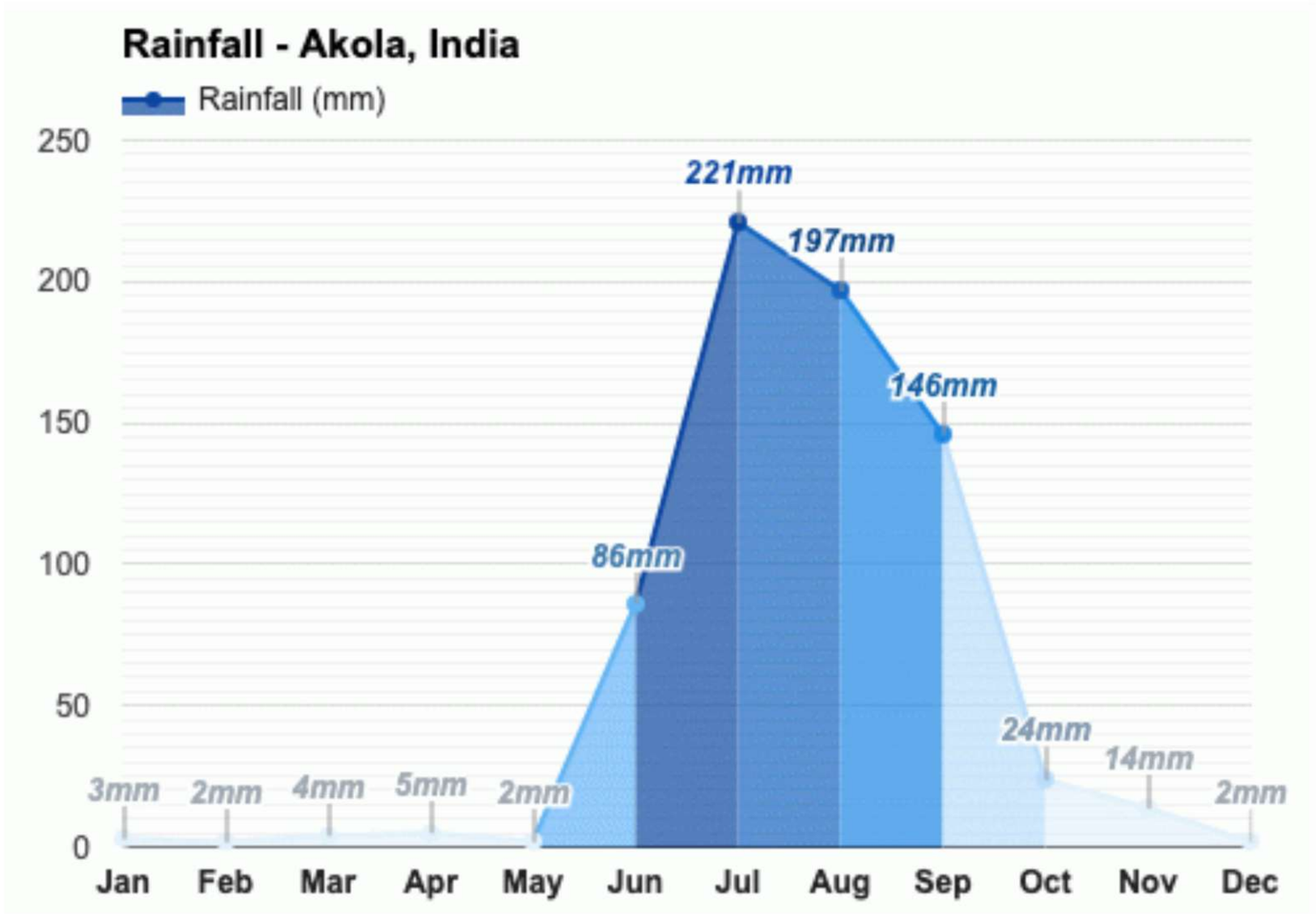
Shri Shivaji College of Arts, Commerce & Science, Akola.

Shri Shivaji Education Society, Amravati's Shri Shivaji College of Arts, Commerce and Science, Akola is situated in the western Vidarbha region of Maharashtra and is affiliated to Sant Gadge Baba Amravati University, Amravati. The institution always strives for quality sustenance and enhancement in higher education. Shri Shivaji Education Society, Amravati, was founded in 1932, by Late DR. Punjabrao Deshmukh, the first agriculture minister of independent India, and a member of the "Constitution Draft Committee" for the Government of India. It is one of the premier institutions of higher education in the Vidarbha region. It is worth mentioning that, under its canopy, there are in all 277 institutions including Medical, Agriculture, Engineering, Science, Law, Education as well as Higher Secondary Schools, High Schools, Middle Schools, and Primary Schools. The society has bagged many prestigious awards from the state government in recognition of its dedication to the field of education.

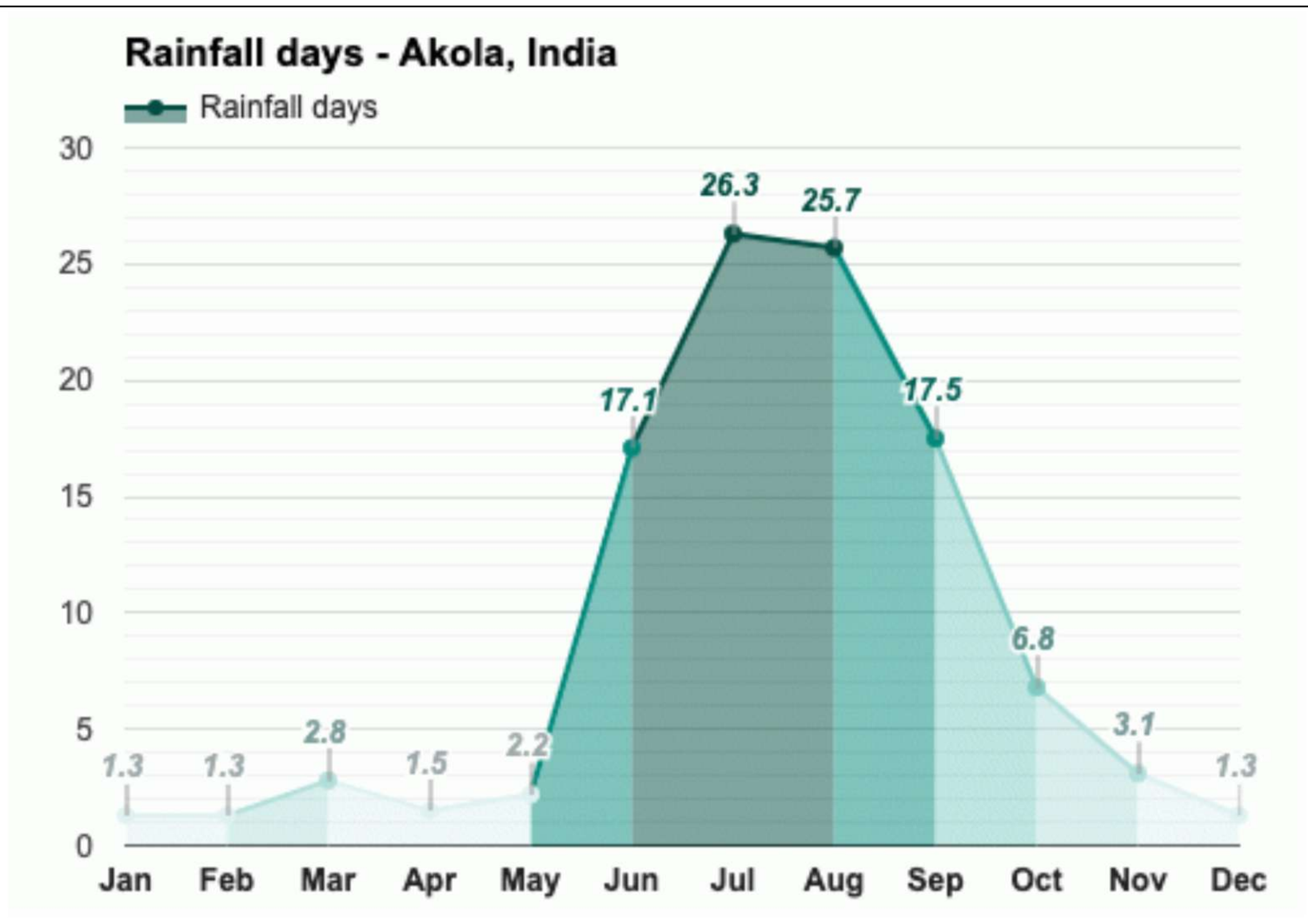
Shri Shivaji College of Arts, Commerce and Science, Akola was established in 1963 and has already completed fifty glorious years of its existence in 2013. We can proudly say that it has indeed grown from a seedling into a tree that has not only sheltered thousands of youngsters but also has molded them into great personalities, now scattered across the globe. Since a large number of our students come from economically weaker sections of the society, we try to imbibe in them good values so that they become responsible citizens of this great country. The College aims at catering to the academic excellence of the students and providing them with facilities to develop their inherent talents. In its continuous efforts to impart quality education, Shri Shivaji College was reaccredited with an "A" grade with CGPA 3.11 in January 2010.

The college has also earned a special reputation for being conferred with the status of a “College with Potential for Excellence” by the U.G.C. in the first phase and now for the second phase up to 2019 Since the institution has completed the second cycle, now it has intended to go for the third cycle in accreditation. Efforts have been made to fulfill the recommendations made by the peer committee for the overall development of the Institution. Due consideration has been given to the post-accreditation activities and it continues to plan for academic excellence by imparting quality education.

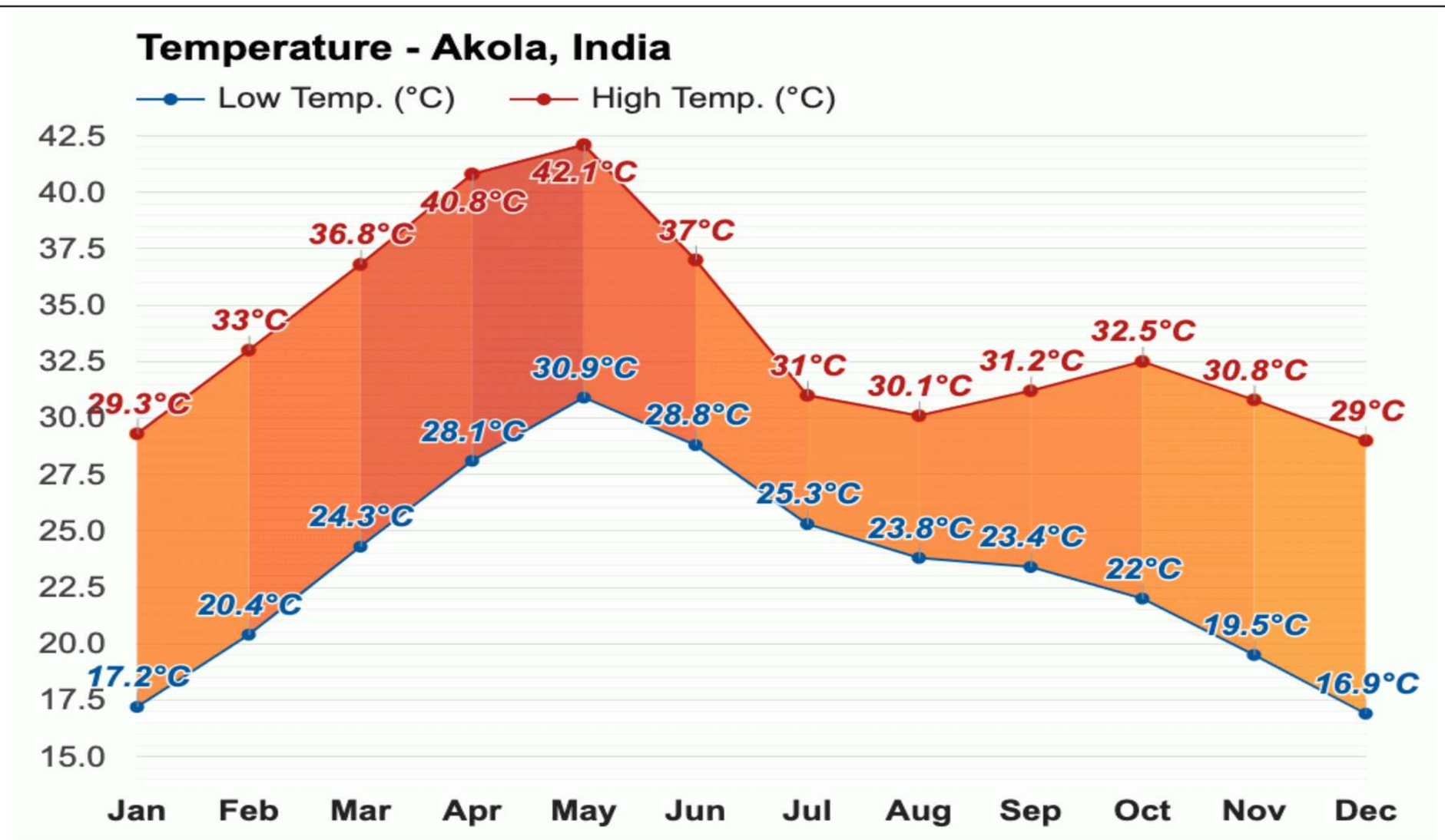
Average Rainfall (in mm) in Akola (Last 50 Years)



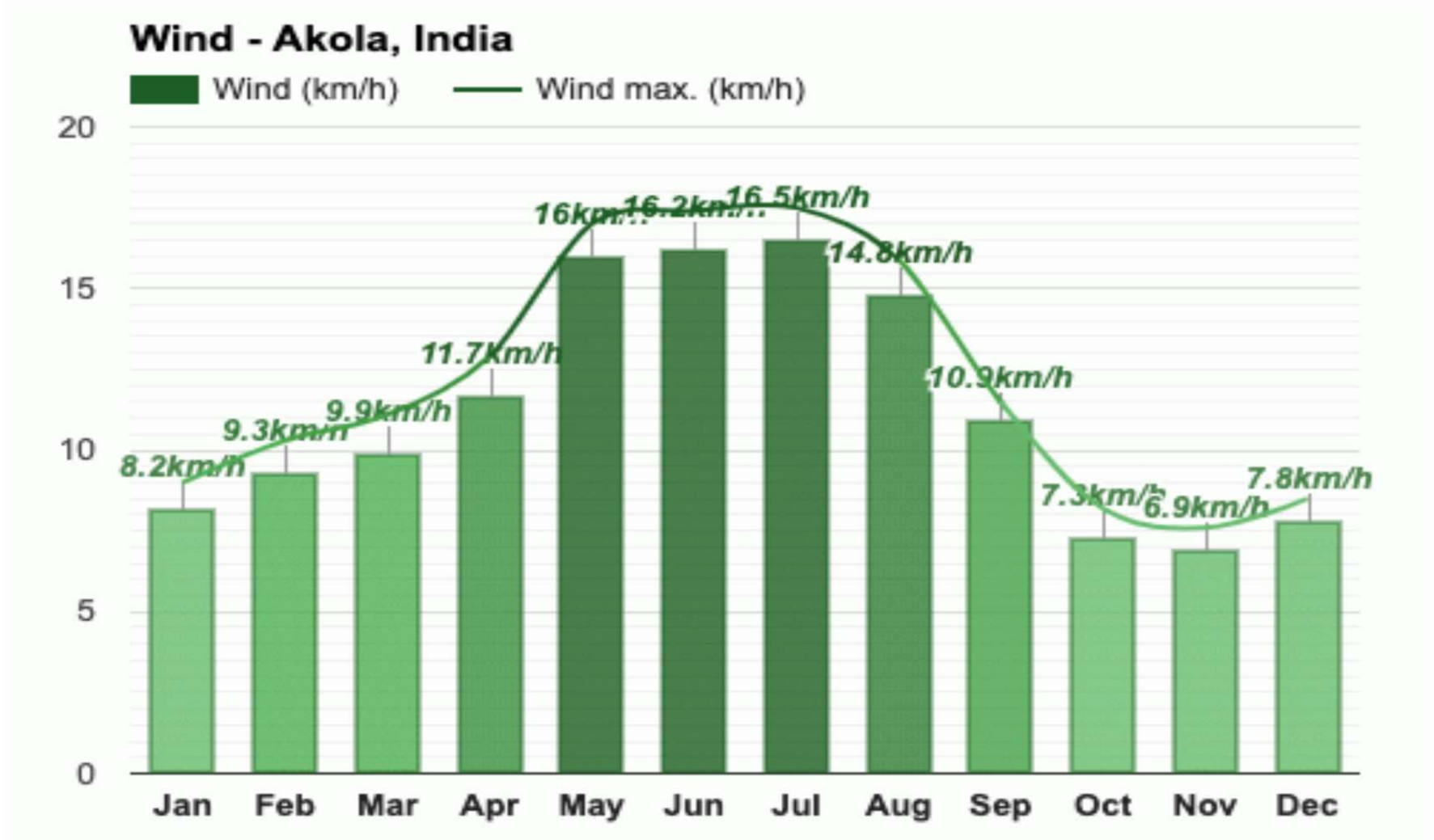
Rainfall in Akola- Average Rainfall Days per month (Last 50 Years)



The average temperature in Akola



Average Wind Speed in Akola



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Green Audit Committee

Sr. No.	Name	Designation
1.	Dr. Rameshwar M. Bhise	Chairman (Principal)
2.	Dr. H. S. Patil	Lead Auditor
3.	Dr. Ashish S. Raut	Coordinator
4.	Dr. Pratiksha P. Umale	Internal Green Auditor
5.	Mr. Shubham P. Thombare	External Green Auditor
6.	Dr. S. S. Kadu	Green Audit Expert
7.	Dr. Anand V. Oke	Green Audit Expert
8.	Mr. S. A. Rathod	Green Audit Expert

Solid Waste Audit

1. Solid Waste Audit

Introduction:

Shri Shivaji College of Arts, Commerce and Science, Akola is an environment-friendly educational institute, and for any Environment-friendly institute, Solid Waste Audit is considered as a crucial part. In educational institutes like Shri Shivaji College, Paper, chalk, Polythene, Glass, and Biomass are the major constituents for solid waste production. Although Paper, Chalk, and Biomass wastes are considered Bio-degradable wastes, their production is directly or indirectly depends on the environment and their inappropriate management can raise environmental issues e.g. this waste can alter the water quality of a stream if it goes into the local water stream. Solid waste auditing gives an actual idea about solid waste generations in the campus and management strategies followed by the college. In this report, studies were carried out to analyze the solid waste profile of the college and corresponding waste management techniques.

Aims and objectives:

i. To calculate total solid waste generation on the campus.
ii. To classify solid waste according to categories and places.
iii. To analyze the obtained data and find key solid waste generation places.
iv. To discuss present-day Waste-Management Strategy of the campus
v. To issue appropriate recommendations considering different parameters like solid waste generation, management strategies, etc.

Methodology:

1. Data collection:

While collecting data, solid wastes like papers, polythene, glass, chalks, etc. are stored separately in a dustbin for a week for each mentioned place and weighed on a balance at end of the week. Solid waste like kitchen and food waste are weighed each day and disposed of, the data of all seven days are added and represented separately.

2. Data analysis:

The obtained data is represented in tables and analyzed in excel by pie diagrams and bar diagrams.

3. Comment on Recommendations:

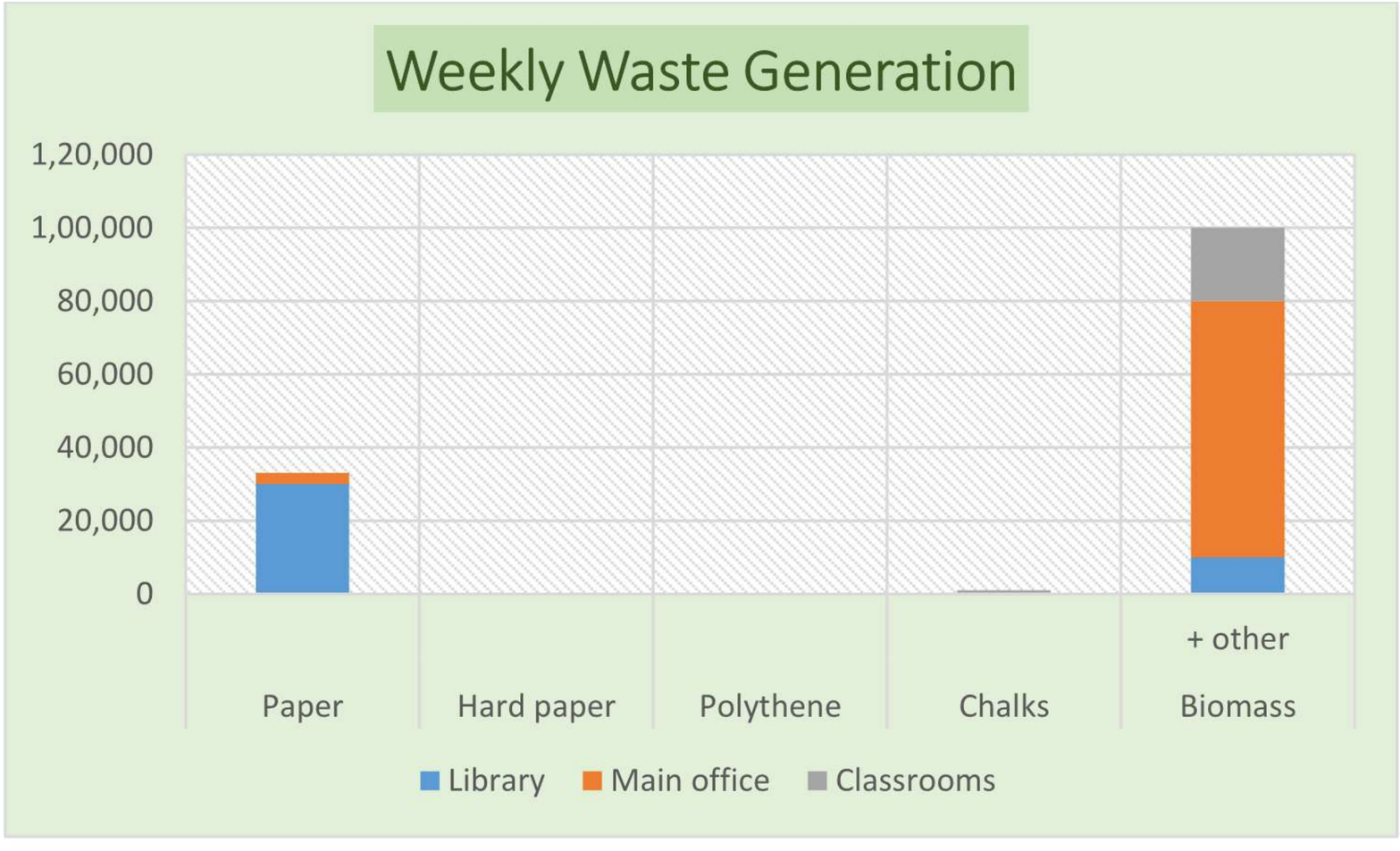
The comments have been made considering the number of stakeholders, the amount of total waste generation, the present-day waste disposal method, and research has been done to recommend more efficient methods of solid waste management.

Observations:

Solid Waste Accounting by Weight

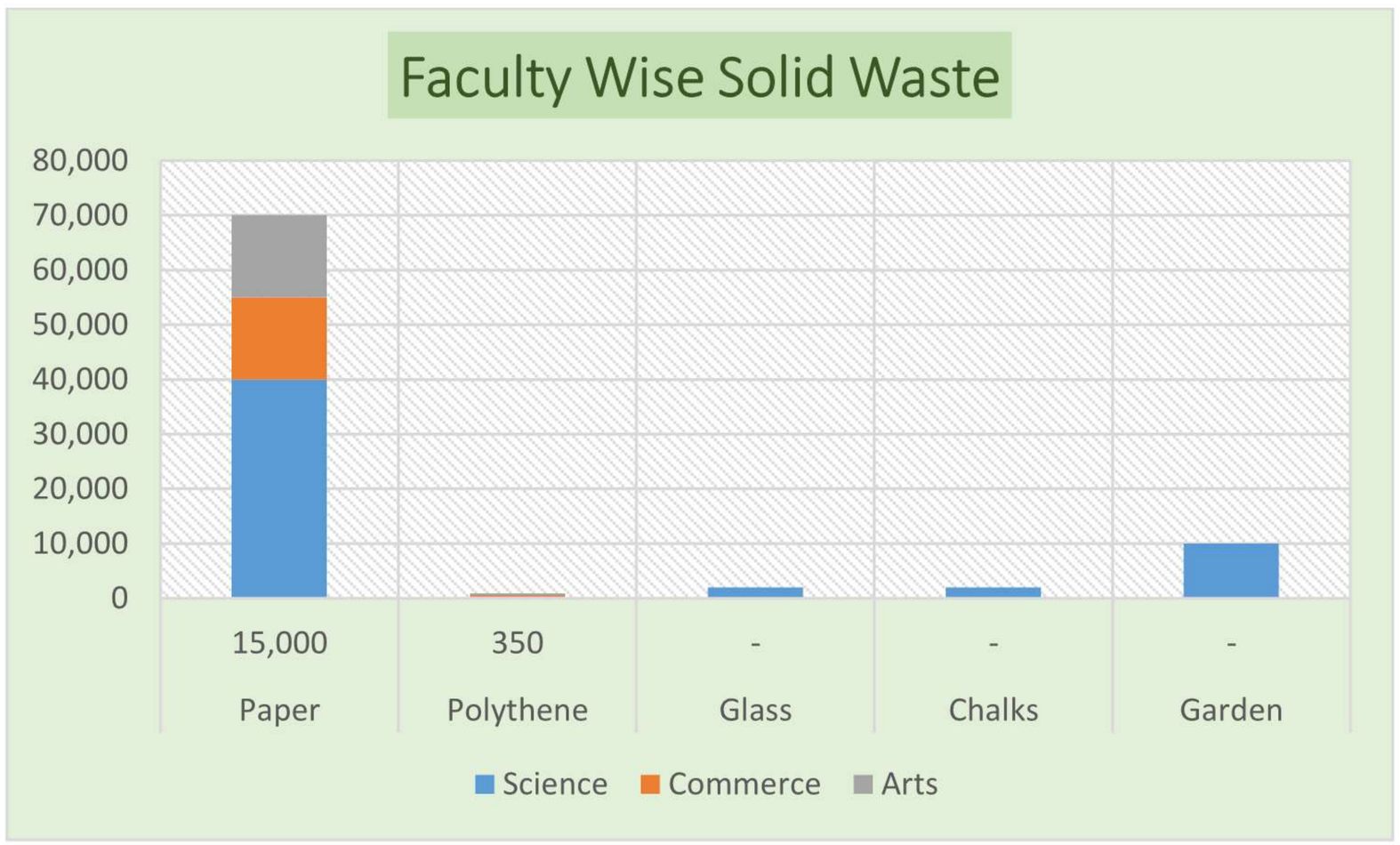
Place	Paper	Hard paper	Polythene	Chalks	Biomass + other
Library	30,000	-	100	-	10,000
Main office	3,000	100	150	-	70,000
Classrooms	-	-	100	1,000	20,000
Total	**33,000**	**100**	**350**	**1,000**	**1,00,000**

TABLE 1 Weekly Waste of Offices, Classrooms & Library in Grams. (Apx.)



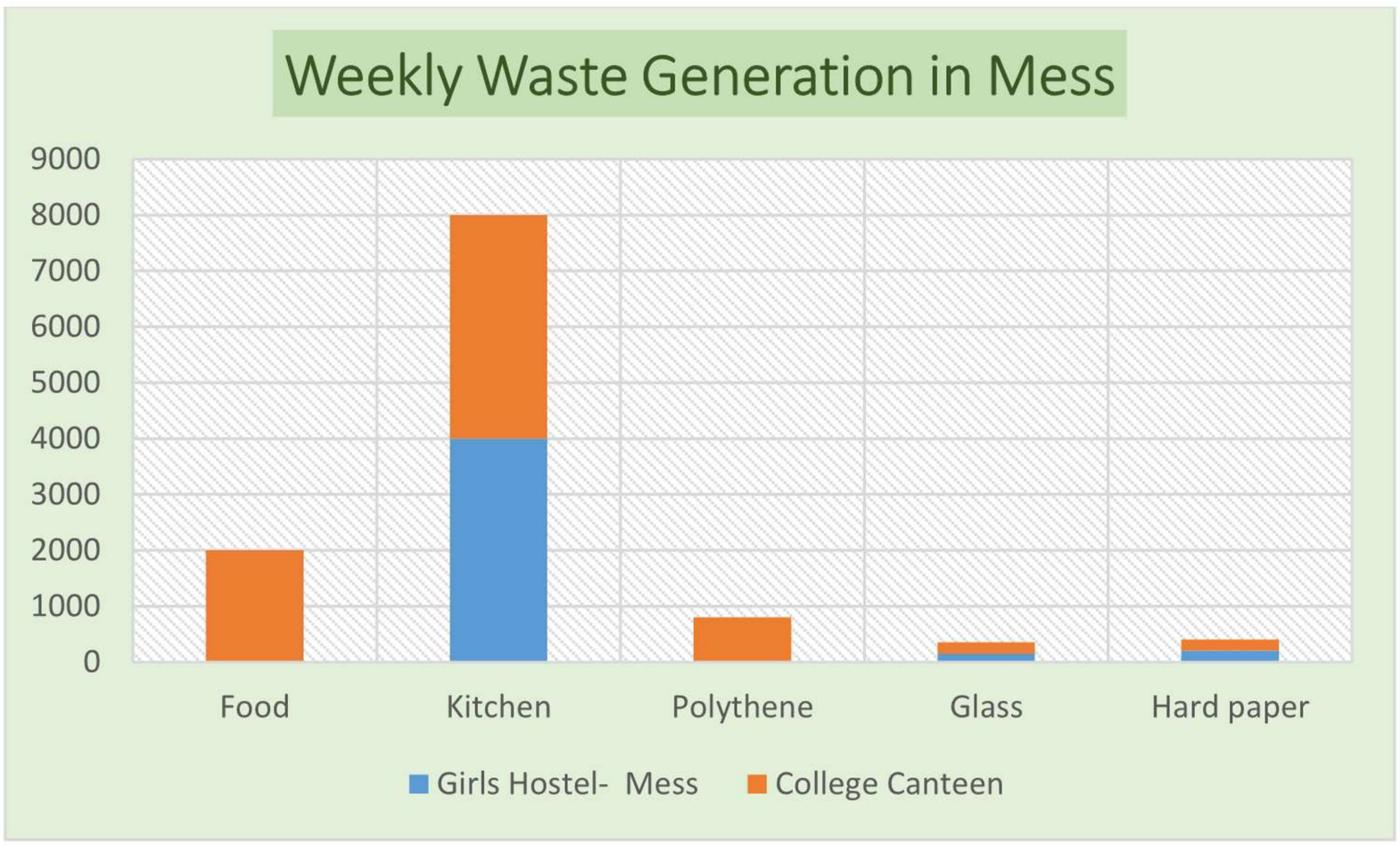
Departments	Paper	Polythene	Glass	Chalks	Garden
Arts	15,000	350	-	-	-
Science	40,000	300	2,000	2,000	10,000
Commerce	15,000	200	-	-	-
Total	**70,000**	**850**	**2,000**	**2,000**	**10,000**

TABLE 2 Weekly Faculty Wise Solid Waste Generation of College in Grams (Apx.)

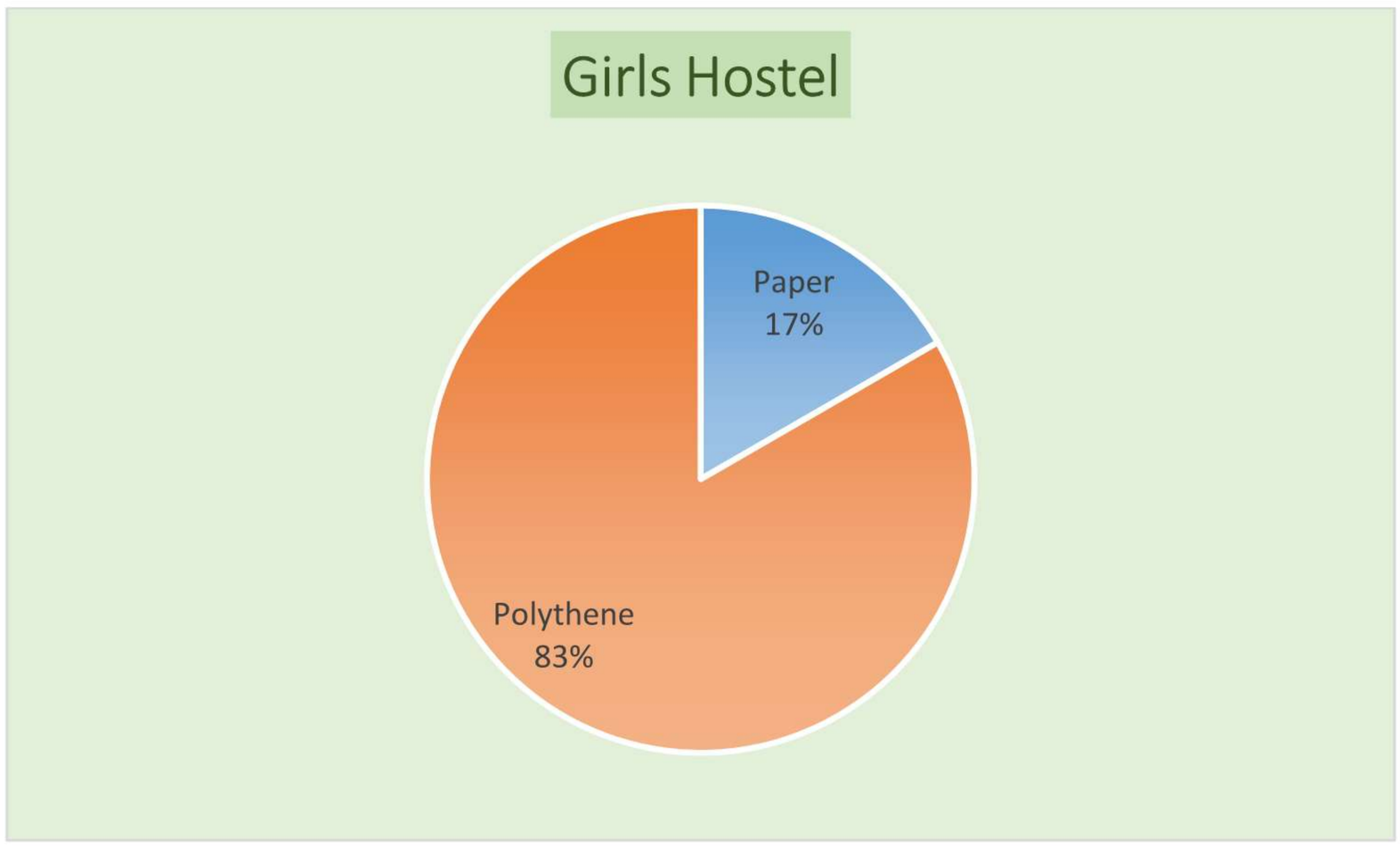


Place	Food	Kitchen	Polythene	Glass	Hard paper
Girls Hostel- Mess	-	4,000	-	150	200
College Canteen	2,000	4,000	800	200	200
Total	2,000	4,000	800	350	400

TABLE 3 Hostels and Staff Quarters – Weekly Solid Waste Generation in Grams (Apx.)



Place	Paper	Polythene
Girls Hostel	100	500
Total	100	500



Conclusion:

Paper, Kitchen waste, and Garden waste (biomass) are the major constituents of solid waste generation on the campus. Hard Paper, Hard Plastic, and Chalk waste are the minor components of solid waste generation. After detailed studies, we can conclude that the campus has a negligible amount of polythene generation.

Discussion:

Shri Shivaji College of Arts, Commerce and Science, Akola a well-known institute in Akola. The institute is famous for conducting curriculum-based activities and delivering social, moral, and ethical values to its stakeholders. As an environment concerned institute, college knows Solid waste, the most common type of waste in an educational institute, should be managed properly. So college has built the Biogas Plant and Compost Manure Plant. The organic waste including food waste and kitchen waste generated in Girls hostel and College canteen are collected, segregated, and transferred to a biogas plant, where it is further processed and decomposed. As garden waste is the major component of solid waste generation, the proper management of the garden waste is done in Compost Manure Plant.

The less polythene generation in the campus is a result of timely awareness programs conducted on the campus.

Paper waste ranks second in the total solid waste generation index of the campus. Key sources for paper waste generation are the library, office, and science departments.

Recommendations:

1. Paperless Campus:

i. The steps like preference should be given to cloud storage against hardcopy prints for storing office-related documents and paper.

Water Audit

2. Water Audit

Introduction:

Water is the prime important constituent of life. The quality of water and availability of water are the factors that define the health of the system. In education institutes having science faculty, PG departments, and research center, the amount of chemical mixed wastewater generation is considerable. The institute like Shri Shivaji College of Arts, Commerce, and Science, Akola which is having around 7000 stakeholders, PG departments, chemistry labs, and research centers, it is necessary to build appropriate water storage systems, check on the water demand, ensure efficient use of water and develop appropriate wastewater management system. The campus of Shri Shivaji College of Arts, Commerce, and Science, Akola, holds several trees, a canteen, and a toilet which are key sink areas for non-potable water. Whereas water purifiers in the campus, as well as in the canteen, are major potable water storage systems. All the detailed study regarding water system of the campus is reported in this report.

Aims and objectives:

- To describe the water storage system of the campus in great detail.
- To estimate the total potable and non-potable water demand of the campus.
- To compare data regarding water storage systems and estimated water demand.
- To recommend specific techniques to use water efficiently.

Methodology:

1. Data Collection

i. Water storage system:

The water storage system of the college is documented by organizing broad interviews with the college staff and spot inspection by audit experts.

ii. Potable and non-potable water demand:

For estimating the water demand of the campus, surveys are carried among all the stakeholders and staff by the digital way (Google forms), the collected data is then analyzed and represented in Microsoft Excel.

iii. Wastewater management system:

The data on the wastewater management system is collected by visiting the places on the campus by audit experts.

2. Data Analysis

The collected data from digital surveys, interviews, and spot visits is then analyzed by MS-Excel and represented in suitable diagrams.

3. Comments and Recommendations

The comments and recommendations have been made considering the number of stakeholders, the total water demand, water storage system, wastewater generation, and wastewater management system.

Observations:

Water storage details:

Sr. No.	Non-Potable Water Storage System	Capacity (in Lit)
Campus (including toilet)		
1.	Underground water storage in front of Chemistry Department	25000 lit
2.	Chemistry Department terrace	5000 lit
3.	Chemistry Department Rainwater storage	6000 lit
4.	Library Terrace	5 x 2000 lit
5.	Botany Department terrace	2000 lit
6.	Morna Building Terrace	2000 lit
7.	MCVC Department	1000 lit
Hostel		
1.	PG Hostel	3000 lit
2.	UG Hostel	4 x 2000 lit
Total		62000 lit

Sr. No.	Potable Water Storage System	Capacity in Litres
Campus		
1.	Library Terrace	11000 lit
2.	Rest House	3000 lit
3.	Morna Building	1000 lit
Hostel		

1.	PG Hostel	2000 lit
2.	UG Hostel	6000 lit
Total		23000 lit

WATER USAGE

Water users	Number
Students	7000
Teaching staff	98
Non-teaching staff	75
Total	**7173**

The total number of taps:

Toilets, washrooms, garden, departments (Science lab)

Sr. No.	Place	Number of taps
1.	Gents Toilet No. 1	03
2.	Gents Toilet No. 2	01
3.	Gents Toilet No. 3	05
4.	Ladies Washroom No. 1	01
5.	Ladies Washroom No. 2	03
6.	Principal Office Toilet	04
7.	Chemistry Department Washroom	04
8.	Chemistry Department Lab 1	03
9.	Chemistry Department Lab 2	20
10.	Chemistry Department Lab 3	24
11.	Chemistry Department Lab 4	26

Sr. No.	Place	Number of taps
12.	Chemistry Department Lab 5	26
13.	Chemistry Department Research Lab	16
14.	Zoology Department Lab 1	04
15.	Zoology Department Lab 2	02
16.	Zoology Department Lab 3	02 + 1
17.	Botany Department Lab 1	01
18.	Botany Department Lab 2	02
19.	Botany Department Lab 3	03
20.	Botany Department Lab 4	03
21.	Microbiology Department UG Lab	03
22.	Microbiology Department PG Lab	04
23.	Microbiology Department Research Lab	04
24.	Microbiology Department Washroom and Garden area	04
25.	Forensic Science Department Lab	01
26.	Biotechnology Department Lab	02
27.	Physics Department Lab	03
28.	Home Science Department Lab	04
29.	Biochemistry Department UG Lab	05
30.	Biochemistry Department PG Lab	05
31.	Biochemistry Department PG Lab	05
Total		**194**

Calculations:

1. **Non-Potable Water Demand:** (excluding laboratory use)

Per Head Non-Potable Water Demand Calculated by analyzing data of personal individual water use collected by Google Forms.

Net **Non-Potable Water Demand** is: 04 Lit/head/day

Number of Users = 7173

Total **Non-Potable Water Demand** = 28,692 Lit/day

Total **Non-Potable Water** storage system capacity= 52,000 lit

Discussion: After considering water flow to the laboratory and garden including leakage and wastage, the water storage system is properly built considering water demand.

Recommendation: Water tanks should be fully refilled after every two days.

2. **Per Head Potable Water Demand:**

Per Head Potable Water Demand Calculated by analyzing data of personal individual water use collected by Google Forms.

Net **Potable Water Demand** is: 03 Lit/head/day

Number of Stakeholders = 7173

Total **Potable Water Demand** = 21519 Lit /day

Total **Potable Water** storage system capacity = 23,000 lit

Recommendations: By calculations, it is recommended to refill the Potable water storage system tanks five times per week i.e. days.

Discussion:

The key water sources on the campus are-

1. **Rainwater harvesting unit**:

   The college has taken the initiative to refill the underwater table with the help of rainwater harvesting. The soak peats are about 28x10 ft.

   Hostel receives water supply from three bore wells present in the campus which are refilled with rainwater harvesting plant.

   Department of Chemistry collects rainwater and utilizes it for regular practical purposes.

2. **Borewell and other sources**:

   There are 5 Borewells in working and one two-inch municipal water connection which gives daily two to three hours water supply.

Recommendations:

1. **Wastewater disposal:**

   The healthy practice should be adopted for wastewater disposal at Chemistry laboratories, which includes- keeping three separate containers for the chlorinated chemicals, non-chlorinated chemicals, and water-miscible chemicals. The generated waste chemicals are then suggested to be hand-over to the water treatment laboratories.

Noise Audit

3. Noise Audit

Introduction:

Shri Shivaji College of Arts, Commerce, and Science, Akola, believes in student's utmost development by providing quality education. The institute takes all moral, ethical, social responsibilities that will enhance students' focus in all aspects of the course curriculum. For the same, the institute has taken in its policy that, the institute will have silent but happening premises which will lead to better growth of students. This report includes the data, calculations, analysis, and discussion about the noise index of the campus and corresponding standards set by government agencies.

Aims and Objectives:

1. To analyze noise level in campus considering road traffic parameters, different noise indices, and altitudinal response.
2. Recommend healthy practices to minimize or maintain noise levels.

Methodology:

1. **Review of literature and Government standards:** This audit procedure included a review of government policies related to noise standards in educational institutes.

2. **Data Collection:** The data regarding noise is collected from different locations and times. Noise Meter is used for the collection of data in decibels.

3. **Result and Conclusion:** The result and conclusion are drawn after the detailed analysis of the literature reviewed and the data collected.

Map of Shri Shivaji College

Observations:

Sr. No.	Location	No. of Readings	Time slot	Average Units (dB)
1.	Main Gate Premises	10	10:00 am to 05:00 pm	69.5
2.	Library	10	12:30 pm to 04:30 pm	54.5
3.	Office	10	10:00 am to 02:00 pm	61.5
4.	Central	10	10:00 am to 04:00 pm	53
5.	Botanical Garden	10	12:10 pm to 03:00 pm	51
6.	Class Room 1, 2, 3, 4 (1st floor, Morna Building)	06	10:00 am to 04:00 pm	51.66
7.	Class Room 5, 6, 7, 8 (2nd floor, Morna Building)	06	10:00 am to 04:00 pm	51.33
8.	Classroom 18,19,20 (Near Physics Dept.)	06	10:00 am to 04:00 pm	54.33
9.	Classroom 24, 25, 26 (Near Microbiology Dept.)	06	10:00 am to 04:00 pm	54

Conclusion:

The key places for noise generation are Main Gate and office premises, which shows the highest (Average for the location) i.e. 69.5 dB and 61.5 dB and Classrooms, Main Building, Library, and Botanical Garden have lowest (Average for the location) noise generation i.e. approximately near to 50 dB.

Discussion:

The standards set by CPCB (Central Pollution Control Board) for silent zones include noise levels of 55dB in the daytime and 45 dB in the nighttime. The core study areas of the college premises are meeting the standards set by CPCB for the educational institute and so the college can be considered as a silent zone as it meets the standards set by CPCB. The highest level of noise in the campus is at the entrance gate (69.5 dB), which is due to the vehicular noise on the street next to the entrance gate. The lowest noise level in the campus is near the classroom, library, and botanical garden (51 dB ±2 dB), which is due to the architectural planning of the infrastructure and dense vegetation in the campus.

Recommendations:

Following recommendations are made to monitor the noise level in campus:

1. It is recommended to plant more trees near the boundary of the college campus, which will reset the noise level caused by vehicular traffic on the road.

Biodiversity Audit

4. Biodiversity Audit:

Introduction:

The biodiversity of any institute defines the perspective of the institute towards the environment. More the diversity more the concern college has paid towards the environment. Keeping this in mind biodiversity audit is carried at Shri Shivaji College of Arts, Commerce, and Science campus. This report includes the aims and objectives set for the audit, observation, conclusion, and recommendations.

Aims and Objectives:

1. Enlisting of species biodiversity of the campus.
2. Analyzing spatial features of the area.

Methodology:

1. **Field surveys:** Extensive field surveys are carried to enumerate floristic diversity and enlisting of faunal diversity.

2. **Collection and analysis of data:** The collected data from field surveys are tabulated and analyzed for deciding the biodiversity status of the campus.

3. **Discussion:** The aspects regarding the biodiversity audit and environment-centric approach of an institute are discussed in great detail.

4. **Recommendations:** The recommendations are issued after a detailed study of the data.

Observations and inventory

Sr. No.	Name of the plant	Number of individuals
1.	***Canna indica***	10
2.	***Tradescantia species***	4
3.	***Duranta erecta***	2
4.	***Rosa species***	5
5.	***Ixora chinensis***	1
6.	***Thuja species***	21
7.	***Bougainvillea species***	5
8.	***Wedellia chinensis***	3
9.	***Ficus benjamina***	8
10.	***Plumeria species***	2
11.	***Nerium species***	1
12.	***Polyalthia longifolia***	19
13.	***Hibiscus species***	5
14.	***Plumeria pudica***	1
15.	***Oxalis corniculata***	1
16.	***Acalypha wilkisiana***	2
17.	***Dracena species***	5
18.	***Euphorbia milli***	3
19.	***Murraya paniculata***	1
20.	***Juniperus species***	1
21.	***Alstonia scholaris***	2

Sr. No.	Name of the plant	Number of individuals
22.	***Adenium obessum***	5
23.	***Azadirachta indica***	3
24.	***Vinca rosea***	10
25.	***Taebernimontana divaricata***	1
26.	***Morus alba***	1
27.	***Bauhinia species***	1
28.	***Ficus benghalensis***	1
29.	***Ficus religiosa***	10
30.	***Melia azadirach***	2
31.	***Hyophorb lagenicaulis***	10
32.	***Terminalia catappa***	14
33.	***Bamboo species***	2
34.	***Ocimum americanum***	1
35.	***Pyrostegia venusta***	1
36.	***Caryota urence***	2
37.	***Colocasia species***	1
38.	***Dracena species***	2
39.	***Quisqualis indica***	1
40.	***Ruellia species***	1
41.	***Agave species***	2
42.	***Russelia equisetiformis***	2
43.	***Ravenella madagascarensis***	1
44.	***Beaucarnea recurvata***	2

Sr. No.	Name of the plant	Number of individuals
45.	***Cycus species***	2
46.	***Caryota mitis***	3
47.	***Dracena trifacicata***	9
48.	***Pentas lanceolata***	1
49.	***Chrysanthemum species***	1
50.	***Aloe barbadensis***	1
51.	***Jatropha integerrima***	1
52.	***Bixa orellana***	1
53.	***Nyctanthis arbor-tristis***	1
54.	***Caleandra hematocephala***	1
55.	***Acalypha hispida***	1
56.	***Ricinus communis***	1
57.	***Ficus spp***	1
58.	***Mangifera indica***	1
59.	***Pisidium guajava***	1
60.	***Clitoria ternatea***	1
61.	***Alamenda catheretica***	1
62.	***Jatropha gossypifolia***	1
63.	***Holoptelea integrifolia***	1
64.	***Eucalyptus globulus***	1
65.	***Semecarpus anacardium***	1
66.	***Lawsonia inermis***	1
67.	***Citrus limon***	1

Sr. No.	Name of the plant	Number of individuals
68.	***Ceiba pentandra***	2
69.	***Vitex nigundo***	1
70.	***Argeria nervosa***	1
71.	***Adhatoda vesica***	1
72.	***Simarouba glauca***	1
73.	***Erythrina suberosa***	1
74.	***Carissa carandas***	1
75.	***Plumbago xylenica***	2
76.	***Cocculus hirsutus***	1
77.	***Securingea virosa***	1
78.	***Murraya coeningii***	1
79.	***Pongamea pinnata***	1
80.	***Tinospora cordifolia***	1
81.	***Mimosa pudica***	1
82.	***Ocimum basilicum***	1
83.	***Commiphora vightii***	1
84.	***Bamboo sp.(Golden)***	1
85.	***Cassia siamea***	1
86.	***Cessus quadrangularis***	1
87.	***Caesalpinia pulcherrima***	1
88.	***Sizyzium cumini***	1
89.	***Asparagus racemosus***	1
90.	***Costus speciosus***	1

Sr. No.	Name of the plant	Number of individuals
91.	***Jatropha podagarica***	1
92.	***Mirabilis jalapa***	1
93.	***Peltophorum pterocarpum***	5
94.	***Delonix regia***	3
95.	***Tecoma stans***	1
96.	***Moringa oleifera***	1
97.	***Ailanthus excelsa***	1
98.	***Thespesia populnea***	1
99.	***Jasminun multiforum***	1
100.	***Asclepias crassavica***	1
101.	***Hamelia patens***	1
102.	***Araucaria spp***	1
103.	***Euphorbia tithimalodes***	1
104.	***Coccus nucifera***	1
105.	***Cordia dichotoma***	1
106.	***Terminalia arjuna***	2
107.	***Roystonea regia***	2
108.	***Anthocephalus cadamba***	1
109.	***Teminalia bellirica***	1
110.	***Casuarina equisitifolia***	1
111.	***Grevillea robusta***	1
112.	***Euphorbia tirucalii***	1
113.	***Albezzia lebbeck***	1

Sr. No.	Name of the plant	Number of individuals
114.	***Leucaena leucocephala***	1
115.	***Wodyetia bifurcata***	1
116.	***Duranta repens***	1
117.	***Areca catechu***	2
118.	***Hymenocallis sp.***	2

Faunal Diversity:

Sr. No.	Name of the organism
A)	**Birds**
1.	Green Bee-eater
2.	House Swift
3.	Indian Robin
4.	Red-vented bulbul
5.	Indian grey hornbill
6.	Asian koel
7.	Rose-ringed parakeet
8.	Common Hoopoe
9.	Indian Roller
10.	Greater coucal
11.	Spotted Dove
12.	Rock Pigeon
13.	White Breasted King Fisher
14.	Little Brown Dove

Sr. No.	Name of the organism
15.	Black Kite
16.	Ashy wren
17.	White-Breasted Water lam
18.	Cattle Egret
19.	Jungle Babbler
20.	Little Egret
21.	Black Drongo
22.	Purple Sunbird
23.	Brahminy Starling
24.	Indian Pond Heron
25.	House Sparrow
26.	Red-wattled lapwing
27.	Common Myna
28.	House Crow
29.	Black Shoulder kite
30.	Barn owl
B)	**Insects**
31.	Dragonfly
32.	Grasshopper
33.	Lepisma
34.	Mosquito
35.	Housefly
36.	Crickets

Sr. No.	Name of the organism
37.	Ring mantis
38.	Common Rosy
39.	Tiger beetle
C)	**Spiders**
40.	*Neiscona thesi*
41.	*Neiscona mukergi*
42.	*Neiscona cursifera*
43.	*Araneus mitificus*
44.	*Tenona sp.*
45.	*Uloborous sp.*
46.	*Cyrtophora sp.*
47.	ground spider
48.	*Stigodipouse sp.*
49.	*Plexipus paykuli*
D)	**Mammals**
50.	Squirrel
51.	Bat
52.	Mangoes
53.	Monkey
54.	Rat
55.	Cat
56.	Dog

Discussion:

The 275 individuals from 118 plant species and 56 notable faunal species among many other species show the richness of the campus. The Grey Hornbill and Black Kite are the key species indicating the healthiness of the campus. The institute is trying its best to maintain the biodiversity on the campus as well as off-campus. Knowing the need for percolation of scientific knowledge in the society, the Botany department has carried various projects to collect taxonomic information about the plants belonging to nearby areas, and as a part of social responsibility around 500 plants of different species are planted by the college in the surrounding village; images and news cuttings of the same are attached in the annexure.

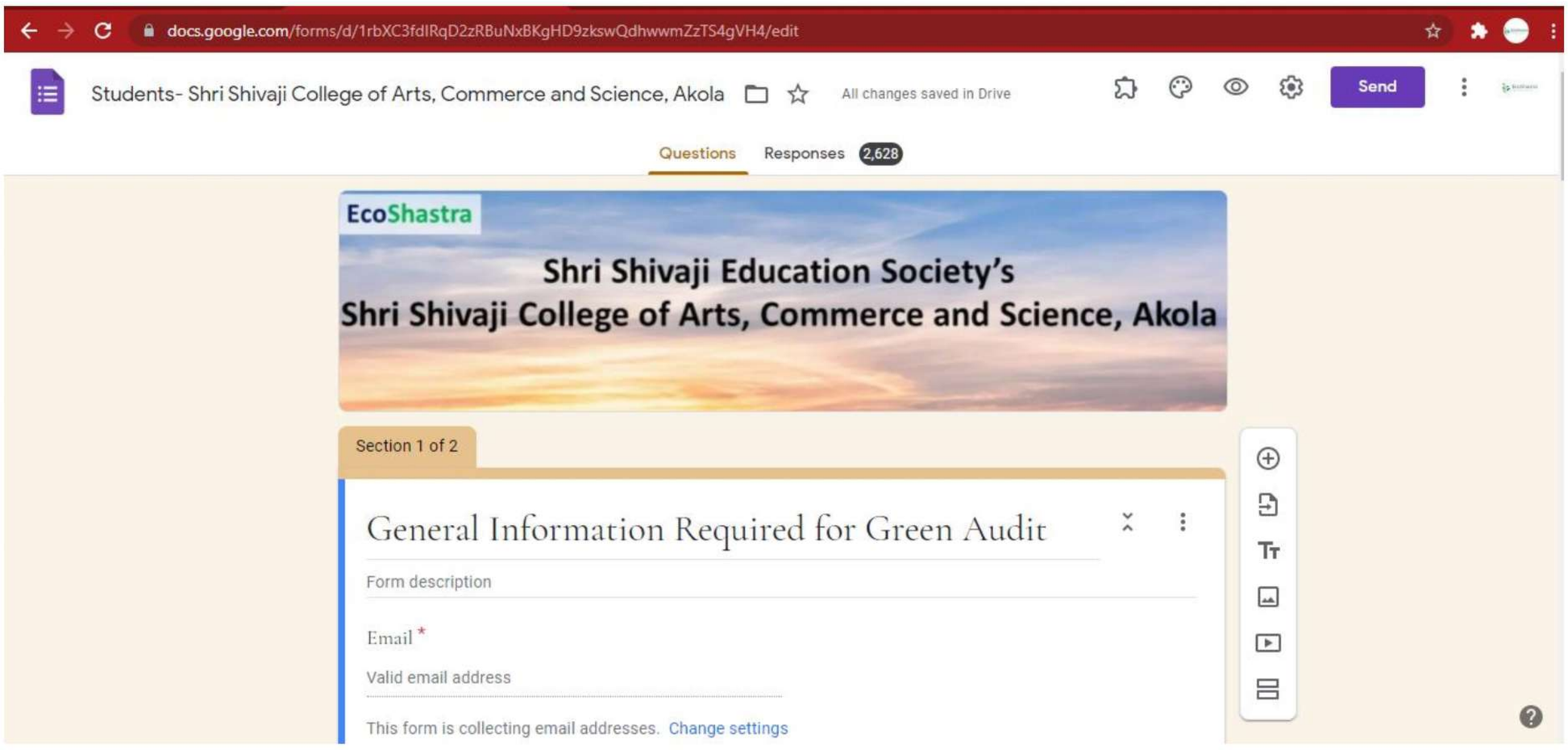
Recommendations:

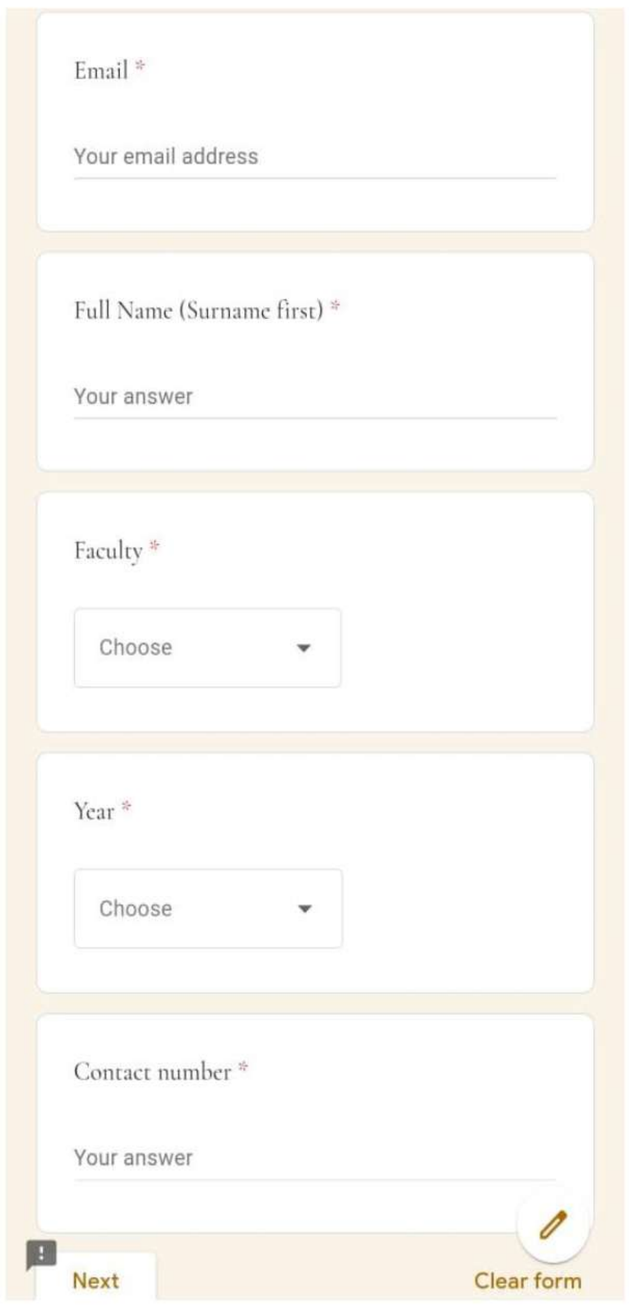
Following recommendations are issued after studying the collected data:

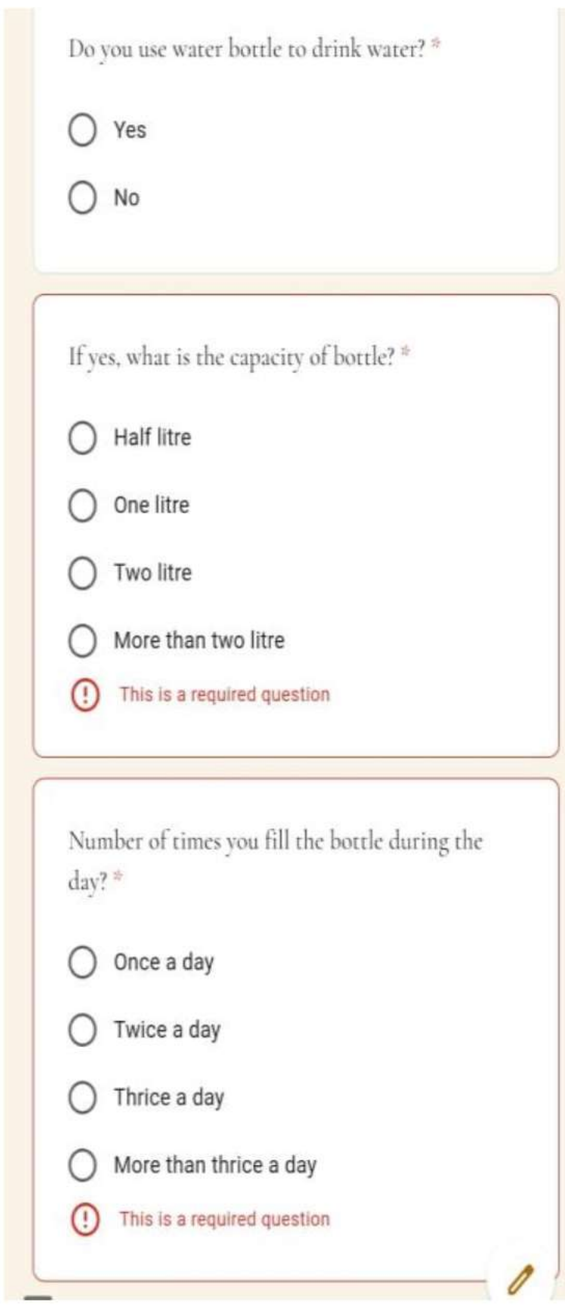
1. The plants from native flora should be preferred for further cultivational activities on the campus.

ANNEXURE

1. Survey regarding water audit is carried out on Google form







2. Noise Audit readings

3. Tree Plantation Activities through colleges

३) दि ५ जुलै २०१७ वृक्षारोपन : ग्राम येवता येथील जि प शाळेच्या खुल्या जागेत २३५ वृक्षांची लागवड करण्यात आली. रासेयो स्वयंसेवकांनी यासाठीचे खडडे तयार करून वृक्षारोपन केले व गावातील घरोघरी जाउन वृक्ष लावण्यासाठी रोपांचे वाटप केले.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७ दि ९ ऑगष्ट २०१८ ऑगष्ट कांती दिना निमित्य महाविद्यालय परिसरात वृक्षरोपन करण्यात आले यावेळी प्रसिध्द साहित्यीक व कवी डॉ विठठल वाघ व श्री शिवाजी शिक्षण संस्थेचे कार्यकारिणी सदस्य मा केशवराव मेतकरए प्राचार्य डॉ रामेश्वर भिसे उपस्थित होते.

4. News articles

मुख्याध्यापक यांना कळले. सामता अकला यांना कळावल आह.

श्री शिवाजी महाविद्यालयात रासेयोचा वृक्षसंवर्धन पंधरवडा

प्रतिनिधी/७ जुलै

अकोला : स्थानिक श्री शिवाजी महाविद्यालयाच्या राष्ट्रीय सेवा योजनेच्यावतीने १ जुलै ते १५ जुलै दरम्यान महाविद्यालय परिसरात वृक्षसंवर्धन पंधरवडा साजरा करण्यात येत आहे. १ जुलै रोजी महाविद्यालय परिसरात आवळा, फापळा व इतर जातीचे ५० वृक्षाचे मान्यवरांच्याहस्ते रोपण करण्यात आले यावेळी प्राचार्य सुभाष भडांगे, उपप्राचार्य डॉ. एस. पी. रोठे, डॉ. एम.आर. इंगळे, डॉ. एस.पी. देशमुख,

रासेयो जिल्हा समन्वयक प्रा. विवेक हिवरे, रासेयो कार्यक्रम अधिकारी डॉ. संजय तिडके, महिला कार्यक्रम अधिकारी प्रा. कपिला म्हैसणे, सहकार्यक्रम अधिकारी प्रा. मिनाक्षी सरोदे यांच्यासह महाविद्यालयातील शिक्षक व शिक्षकेत्तर कर्मचारी मोठ्या संख्येने उपस्थित होते. परिसरात लावलेले वृक्षांचे संगोपन व संवर्धन करण्यासाठी त्यांना संरक्षक लावणे, पाणी देणे व झाडांची सर्वतोपरी निगा राखून वृक्ष जगविण्यासाठी या वृक्षसंवर्धन पंधरवड्य कार्य करण्यात येत आहे. कार्यक्र अधिकारी डॉ. संजय तिडके य मार्गदर्शनात रासेयो गटप्रमुख अंकुश इंग रोहन बुंदेले, जितेश इंगळे, श्रद्धा का कोमल गायकवाड, शिवशंकर मिरगे, हर्ष इंगळे, धनश्री मुईभार, मीरा डिक्कर, अ उगवेकर, जयश्री मुईभार, पूजा आ आदींनी परिश्रम घेतले आहे.

जाहीर सुचन

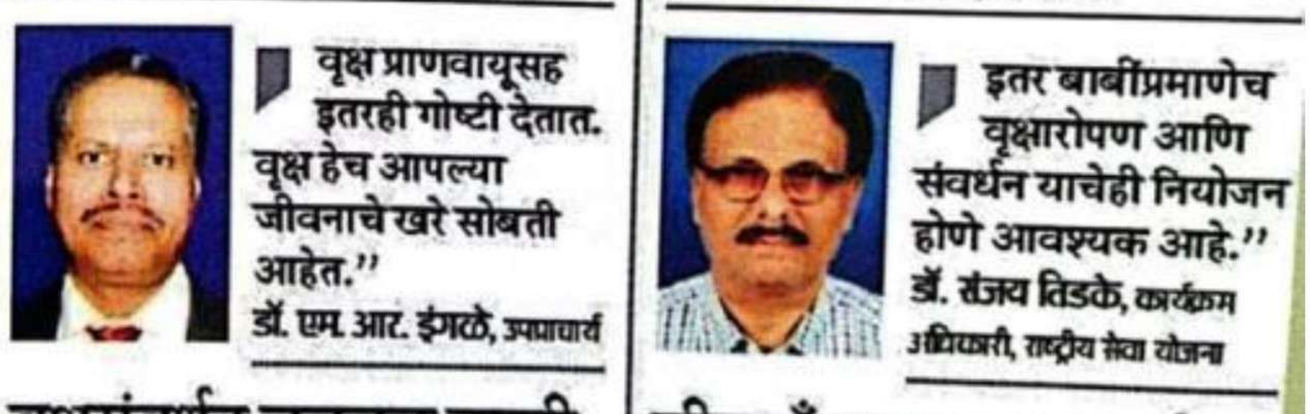
शिवाजी महाविद्यालयामध्य वृक्षारापण

महाविद्यालय, डॉ. बाबासाहेब आंबेडकर अभ्यास केंद्र आणि रासेयोचा संयुक्त उपक्रम

प्रतिनिधी । अकोला

दैनिक 'दिव्य मराठी'ने सुरू केलेल्या "एक वृक्ष एक जीवन' या अभियानात शहरातील श्री शिवाजी महाविद्यालयाने सहभाग नोंदवून गुरुवारी महाविद्यालयाच्या परिसरात वृक्षारोपण केले. महाविद्यालय, डॉ. बावासाहेब आंबेडकर अभ्यास केंद्र आणि राष्ट्रीय सेवा योजना यांच्या वतीने संयुक्तरित्या हा उपक्रम राववण्यात आला.

महाविद्यालयाच्या परिसरात विद्यार्थी आणि प्राध्यापकांनी विविध प्रकारची झाडे लावली. प्राचार्य डॉ. सुभाष भडांगे यांच्या मार्गदर्शनात हा उपक्रम राववण्यात आला. या अभियानांतर्गत आवळा, आंबा, कडूनिंब, पिंपळ अशी २० झाडे लावण्यात आली. यापूर्वी देखील काही झाडे लावण्यात आली. या वेळी महाविद्यालयाचे उपप्राचार्य डॉ. एम. आर. इंगळे, राष्ट्रीय सेवा योजनेचे कार्यक्रम अधिकारी डॉ. संजय तिडके, प्रा. राहुल माहुरे, प्रा. आकाश हराळ, प्रा. सुनील मावस्कर, राहुल कुरे, अमित लोंढे, विशाल इंगळे, आकाश हिवराळे, शुभम गोडे, कुणाल मेश्राम, अजिंक्य घेवडे, विशाल नंदागवळी, हेमंत तायडे यांच्यासह राष्ट्रीय सेवा योजना आणि अभ्यास केंद्रातील विद्यार्थी उपस्थित होते.



शिवाजी महाविद्यालयाच्या परिसरात वृक्षारोपण करण्यात आले.

वृक्ष हेच जीवनाचे सोबती

वृक्ष प्राणवायूसह इतरही गोष्टी देतात. वृक्ष हेच आपल्या जीवनाचे खरे सोबती आहेत.''

डॉ. एम. आर. इंगळे, उपप्राचार्य

नियोजन आवश्यक

इतर बाबींप्रमाणेच वृक्षारोपण आणि संवर्धन याचेही नियोजन होणे आवश्यक आहे.''

डॉ. संजय तिडके, कार्यक्रम अधिकारी, राष्ट्रीय सेवा योजना

वृक्षसंवर्धन चळवळ व्हावी

झाडे लावणे आणि झाडे जगवणे हे उपक्रमापुरते मर्यादित न राहता वृक्षसंवर्धनाची चळवळ झाली पाहिजे. सण किंवा इतर वेळी वस्तूऐवजी झाडेच भेट दिली पाहिजेत.''

प्रा. राहुल माहुरे

सीड बँक स्थापन करावी

शाळा-महाविद्यालयांत विद्यार्थ्यांनी मिळून सीड बँक स्थापन करावी. आपण कुठेही बाहेर जाताना यातील सीड्स रस्त्याच्या कडेने लावता येतात.''

विशाल नंदागवळी, विद्यार्थी

वृक्षारोपणाच्या उपक्रमात नियमितता असावी. झाडे लावून संगोपन होणे आवश्यक आहे.''

हेमंत तायडे, विद्यार्थी

5. Field surveys done by college

The college has conducted the survey of various plant species around the Akola city. The outcome of the project is as follows:

Floristic Survey on Angiospermic Plants of Campus of Shri Shivaji College, Akola (2018-19)

Sr.No.	Family	Botanical name	Common name
1	Rannuculaceae	***Clematis heynei* L.**	Morvel
2	Annonaceae	***Annona squamosa* L.**	Sitaphal
		***Polyalthia longifolia* (Sonner.)Thw**	False ashoka
3	Menispermaceae	***Cocculus hirsutus* L. Diels.**	Vasan vel
		***Tinospora cordifolia* Willd. Miers**	Gulvel
4	Nelumbonaceae	***Nelumbo nucifera* L.**	Lotus
5	Brassicaceae	***Brassica compestris* L.Var Sarson.**	Sarsu, Sarsav
		***Brassica juncea* L.Czern.Consp.**	Mustard
6	Cleomaceae	***Cleome viscosa* L.**	Asian spider flower
7	Caryophylaceae	***Dianthus chinesis* L.**	Rainbow pink
8	Portulacaceae	***Portulaca grandiflora* Hook**	China rose
9	Malvaceae	***Gossypium hirsutum* L.**	Cotton
		***Hibiscus rosa-sinesis* L.**	Jaswand
		***Malachra capitata* L.**	Ran Bhendi
		***Malvastrum cromandelium*(L.)Grcke**	Clockplant (Chandiri)
		***Sida acuta* Burn.f.**	Kareta
		***Sida cordifolia* L.**	Heart-Leaf sida
10	Elaeocarpaceae	***Muntingia calabura* L.**	Singapur cherry
11	Malphiginaceae	***Galphimia gracilis* Bartl.**	GoldShower
12	Oxalidaceae	***Biophytum sensitivum* L.DC**	Lifeplant (Lajalu)
		***Oxalis corniculata* L.**	Ambushi
13	Rutaceae	***Citrus limon* Burn.**	Limbu
		***Murraya paniculata* Jack.**	Kunti

Sr.No.	Family	Botanical name	Common name
		***Murraya paniculata* Jack.**	Kunti
14	Meliaceae	***Azadiracta indica* A.Juss**	Nim
		***Melia azidiracta* L.**	Nim
15	Vitaceae	***Cissus quadrangularis* L Syn.**	Had sakal
16	Sapindaceae	***Cardiospermum halicacabum* L.**	Kapalpholi
17	Anacardiaceae	***Magnifera indica* L.**	Amba
18	Fabaceae	***Abrus precatorious* L.**	Gunj vel
		***Cajanas cajan*(L.)Mill.Sp.**	Tur
		***Callindra haematosephala* Hassk.**	Red Powder puff
		***Cicer arieticum* L.**	Chana
		***Clitoria ternata* L.**	Blue pea(Gokarna)
		***Erythrina ceberoja* Roxb.**	Panghara
		***Pongamia pinnata*(L.) Pierre**	Karum Tree
19	Cesalpiniaceae	***Bauhinia purpurea* L.**	Dev kanchan
		***Cassia siamia* Lamk.**	Kasid
		***Cassia tora* L.**	Tora (tarota)
		***Ceasalpinia pulchirima*(L.)Sw.**	Sankeshwar
		***Delonix regina* (Boj.)Raf.**	Gulmohar
		***Peltocarpum pterocarpum* (DC) Backer.**	Tamra varni
		***Tamarindus indica* L.**	Chich
20	Mimosaceae	***Mimosa pudica* L.**	Lajalu
21	Combretaceae	***Quisqualis indica* L.**	Madhumalati
		***Terminaria arjuna* (Roxb.)Wt & Arn**	Arjun Tree
		***Terminaria belerika* Roxb.**	Behada
		***Terminaria cattappa* L.**	Indian almond
22	Rosaceae	***Rosa indica* L.**	Rose
		***Rosa multiflora* Thunb.**	Rose

Sr.No.	Family	Botanical name	Common name
23	Myrtaceae	***Eucalyptus grandis* Labill.**	Nilgiri
		***Psidium guajava* L.**	Peru
		***Syzygium cumini* L.**	Jambhul
24	Lythraceae	***Lawsonia alba* Lamk.**	Mehandi
		***Lawsonia innermis* L.**	Mehandi
25	Passifloraceae	***Turnera ulmifolia* L.**	Buttercup flower
26	Cucurbitaceae	***Trichozanthus cucurmerina* L.**	Parval
27	Cactaceae	***Cactus sp.* Juss.**	Nivdung
28	Rubiaceae	***Ixora coccinia* L.**	Rati nevari
		***Pentas lanceolata* Forssk.Deflers**	Star flower
		***Anthocepalous cadamba* A.Rich**	Kadamb
29	Asteraceae	***Conyza bonariensis* (L.)**	Hairy horseweed
		***Crysanthemum morifolium* L.**	Garden mum (Shevanti)
		Cyanthium cenerum	Sahdevi
		***Eclipta alba* (L.) Hassk**	False daisy(Bhringraj)
		***Echinops echinatus* Roxb.**	Utkant
		***Launaea procumbance* (Roxb.)**	Pathari(jagali gobi)
		***Parthenium hysterophorus* L.**	Ganjar gavat
		***Pulicaria dysenterica* (L.) Bernh.**	False Fleabane
		***Sonchus asper* (L.) Hill**	Mhatara
		***Synedrella nodifolia* (L.)**	Pig Grass
		***Tagest erecta* L.**	Zendu
		***Tridax procumbance* L.**	Kambarmodi
		***Wedelia chinesis*(Osbeck)Merr.**	Pilabhangara
		***Zinnia angustifolia* L.**	Creeping Zinnia
30	Plumbaginaceae	***Plumbago zeylanica* L.**	Chitrak
31	Primulaceae	***Embelina ribs* Burm.f.**	Vavding
32	Oleaceae	***Jasmimum multiflorum* (Bur**	Mogara

Sr.No.	Family	Botanical name	Common name
		m.f.) **Andra**	
		***Jasmimum sambac* (L.) Alt.**	Mogara
		***Nyctanthes arbortristis* L.**	Prajakta
33	Apocynaceae	***Adenium obesum*(Forssk.) Roem. & Schult.**	Desert Rose
		***Allamanda cathartica* L.**	Golden Trumpet Vine
		***Alstonia scholaris* (L.)R.Br.**	Saptaparni
		***Carissa carandus* L.**	Karvand
		***Catharanthus roseus* (L.)G.Don**	Sadaphuli
		***Gynnema sylvesrtis* R.Br.**	Gurmar
		***Nerium oleander* Blanco**	Kanher
		***Plumeria alba* L.**	Chafa
		***Plumeria rubra* L.**	Chafa
		***Plumeria pudica* Jacq.**	Chafa
		***Tabernaemontena divaricata* (L.)R.Br.**	Swastik
34	Asclepideaceae	***Calotropis gigantean*(L.)R.Br.**	Giant Milkweed
		***Calotropis procera* (Ait)R.Br.**	Rui
35	Convolvulaceae	***Argyreia nervosa* (Burn.f.) Boj.**	Samudra shosh
		***Ipomoea hedrifolia* L.**	Scarlet morningGlory
		***Ipomoea quamocli* L.**	Ganeshvel
		***Merremia emarginata* (Burm. fil.) Hall. fil.**	Kidney leaf morning glory
36	Solanaceae	***Capsicum annunum* L.**	Mirchi
		***Datura inoxia* Mill.**	Black Dhatura
		***Datura metal* L.**	Dhotara
		***Solanum lycopercicum* L.**	Tomato
		***Solanum melongena* L.**	Brinjal
37	Bignoneaceae	***Tecoma stance* (L.)H.B&K**	Yellow bells
38	Acanthaceae	***Adhatota vasica* Nees.**	Adulsa

Sr.No.	Family	Botanical name	Common name
		***Barleria priontis* L.**	Katekoranti
		***Crosandra infundibuliformis*(L.) nees**	Aboli
		***Odonotonema tubaeforme* (Bertol.) Kuntze**	Firespike
		***Pachystachys lutea* Nees.**	Lolypop
39		***Ruellia tuberose* L.**	Bluebell
	Verbenaceae	***Duranta erecta* L.**	Damyanti
		***Lantana camera* L.**	Indradhanu
		***Vitex neugundo* L.**	Nirgudi
40	Lauraceae	***Cinnamomum tamala* (Buch-Ham.)**	Tej-patta
41	Lamiaceae	***Ocimum americium* L.**	Ran-tulasi
		***Ocimum basilicum*L.**	Ram-tulasi
		***Ocimum gratissium* L.**	Ram-tulasi
		***Ocimum sanctum* L.**	Tulasi
42	Plantiginaceae	***Russelia equisetiformis***	
43	Nyctanginaceae	***Bougainvillea spectabilis* Willd.**	Buganvel
		***Mirabilins jalapa* L.**	4'o'clock
44	Amaranthaceae	***Alternanthera sessalis* (L.)R.Br**	Garudi
		***Amaranthus viridis* L.**	Prince of wales
		***Digera muricata* (L.)Mart**	Kanjro
45	Basellaceae	***Basella alba* L.**	Poipothi
46	Plygonaceae	***Rumex crispus* L.**	
47	Euphorbiaceae	***Acalypha hispida* Burm.f**	Red hot Cat tail
		***Acalypha indica*L.**	Venchhi kanto
		***Acalypha wilkensonia* Mull.Arg**	
		***Croton bonplandiannum* Baill.**	Croton
		***Euphorbia hirta* L.**	Dudheli
		***Euphorbia geniculata* Ort.**	
		***Euphorbia milli* Ch.**	

Sr.No.	Family	Botanical name	Common name
		***Euphorbia thamifolia* L.**	
		***Jatropha gossypifolia* Roxb**	Vilayati Arandi
		***Phylanthus niruri* auct.**	Bhuiavala
		Ricinus communis	Yerandi
48	Moraceae	***Ficus benjamina* L.**	weeping fig
		***Ficus bengalensis* L.**	Banyan tree
		***Ficus recemosa* L.**	Umbar
		***Ficus religiosa* L.**	Peepal tree
		***Morus alba* L.**	white mulberry
49	Hydrocharitaceae	***Hydrila verictillata* Presl.**	Bam
		***Najas indica* (Willd) Cham.**	
50	Zingiberaceae	***Alpinia galangal* (L.) Willd.**	Thai ginger
51	Cannaceae	***Canna indica* L.**	Dev-keli
52	Musaceae	***Musa paradisiacal* L.**	Banana tree
		***Ravenala madagascariensis* Sonn.**	traveller's tree
53	Amyrilidaceae	***Crinum asiaticum* L.**	Sukhadarshan
54	Agavaceae	***Agave sp.*L.**	Kamal cactus
55	Liliaceae	***Allium sativum* L**	Lasun
		***Aloe vera* (L.)Burm.f**	Korfad
		***Asparagus racemosus* Willd.**	Shatavari
56	Commelinaceae	***Commelina benghalensis* L.**	Kena
		***Tradescantia discolor* L.Herit,Sert**	Spiderwort
57	Arecaceae	***Caryota urense* L.**	Shivjata
		***Collocasia esculanta* (L.)Schott.**	Alu
		***Diffenbachia amoena* L.**	Dumb cane
		***Livistonia chinensis* (Jacq.)R.Br. ex Mart.**	Chinese fan palm
		***Phoenix salvestris* (L.)Roxb.**	Khajur
		***Roystonia regina* (Kunth)**	Cuban royal palm

Sr.No.	Family	Botanical name	Common name
		(H.B.K) O.F.cook	
59	Potamogetonaceae	***Potamogeton* L.**	Shinning Pondweed
60	Poaceae	***Bambusa bambos* Voss.**	Bambu
		***Cynadon dyctalon* (L.)Pers.**	Haral
		***Dicanthelium oligosanthes* (Schult.) Gould**	
		***Eleusine indica* (L.) Gaertn.**	Crowfoot grass

Survey on Trees species of Akola City

List of Avenue Trees

Sr.No	Family	Name of Plant	Local Name
1	Capparidaceae	***Crateva religiosa* Auct.**	Temple plant
2	Elaeocarpaceae	***Muntingia calabura* L.**	Singapore cherry
3	Rhamnaceae	***Ziziphus jujuba* Auct.**	Bor
4	Moringaceae	***Moringa concanensis* Nimmo**	Ran Shegat
5	Caesalpiniaceae	***Bauhinia racemosa* Lamk.**	Bidi leaf tree
		***Cassia roxburghii* DC.**	Roxburgh's cassia
		***Cassia siamea* Lamk.**	kassod tree
		***Delonix regia* (Boj. Ex Hook.) Raf.**	Gulmohar
		***Parkinsonia aculeata* L.**	jelly bean tree
		***Peltophorum pterocarpum* (DC.) Baker ex K. Heyne**	Yellowflamboyant
6	Fabaceae	***Gliricidia sepium* (Jacq) Kunth ex Steud.**	Quickstick
		***Pongamia pinnata* (L.) Pierre**	
7	Mimosaceae	***Acacia nilotica* (L) Del.**	Gum arabic tree
		***Albizia lebbeck* (L.) Willd.**	woman's tongue tree.
		***Mimisa hamata* Willd.**	
		***Prosopis juliflora* (Sw.) DC.**	
		***Parkia biglandulosa* Wt. & Arn.**	
8	Combretaceae	***Terminalia catappa* L.**	Indian almond
9	Rubiaceae	***Anthocephalus cadamba* A. Rich.**	Burflower-tree
10	Apocynaceae	***Alstonia scholaris* (L.) R. Br.**	Saptparni
11	Ehretiaceae	***Cordia sebestena* L.**	Kopte
		***Cordia sinensis* Lamk.**	Grey-leaved saucer berry
12	Bignoniaceae	***Millingtoni hortensis* L. f.**	Latak chandani
		***Spathodea companulata* P. Beauv.**	African tulip tree
13	Verbenaceae	***Tectona grandis* L. f.**	Teak tree
14	Euphorbiaceae	***Putranjiva roxburghii* Wall.**	

Sr.No	Family	Name of Plant	Local Name
15	Moraceae	***Ficus benghalensis* L.**	Banyan tree
		***Ficus carica* L.**	Common fig tree
		***Ficus elastic* Roxb.**	Rubber tree
		***Ficus racemosa* L.**	cluster fig tree
		***Ficus religiosa* L.**	Peepal tree
		***Morus alba* L.**	white mulberry
16	Musaceae	***Ravenala madagascariensis* Sonnerat**	Traveller's tree
17	Casuarinaceae	***Casuarina equisetifolia* J. R. & G. Forst.**	Australian pine tree

Lists of Medicinal Plants			
Sr.No	**Family**	**Name of Plant**	**Common Name**
1	Annonaceae	***Annona reticulata* L.**	Ramphal
		***Annona sqamosa* L.**	Sitaphal
2	Rutaceaee	***Aegle marmelos* (L.) Juss**	Bel
		***Citrus lemon* Burm**	Limboo
		***Murraya koinigii* (L.) Spr.**	Kadipatta
3	Simaroubaceae	***Ailanthus excelsa* Roxb.**	Mharukh
4	Balanitaceae	***Balanites aegyptiaca* (L.) Del.**	Hingan Bet
5	Meliaceae	***Azadirachta indica* A. Juss.**	Neem
		***Melia azedirach* L.**	
6	Sapindaceae	***Sapindus mucorosis* Gaertn.**	Ritha
7	Anacardiaceae	***Mangifera indica* L.**	Aam
		***Semicarous anacardium* L. f.**	Bibba
8	Moringaceae	***Moringa oleifera* Lamk.**	Shevga
9	Caesalpiniaceae	***Caesalpinia bonduc* L. emend Dandy & Exell**	Sagargoti
		***Caesalpinia puncherrima* (L.) Swartz**	Sankeshwar
		***Cassia fistula* L.**	Bahava
		***Tamarindus indica* L.**	Imli
10	Fabaceae	***Butea monosperma* (Lam.) Taub.**	Palas
		***Dalbergia sissoo* Roxb. ex DC.**	Shisam
		***Erythrina suberosa* Roxb.**	Coral tree
		***Sesbania grandiflora* (L.) Poir.**	Hummingbird tree
11	Mimosaceae	***Acacia leucophloea* (Roxb.) Ridsd.**	
12	Combretaceae	***Terminalia arjuna* (Roxb.) Wt. & Arn.**	Arjun tree
		***Terminalia bellirica* (Gaertn.) Roxb.**	Behada
13	Myrtaceae	***Eucalyptus globulus* Labill.**	Nilgiri
		***Psidium guayava* L.**	Peru
		***Syzygium cumini* (L.) Skeels**	Jambhul
14	Lythraceae	***Lawsonia inermis L***	Mehndi
		Lagerstromia indica L	crape myrtle

15	Passifloraceae	***Carica papaya L.***	Papaya
16	Rubiaceae	***Morinda citrifolia L.***	Bartondi
17	Sapotaceae	***Madhuca indica* Gmel.**	Moh
		Mimusops elengi L.	Bakul
18	Apocynaceae	***Thevetia peruviana (Pers.) K. Schum.***	yellow oleander
		***Wrightia tinctoria* R.Br. in Mem. Wern.Nat.**	Kala-Kuda
19	Asclepiadaceae	***Calotropis gigantean* (L.) R. Br.**	Runchki
20	Bignoniaceae	***Kigelia africana* Benth.**	Balam Kheera
21	Verbenaceae	***Vitex negundo* L.**	Nirrguli
22	Piperaceae	***Piper nigrum* L.**	Kali mirch
23	Lauraceae	***Cinnamomum tamala* (Buch.-Ham.)**	Tej patta
24	Santalaceae	***Santalum album* L.**	Chandan
25	Euphorbiaceae	***Phyllanthus emblica* Gaertrn.**	Awla
		***Ricinus communis* (L.)**	Castor oil seed
26	Ulmaceae	***Holoptela integrifolia* (Roxb.) Planch**	
27	Moraceae	***Ficus racemosa L.***	Hekala
		***Ficus hispida* L.f.**	Bhui Umbar
28	Musaceae	***Musa paradisica* L.**	Banana

List of Ornamental Trees

Sr.No	Family	Name of Plant	Local Name
1	Annonaceae	***Polialthia longifolia* (Sonner.) Thw.**	Khota Ashoka
2	Bixaceae	***Bixa orellana* L.**	lipstick tree
3	Malvaceae	***Thespesia populnea* (L.) Soland. Ex corr.**	portia tree
4	Caesalpiniaceae	***Bauhinia purpurea* L.**	orchid tree
		***Bauhinia tomentosa* auct.**	yellow bell orchid
5	Mimosaceae	***Albizia julibrissis* Durazz**	pink silk tree
6	Myrtaceae	***Callistemon regidus* R. Br.**	Bottlebrush
7	Sapotaceae	***Manilkara zapota* (L.) P. van Royen**	Chicoo
8	Oleaceae	***Nyctanthes arbor-tristis* L.**	Parijatak
9	Salvadoraceae	***Salvadora persica* L.**	Pilukatar
10	Apocynaceae	***Plumeria alba* L.**	caterpillar tree
		***Plumeria pudica* Jacq.**	
		***Plumeria rubra* L.**	frangipani
11	Bignoniaceae	***Jacaranda mimosifolia* D. Don**	Nilmohar
12	Moraceae	***Ficus benjamina* (L.)**	weeping fig
13	Palmae (Arecaceae)	***Caryota Urens* L.**	solitary fishtail palm
		***Coccus nucifera* L.**	Coconut

Preliminary survey on Climbers of Akola City (2018-19)

Sr.No	Family	Name of Species
2.	Ranunculaceae	***Clematis heynei* L.**
3.	Menispermaceae	***Cocculus hirsutus* L. Diels.**
4.		***Tinospora cardifolia* Willd Miers.**
5.	Vitaceae	***Cissus quadrangularis* L.Syn Vitis Linn**
6.	Sapindaceae	***Cardiospermum halicacabum* L.**
7.	Fabaceae	***Abrus precatorius* L.**
		***Alysicarpus monilifer* L.**
		***Clitoria ternata* L.**
		***Lablab purpureus* (L.) Sweet**
8.	Caesalpiniaceae	***Moulava spicata***
		Bauhinia vahlii
9.	Combretaceae	***Quiscalis indica* L.**
10.	Passifloraceae	***Passiflora caerulea* L.**
		***Passiflora foetida* L.**
11.	Cucurbitaceae	***Trichosanthes cucumerina* L.**
		***Luffa acutangula* L. Roxb.var.**
		***Luffa acutangula* L. Roxb.amara**
		***Momordica charantia* L.**
		***Momordica diocia* Roxb.**
		***Diplocyclos palmatus* (L)jeffrey.**
		***Mukia madaraspatana*(L)Roem.**
		***Solena amplexicaulis* (Lam)Gandhi.**
		Cucumis melo var. agrestis.
12.	Oleaceae	***Jasminum multiflorum*(Burm.f.)Andra.**
		***Jasminum sambac* Ait.**
13.	Apocynaceae	***Nerium oleander* Mill.**
		***Allamanda cathartica* L. Mant.**
14.	Asclepediaceae	***Pargularia daemia*(Forsk)Chiov.**
		***Wattakaka volubilis*(L.f)**
15.	Basellaceae	***Basella alba* L.**

Sr.No	Family	Name of Species
16.	Dioscoraceae	***Dioscorea bulbifera* L.**
17.	Convovulaceae	***Argeria speciosa*(Linn.f.)**
		***Ipomea hederifolia* L.**
		***Ipomea quamoclit* L.**
18.	Bignoniaceae	***Tecomella capensis*(Thunb)**
19.	Nyctaginaceae	***Bougainvillea spectabilis.* Willid.**
		Boungainvillea monco.
20.	Polygonaceae	***Antigonon leptopus* H & Arn.**
21.	Liliaceae	***Asparagus racemosus* Wild. Var. javanica Baker.**

DETAILED ENERGY AUDIT REPORT

Shri. Shivaji Arts, Commerce and Science College Akola

Near Shivaji Park, Akola - 444001
Maharashtra

November 2019

Conducted By

PPS Energy Solutions Pvt. Ltd.
Engineering Consultants
Plot No-18, Girish Housing Society
Warje, Pune – 411058, Maharashtra, India

PREFACE

Energy Audit is a key parameter of systematic approach for decision-making in the area of energy management. It attempts to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exists provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options.

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

Present audit is a mare mile marker towards destination of achieving safe, healthy and energy efficient unit. We would like to emphasize that an electrical audit is a continuous process. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential. The next step would be to prioritize their implementation. Implementation of recommended measures can help consumes to achieve significant reduction in their energy consumption levels.

WHY ENERGY AUDIT?

An energy audit determines the amount of energy consumption affiliated with a building and the potential savings associated with that energy consumption. Additionally, an energy audit is designed to understand the specific conditions that are impacting the performance and comfort in your facility to maximize the overall impact of energy-focused building improvements.

An energy audit is a systematic review of the energy consuming installations in a building or premises to ensure that energy is being used sensibly and efficiently. An energy audit usually commences with the collection and analysis of all information that may affect the energy consumption of the building or premises, then follows with reviewing and analyzing the condition and performance of various building services installations and building management, with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, building owners can get the immediate benefit for paying less for energy bills. On the other hand, lowering of energy consumption in buildings will lead to the chain effect that less fossil fuel will be burnt for electricity generation by the power supply companies and relatively less pollutants and greenhouse gases will be introduced into the atmosphere, thus contributing to conserve the environment and to enhance sustainable development.

ACKNOWLEDGEMENT

We express our sincere gratitude to the authorities of Shri. Shivaji Arts, Commerce and Science College, Akola for entrusting and offering the opportunity. It is our immense pleasure to present the detailed report on energy assessment.

We acknowledge the support from management for their positive support in undertaking the task of energy efficiency assessment of all electrical system, thermal systems, utilities and other area and for continuous help and support before and during the audit.

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance and saving potential. We admire the help of all concerned staff for their active participation in completing official documentations.

We express our sincere gratitude to the authorities of Shri. Shivaji Arts, Commerce and Science College, Akola for entrusting PPS Energy Solutions Pvt. Ltd.

For PPS Energy Solutions Pvt. Ltd.

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About PPSES

M/s. PPS Energy Solutions Pvt. Ltd (PPSES) is an ambitious company, established by enterprising engineering professionals in the year 2009. The company offers services pertaining to Energy and Engineering to clients across the globe. Our team is based in Pune, a city known for its Software and Engineering talent in India. We are a rapidly growing company with a team of about 100 people which includes highly trained and experienced Techno-Managers, Analysts, and Engineers & Detailers.

We are presently working in India (Maharashtra, Assam, Madhya Pradesh, Gujarat, Andhra Pradesh, Delhi, Orissa, Chhattisgarh, Bihar, Andhra Pradesh, Telangana and Jharkhand) and Abroad (Bahrain, Stanford)

- We serve in majorly four areas,
  - Energy Audit, Management and System Evaluations
  - Power Distribution System Design, Evaluations and Monitoring
  - MEP Design and Project management
  - Research and Training

PPSES Team Members

Name	Role	Academics and Expertise
Dr. Ravi Deshmukh	ECM verification, Report verification and presentation	Accredited Energy Auditor PhD, M tech, MBA (Power), Graduate E&TC Engineer with over 18 years of experience in Energy Management, Management of Power System, street light projects, Power Exchange Operations, Power Trading and Analysis, Electrical Automation. Has worked as Expert in Iron & Steel sector and Energy
Mr .Nilesh Saraf	Co-ordination with officers, project status review.	Expert in Energy sector with 16 years of experience in Energy efficiency assessment, Industrial engineering sector & Renewable Energy.
Mr. Vinayak Apte	Energy Audit Expert	Graduate Electrical Engineer with more than 10 years of experience in various sectors. He handled Energy Audits, Energy Conservation and Energy Efficiency projects in Industries, Commercial and Residential Buildings, Pump House
Mr. Vedmurthy Swamy	Field study, data tabulation and analysis, report preparation	Graduate Mechanical Engineer with 5 years of experience in project management, energy efficiency assessment
Mrs. Utkarsha Bharate	Data tabulation and analysis, report preparation	Graduate in Electrical & Electronics Engineering, Sr. Engineer, 3 years of experience in Energy & Power projects

1. EXECUTIVE SUMMARY

Detailed Energy Audit was undertaken in order to evaluate energy performance and identify potential energy conservation measures. The assessment was undertaken in three steps, i.e. document review of data and information initially provided by facility, site visit and preparation of this report.

The building visit was conducted by energy audit team. The site visit included interaction with staff, electricians of building, the collection/review of further data and a field inspection of the facilities and equipment.

This brief report has therefore sought to provide a high-level overview of the status of energy efficiency at building, combined with an illustration of areas where further, previously unidentified savings opportunities may exist.

Our survey has identified further potential opportunities, ranging from "no & low cost" measures, through to those that will require significant capital expenditure.

Note: Investment figures mentioned in are only indicative, further detailed study is recommended.

Summary of Recommended Energy Conservation Measures:

Sr. No.	ECM Details	Investment (Rs. Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs. Lacs /Year)	Payback (Years)
1	Replacement of conventional lights with more efficient lights	4.43	17264.10	14.67	1.04	4.28
2	Replacement of existing fans with energy efficient fans	11.99	22307.25	18.96	1.34	8.96
	Total	**16.42**	**39571.35**	**33.64**	**2.37**	**6.92**

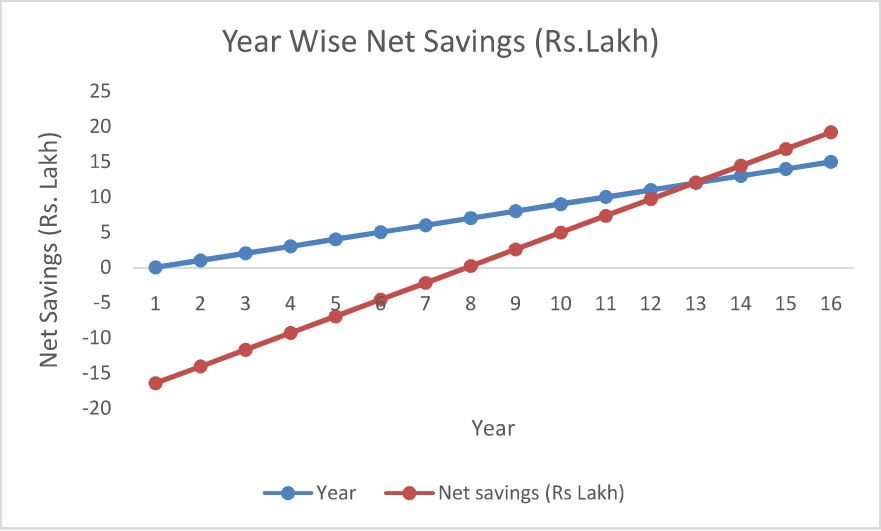
Note: Estimated savings may base on operating conditions

Other Recommendations:

A. Regular cleaning and maintenance of equipment's is important to reduce energy losses.
B. Use of start rates equipment's is also strongly recommended specially in case of Fans and Air conditioning.
C. Cleaning of ceiling fan and exhaust fan blades will reduce the drag on the fan and intern will reduce energy loss.
D. Awareness amongst students and staff is very essential step to reduce wastage of electricity

E. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of employees and students motivates them to work as a team can lead to reductions in energy consumption and save the money.

Year	Investment (Rs. In Lacs)	Saving (Rs.In Lacs /Year)	Cum Savings(Rs Lakh)	Net savings (Rs Lakh)
0	-16	0	0	-16
1	0	2	2	-14
2	0	2	5	-12
3	0	2	7	-9
4	0	2	9	-7
5	0	2	12	-5
6	0	2	14	-2
7	0	2	17	0
8	0	2	19	3
9	0	2	21	5
10	0	2	24	7
11	0	2	26	10
12	0	2	28	12
13	0	2	31	14
14	0	2	33	17
15	0	2	36	19



2. GENERAL AUDIT REVIEW

Building can implement faster payback energy conservation measures (ECMs) which have already been considered and for which the ECMs are fully developed.

Other General Points:

1. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of staff, students and motivating them to work as a team can lead to reductions in energy consumption and save the money. Savings estimates range in the order of 5 to 10%. When implemented effectively these savings can be realized quickly and cost effectively.
2. Most of the fans are of older design and not energy inefficient.
3. Most of the places the tube light installed are energy efficient and fittings are in healthy condition.
4. Natural day light is efficiently used in corridor and few classrooms and labs areas.

It is believed that with the current approach and organization of energy management, energy can be reduced in a systematic, cost effective manner. We hope that this report will help building to implement these changes and provide direction to the Energy Management Team.

3. ABOUT ENERGY AUDIT

Objective

The overall objective of the assignment is to quantify energy saving in existing system and achieve reduction in energy consumption pattern.

Hence the detail objectives are as under,

1. To calculate the energy consumption.
2. To evaluate the performance of the equipment.
3. To find out the energy saving opportunities.
4. To quantify the total energy savings.
5. To find out the ways to achieve energy efficiency.

3.1. Scope of Work

Following is the scope of work envisaged for this assignment,

Data Collection
To collect the details of various electrical and mechanical system and their ratings, the available drawings and details shall be studied. Detail load list shall be prepared and checked.

A, B, C Analysis
With the details available from load list, analysis shall be carried out depending on the present usage trends. All the power consuming equipment's shall be classified in three categories depending on their ratings, condition and operating time. The area for larger potentials for savings shall be identified.

Field Study
The detail field study on site shall include the following as well as all other measures required for energy audit study,

a. Lay out the system and study of Electrical distribution.
b. Study of area wise power distribution and Measurement of power consumption
c. Study of instrumentation provided
d. Measurement of motor currents, voltages, power etc. parameters by energy analyzer and measurement of water flow, pressures etc. parameters of pumps simultaneously and other measurements as needed to characterize the system and required for calculating efficiency at various combinations.
e. Study of air conditioner operations and system requirements.
f. Analysis of readings obtained from field with the standard consumption.

3.2. Approach and Methodology

1. Understanding the Scope of Work and Resource Planning

2. Identification of Key Personnel for the assignment/ project

3. Structured Organization Matrix

4. Steps in preparing and implementing energy audit assignment.
   a) Discussions with key facility personnel.
   b) Site visits and conducting "walk-through audit".
   c) Preliminary Data Collection through questionnaire before audit team's site visit.
   d) Steps for conducting the detailed audit
      - Plan the activities of site data collection in coordination with the facility in-charge.
      - Study the existing operations involving energy consumption
      - Collect and collate the energy consumption data with respect to electricity consumption
      - Conduct performance tests to assess the efficiency of the system equipment/ electricity distribution, lighting, and identify energy losses.
      - Discuss with facility personnel about identified energy losses.

5. List proposed efficiency measures
   - Develop a set of potential efficiency improvement proposals
   - Baseline parameters
   - Data presentation
   - System mapping
   - List of potential Energy Savings proposals with cost benefit analysis.
   - Review of current operation & maintenance practices

6. Preparation of the Draft Energy Audit Report.

7. Preparation and submission of final Energy Audit Report after discussion with concerned persons.

4. ENERGY DETAILS

The electricity supply for College building is provided by Maharashtra State Electricity Distribution Company Limited (MSEDCL). Having Connected total 8 meters. Billing is carried out according to LT-X B Tariff.
Detailed Energy Audit was conducted for the load connected to the mains supply used.

Mainly energy is used on this facility for the following purposes:

1) Lighting load
2) Ceiling fans

Based on above it is clear that followings buildings have highest potential for energy savings

Table 1 Name of CollegeAreas

Sr. No.	Name of the Areas
1	Chemistry Department
2	Shatabadi Building
3	Narnala Building Block-J
4	Building-I
5	Admin Building
6	Mcvc Building
7	Murna Building
8	Murna Building
9	Block A
10	Admin Building
11	Block E
12	Block D
13	Block C

4.1. Electricity Bill Analysis

1. Consumer Details of Meter No. 310070132248

Consumer Details

Table 2 Consumer Details

Parameter	Details
Consumer No.	**310070132248**
Consumer Name	The Principal Shivaji College
Address	Akot Stand Akola Akola 444001
Pin Code	444001
Sanction load (KW)	4.6
Tariff	LT-X B

Consumption Details

Table 3Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	1015	6504	9075
Nov-18	0	0	351
Dec-18	30	124	534
Jan-19	240	1030	1851
Feb-19	184	761	1435
Mar-19	239	1116	1924
Apr-19	494	2825	4169
May-19	1113	7149	9813
Jun-19	775	4833	6755
Jul-19	630	3854	5316
Aug-19	711	4338	5736
Sep-19	1113	7080	9351

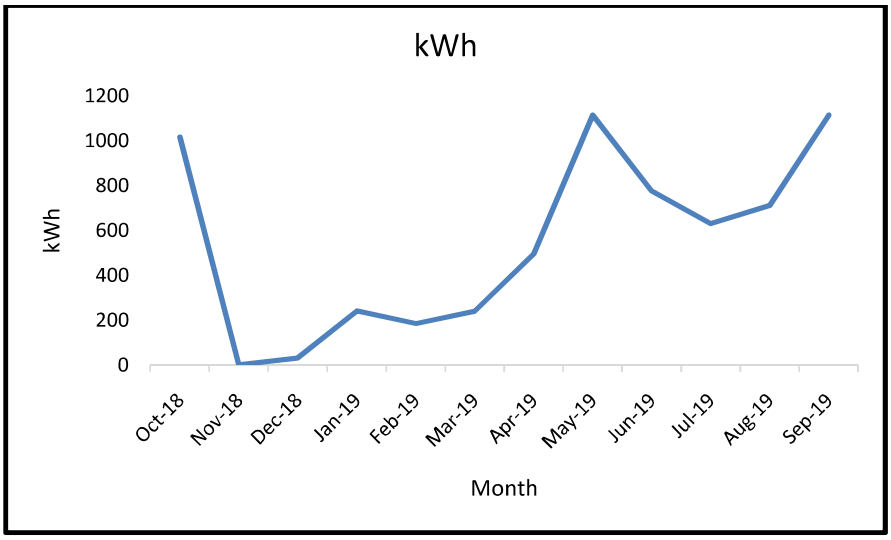


Figure 1 Monthly kWh Consumption

2. Consumer Details of Meter No.310070132256

Consumer Details

Table 4 Consumer Details

Parameter	Details
Consumer No.	**310070132256**
Consumer Name	The Principal Shivaji College
Address	Akot Stand Akola
Pin Code	444001
Connected load (KW)	24
Tariff	LT-X B

Consumption Details

Table 5Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	4944	33,866.00	51069.00
Nov-18	2584	17,700.00	26165.00
Jan-19	3863	26,461.00	39074.00
Feb-19	4214	28,865.00	42257.00
Mar-19	5246	35,916.00	51487.00
Apr-19	3714	25,255.00	36950.00
May-19	3378	22,970.00	33968.00
Jun-19	3199	21753	32,738.00
Jul-19	5310	36,108.00	51,247.00
Aug-19	5532	37,617.00	51521.00
Sep-19	4997	33,979.00	48874.00

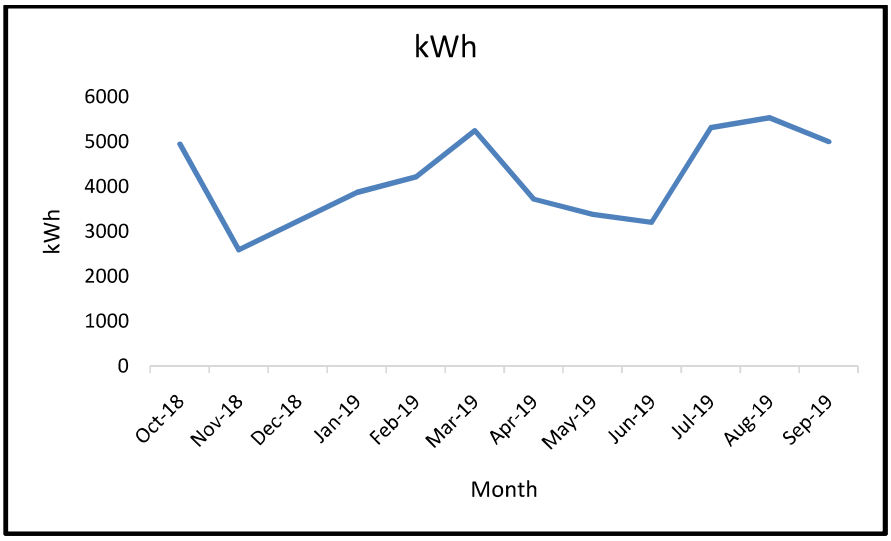


Figure 2Monthly kWh Consumption

3. Consumer Details of Meter No.310070132272

Consumer Details

Table 6 Consumer Details

Parameter	Details
Consumer No.	**310070132272**
Consumer Name	Shri Principal Shivaji Mahavidyalaya
Address	Akot Stand Akola
Pin Code	444001
Sanction load (KW)	4
Tariff	LT-X B

Consumption Details

Table 7Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	296	1,512.00	2362
Nov-18	429	2,382.00	3433
Jan-19	3027	15,362.00	-3231
Feb-19	330	1,694.00	2711
Mar-19	346	1,856.00	2831
Apr-19	326	1,698.00	2683
May-19	326	1,719.00	2715
Jun-19	326	1,719.00	2722
Jul-19	1186	6,046.40	1651
Aug-19	296	1,512.00	2375
Sep-19	296	1,512.00	2298

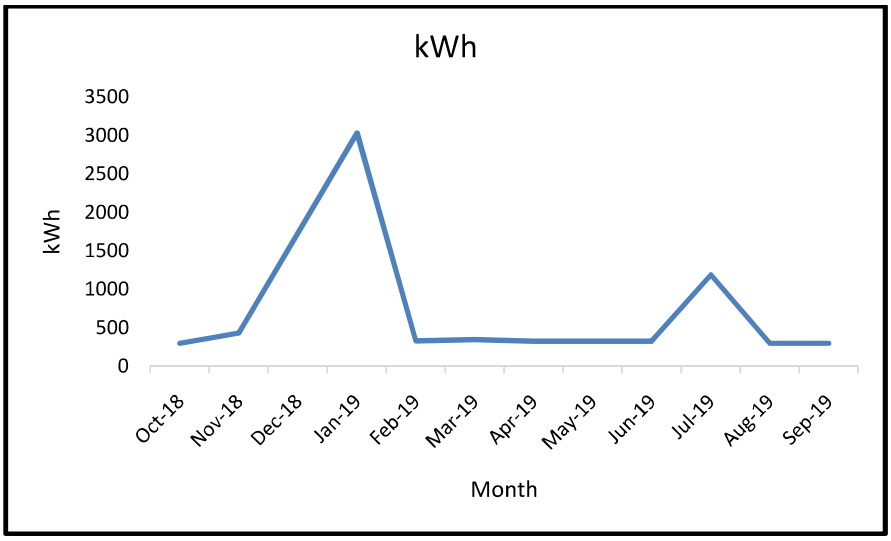


Figure 3Monthly kWh Consumption

4. Consumer Details of Meter No.310070132299

Consumer Details

Table 8 Consumer Details

Parameter	Details
Consumer No.	**310070132299**
Consumer Name	The Principal Shivaji College
Address	Akot Stand Akola
Pin Code	444001
Sanction load (KW)	5
Tariff	LT-X B

Consumption Details

Table 9Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	294	1,498.00	2345
Nov-18	198	770.00	1415
Jan-19	251	1,158.00	2304
Feb-19	376	2,007.00	3122
Mar-19	394	2,182.00	3246
Apr-19	713	4,345.00	6119
May-19	422	2,365.00	3561
Jun-19	355	1,903.00	2967
Jul-19	166	705.00	1371
Aug-19	446	2,510.00	3640
Sep-19	217	951.00	1621

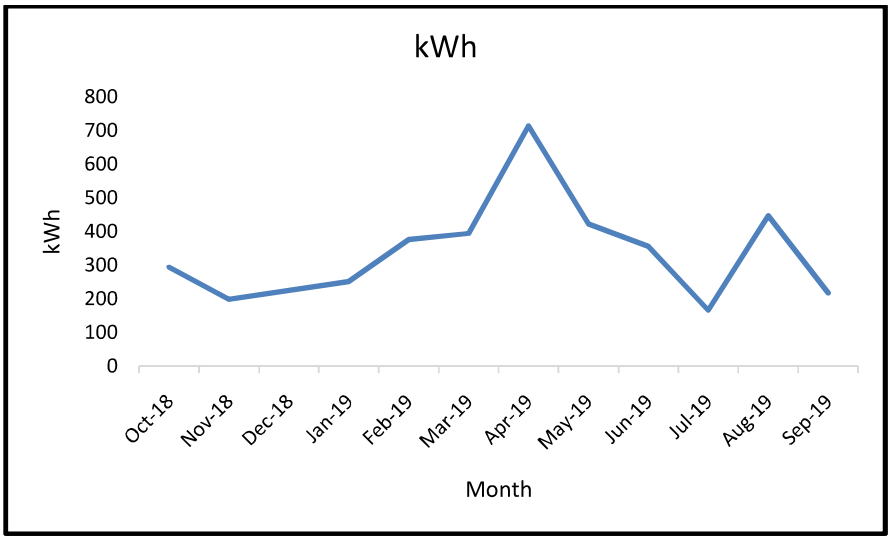


Figure 4Monthly kWh Consumption

5. Consumer Details of Meter No.310071314749

Consumer Details

Table 10 Consumer Details

Parameter	Details
Consumer No.	**310071314749**
Consumer Name	Principal Shri Shivaji College
Address	Akot Road Akola Near Shivaji Park Narnala Building
Pin Code	444002
Sanction load (KW)	4
Tariff	LT-X B

Consumption Details

Table 11Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	771	4,789.00	6466
Nov-18	346	1,819.00	2731
Jan-19	316	1,599.00	2869
Feb-19	421	2,291.00	3501
Mar-19	542	3,203.00	4543
Apr-19	988	6,208.00	8543
May-19	655	3,989.00	5673
Jun-19	627	3,796.00	5411
Jul-19	627	3,796.00	5411
Aug-19	743	4,580.00	6243
Sep-19	678	4,132.00	5480
Oct-18	771	4,789.00	6466

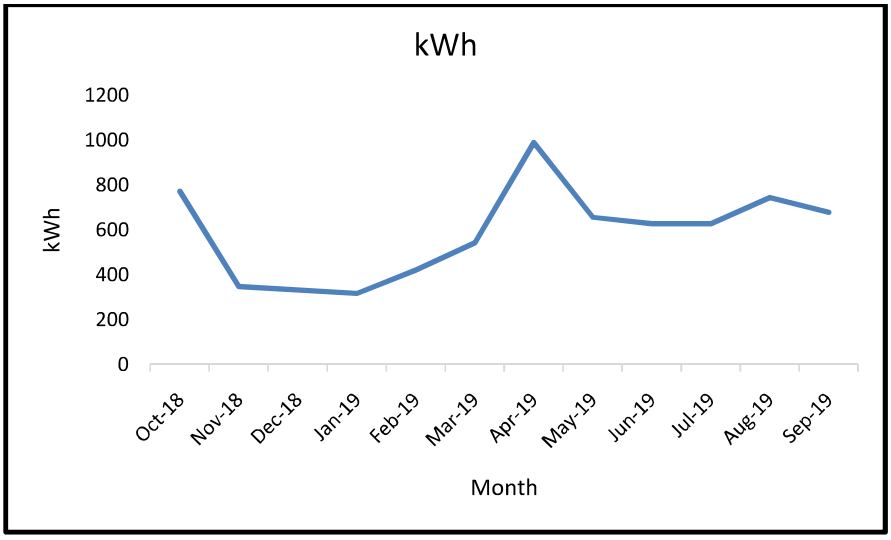


Figure 5Monthly kWh Consumption

6. Consumer Details of Meter No.310071403466

Consumer Details

Table 12 Consumer Details

Parameter	Details
Consumer No.	**310071403466**
Consumer Name	Principal Shri Shivaji College
Address	Near Shivaji Park Akot Faill Road
Pin Code	444005
Sanction load (KW)	44
Tariff	LT-X B

Consumption Details

Table 13Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	2492	16,664.00	21336
Nov-18	2187	14,335.00	18323
Jan-19	1949	12,687.00	17060
Feb-19	2243	14,684.00	19795
Mar-19	2488	16,400.00	21360
Apr-19	4032	27,004.00	35557
May-19	3615	24,413.00	32285
Jun-19	3139	21,113.00	28051
Jul-19	2221	14,794.00	19710
Aug-19	2587	17,304.00	22268
Sep-19	2503	16,724.00	20756

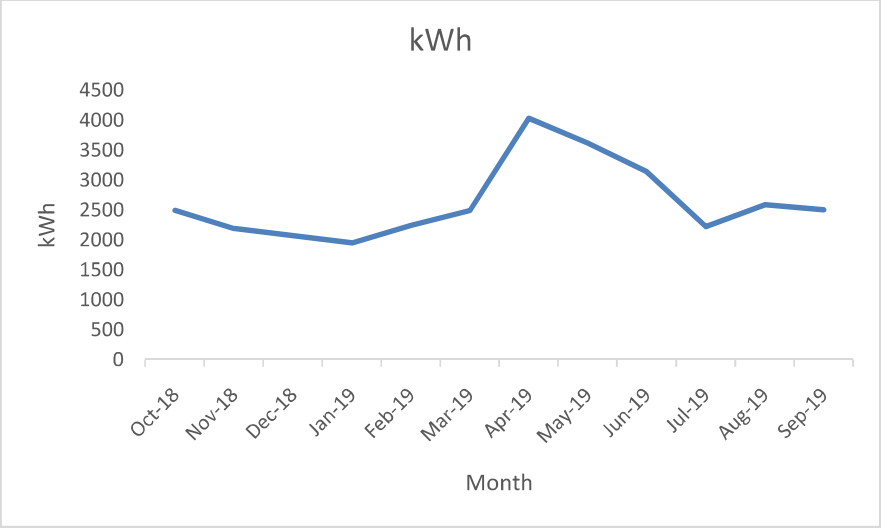


Figure 6Monthly kWh Consumption

7. Consumer Details of Meter No.310074001725

Consumer Details

Table 14 Consumer Details

Parameter	Details
Consumer No.	**310074001725**
Consumer Name	The. Principal Shivaji College
Address	Akot Fail Road Akola
Pin Code	444001
Sanction load (KW)	4.4
Tariff	LT-X B

Consumption Details

Table 15Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	351	1,891.00	2837
Nov-18	369	1,527.00	1114
Jan-19	251	1,158.00	2304
Feb-19	484	2,740.00	4087
Mar-19	398	2,209.00	3281
Apr-19	392	2,150.00	3269
May-19	235	1,075.00	1880
Jun-19	208	889.00	1642
Jul-19	181	769.00	1464
Aug-19	259	1,220.00	2015
Sep-19	215	937.00	1604

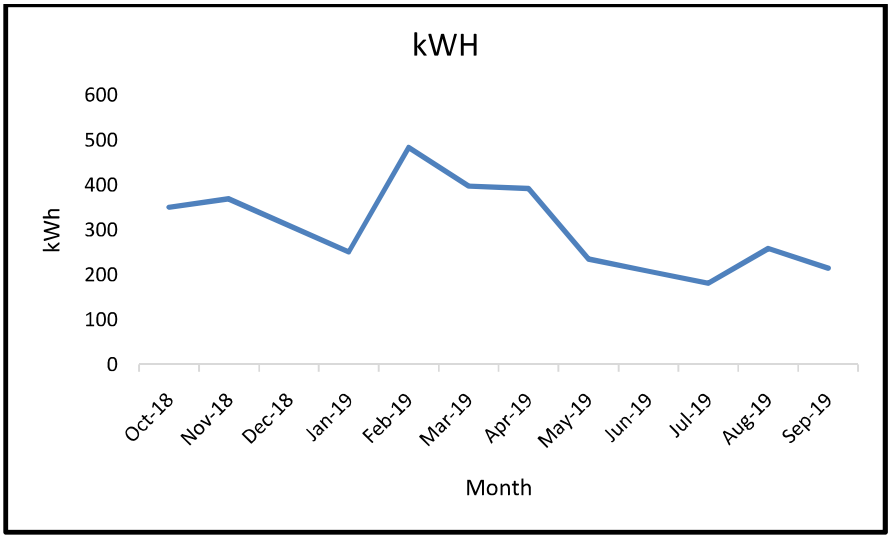


Figure 7Monthly kWh Consumption

8. Consumer Details of Meter No.310074019659

Consumer Details

Table 16 Consumer Details

Parameter	Details
Consumer No.	**310074019659**
Consumer Name	The. Principal Shivaji College
Address	Near Shivaji Park Akot Stand Akola
Pin Code	444001
Sanction load (KW)	3
Tariff	LT-X B

Consumption Details

Table 17Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	9015	60,681.00	81002
Nov-18	3086	20,423.00	25912
Jan-19	1774	11,478.00	15584
Feb-19	0.00	0.00	350
Mar-19	7155	48,131.00	63106
Apr-19	4521	30,664.00	40430
May-19	0.00	0.00	351
Jun-19	0.00	0.00	351
Jul-19	8497	58,099.00	73645
Aug-19	2891	19,402.00	24003
Sep-19	5166	35,115.00	44441

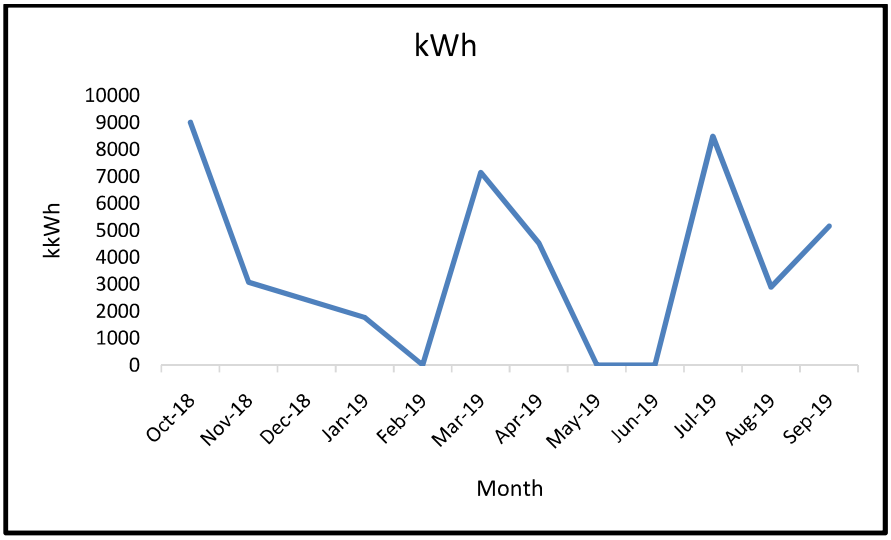


Figure 8Monthly kWh Consumption

4.2. Connected Load Quantity of Buildings

Connected Load of Chemistry Department, Shatabadi Building andNarnala Building Block-J:

Table 18 Connected Load of Building:

Equipment's	Wattage	Chemistry Department			Shatabadi Building	Narnala Building Block-J			
		Ground Floor	First Floor			G Floor	First Floor	Second Floor	CIC
		Chemistry Lab	Forensic Science	Zoology					
Tube Light	18	12			9	4			3
Tube Light	40	6	10	25	12	3	11	17	
LED Light tube light	20	14		30	32			3	
CFL	18						7		
Ceiling Fan	60	15	6	27	21	7	14	13	2
Exhaust fan	45	10		1	7				
Air Conditioner (Split) (1 Ton) (2*)	1500				1				
Air Conditioner (Split) (1.5 Ton) (2*)									2
Air Conditioner (Split) (1.5 Ton) (3*)									1
Air Conditioner (Split) (1.5 Ton) (0*)									1
Air Conditioner (Split) (2 Ton) (2*)	1500						1		
Computer (PC)	150	1	5	3	2			13	3
Printer	150		1	1	2			2	2
projector	150			2					
Desert Cooler	150		2	1					
Fridge	300			2	1				

Connected Load Quantity of Building I, Admin Building, MCVC Building:

Table 19 Connected Load of Building I, Admin Building, MCVC Building:

Equipment's	Wattage	Building-I				Admin Building				MCVC Building		
		Library	Computer Science	Music Lab	Class Rooms	Office	Staff Room	Principal Cabin	Main Building	Canteen	Hostel-I	Hostel-II
Tube Light	18	51	28	4		23			6		2	1
Tube Light	40	38	41	11	20	26	2		7			11
Tube Light	36								9			
LED Light tube light	20	11	4		11	7	6	4			3	4
LED	9		42							4		
LED Bulb	5	3										
LED	50										2	
CFL	5			2								
CFL	15		9									
CFL	18			2								
Ceiling Fan	60	47	89	13	28	29	3	4	15	3	15	29
Exhaust fan	45	2	5	2		16				2		1
table fan	50	7	10		4	2			2			
A/C (Split) (1 Ton) (2*)	1500		1									
A/C (Split) (1.5 Ton) (2*)								1				
tv 43"	85				1							1
Computer	150	25	130	2	3	18		1				
Printer	150	4	10	1	2	17		1				
Water Cooler	1100		1								1	1
projector	150		2	1								
Desert Cooler	150						3					
Deep Freezer	800				1							
Fridge	300				2							
Oven	5000				6							

Connected Load Quantity of Other Buildings:

Table 20 Connected Load of Other Buildings:

Equipment's	wattage	Murna Building		morna building	Block A	Admin building	Block E	BLOCK D	Block C
		geo lab	class room	bio chemistry department		computer lab			
Tube Light	18						9		
Tube Light	40	9							10
Tube Light	36		9	12	4		29	11	
LED Light tube light	20	3	27	18	17		5	9	67
LED	15								3
LED	30				2	12	2		7
CFL	15			5					
CFL	18			5			15		
Ceiling Fan	50		13	17					
Ceiling Fan	60	9	27	8	7	14	53	20	71
Exhaust fan	45	2		2			1		
Exhaust fan	18				3				
table fan	50	2		2	6				5
Air Conditioner (Split) (1 Ton) (2*)	1500			2	1				1
Computer (PC)	150	1	1	2	1	56	6	2	16
Printer	150			1		6	4	2	8
Xerox M/C	800				1				
Water Cooler	1100		2				1		1
projector	150	1	1	1			3		1
amplifier	350						1		
Air cooler	700					1			1
Desert Cooler	150			1					
Deep Freezer	800			1					
Fridge	300			3					5
Oven	2000			1					4
Oven	5000			1					
pump submersible (1 HP)	0.745				5				
pump submersible (3 HP)	2.235				1				

5. ACTUAL MEASUREMENTS

The Three-phase portable power analyzer was installed at incoming panel and data is recorded. Following graphs shows the loading pattern, Voltage, Current PF variation.

Parameter		R-Phase	Y-Phase	B-Phase	Total/Neutral
Voltage (V)	Avg	411	408	408	-
	Max	418	412	411	-
	Min	409	404	404	-
Current (A)	Avg	24	28	27	11
	Max	31	34	39	27
	Min	13	22	25	6
Active Power (W)	Avg	5721	6397	6262	18380
	Max	7360	7817	9044	24221
	Min	3031	4939	5717	13687
Power Factor	Avg	0.98	0.98	0.99	
	Max	0.99	0.99	0.99	
	Min	0.95	0.97	0.98	
V % THD	Avg	2.5	2.5	2.5	-
	Max	2.8	2.7	2.7	-
	Min	2.1	2.2	2.2	-
I % THD	Avg	9.8	4.2	14.4	-
	Max	15.4	5.5	15.8	-
	Min	7.7	2.8	9.1	-

Comments:

1. Average, Maximum and Minimum variations for all the Phases is within the limit of +/- 6% i.e.413 V to 467 V
2. The voltage unbalance between the Phases is Absent.
3. The current unbalance between the Phases is Absent.
4. Total Harmonic Distortion for voltage is within the limits of 5% whereas Total Harmonic Distortion for Currents is more than 15%.

Recommendation:

It is recommended to install sutaible size of Active Harmonic Filter to supress Current Total Harmonic Distortion.

Voltage Variation:

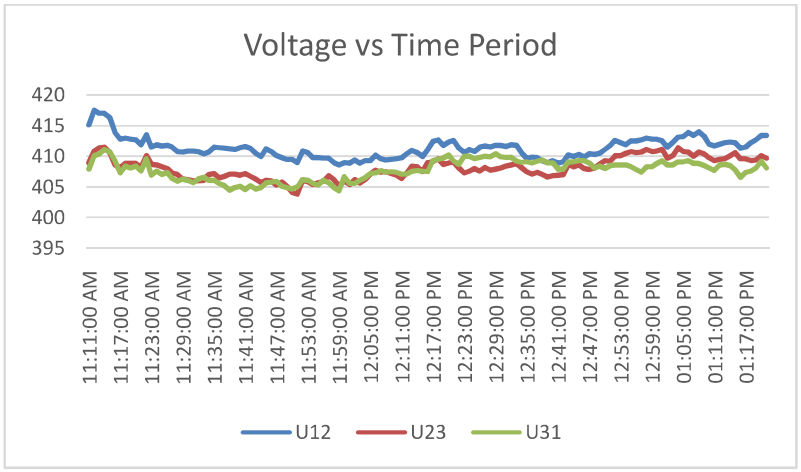


Figure 9Voltage vs Time Period

Current Variation:

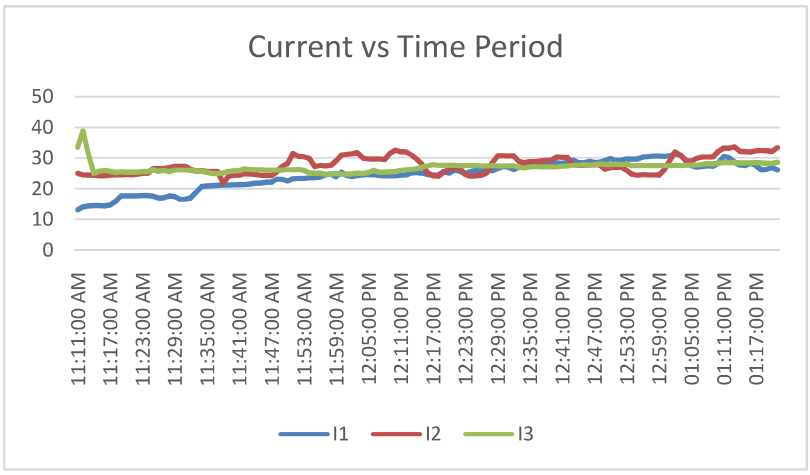


Figure 10Current vs Time Period

Power Variation:

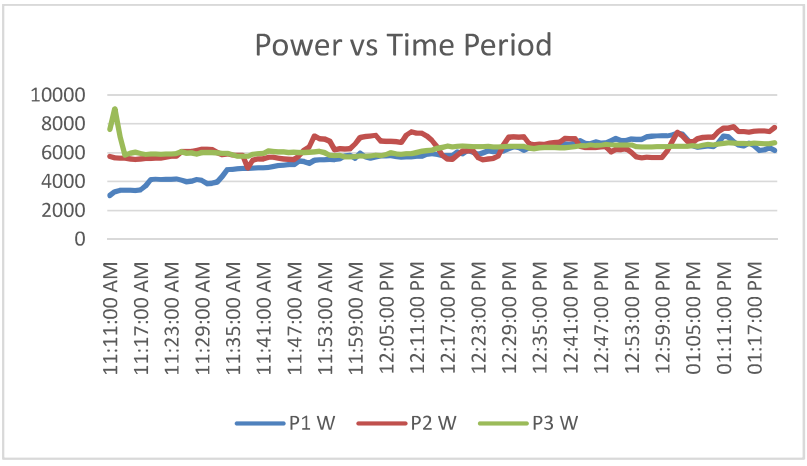


Figure 11Power vs Time Period

Power Factor Variation:

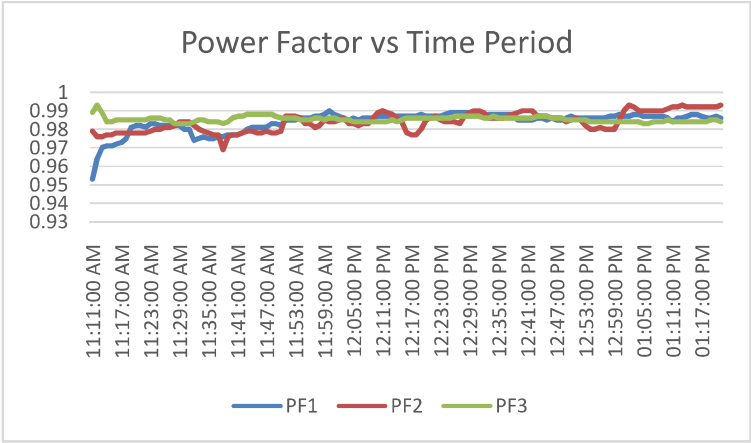


Figure 12Power Factor vs Time Period

Voltage Total Harmonic Distortion Variation:

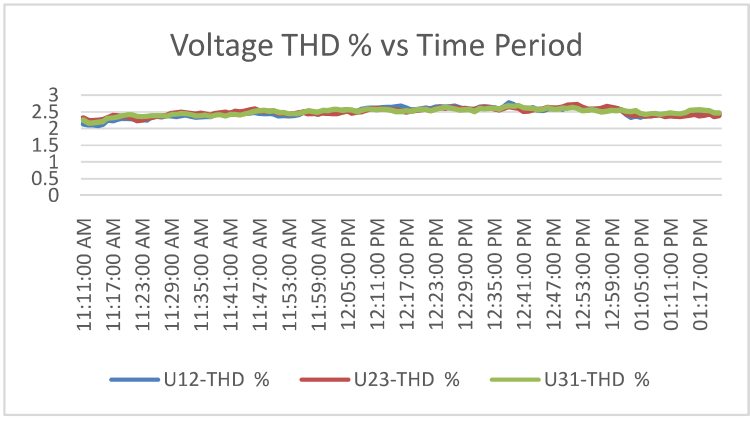


Figure 13Voltage THD % vs Time Period

Current Total Harmonic Distortion Variation:

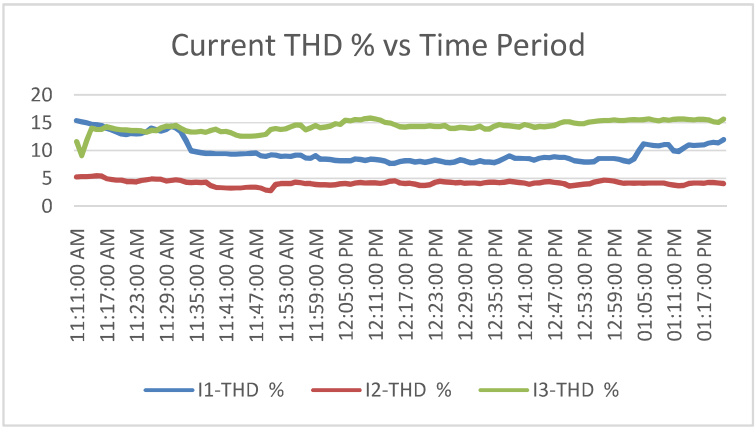


Figure 14Voltage THD % vs Time Period

6. ENERGY CONSERVATION MEASURES

ECM 1: Replacement of Tube Lights with More Efficient Lights

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity	Carbon credit		
			kWh	(Tons of CO_2)		
1	Replacement of Conventional Lights with More Efficient Lights	4.43	17264.10	14.67	1.04	4.28

Observations:

Facility has installed 40 and 36 Watt Tube lights in the buildings

Recommendations:

During energy audit, it is observed that facility has installed T8 tube lights at some of the places in the factory. Also energy team at facility has already replaced some of the of the T8 tube lights with LEDs. The operating hours for these lightings are around 7 hours. T8 tube lightings can be replaced with the LED lightings thereby achieving significant energy consumption reduction. The LEDs could be replaced in such a manner that it has same fixture so there will not be retrofitting cost attached to the replacement. The replacement could be done in a phased manner. LED lightings have better efficacy as well as better lifetime than T8 lightings.

Energy Saving Calculations:

Particular	Unit	Value
Energy Saving Calculation		
Power consumption of TL,MV lamps	KW	16.50
Power consumption of suitable LED	KW	8.28
Average power saving after replacement with LED	KW	8.22
Replacement of conventional lights with suitable LEDs	Nos	530
Average working hour per day	hrs	7
No. of working days in a year	Days	300
Cost Benefit Calculation		
Annual Energy Saving potential	kWh	17264
Electricity tariff	Rs/unit	6
Annual Cost Saving	Rs. Lakh	1.04
Total investment cost	Rs. Lakh	4.43
Annual Saving	Rs. Lakh	1.04
Simple Payback Period	Years	4.28

Type of Fitting	Wattage	Qty	Proposed LED W	Existing KW	Proposed KW	Saved kW	Investment Rs Lakh
Tube light	18	152	18	2.74	2.74	0.00	0.99
Tube light	40	259	20	10.36	5.18	5.18	2.58
Tube light	36	74		2.66	0.00	2.66	0.74
CFL	5	2	3	0.01	0.01	0.00	0.00
CFL	15	14	7	0.21	0.10	0.11	0.04
CFL	18	29	9	0.52	0.26	0.26	0.08
TOTAL	**132.00**	**530.00**	**57.00**	**16.50**	**8.28**	**8.22**	**4.43**

ECM 2: Replacement of Old Fan with Energy Efficient Super Fan

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity	Carbon credit (Tons of CO_2)		
			kWh			
2	Replacement of Existing Fans with Energy Efficient Fans	11.99	22307.25	18.96	1.34	8.96

Observations: During energy audit, it is observed that facility has old 60 watts fan and its energy consumption is on higher side.

Recommendations: During energy audit, it is observed that facility has installed non star rated fan of 60 watts so we recommend to replace energy consuming fan with energy efficient super fan

Energy Saving Calculations:

Particular	Unit	Value
Existing energy consumption of Fan	kWh/year	77364
Fan Wattage	Watt	35
Energy consumption after replacing with Energy Efficient Super Fan	kWh/year	45497
Operating hrs/year	Hrs/year	2100
Diversity factor	%	70%
Annual Saving	kWh/year	22307
Unit rate	Rs/kWh	6
Annual Saving	Rs. In Lacs	1.34

Category	Nos	Estimated Running kW
Ceiling Fan 60W	589	35.34
Ceiling Fan 50 W	30	1.5

7. LIST OF INSTRUMENTS

Power analyser

Picture 1 Fluke Power analyzer

Specification of the 434 Fluke power analyzer:

Electrical	
Single Phase	YES
Three Phase	YES
USER INTERFACE	
LCD-Type	Graphic LCD
LCD-Dimension	127 x 88 mm
Traditional energy analysis	V, I, P, Q, S, F, PF, cos ϕ, peak, minimum, maximum, demand etc.
Voltage	1V to 1000 V phase to neutral
Current	Up to 6000 A
Frequency	42.50 to 57.50 Hz
Precision Voltage, Current, Power	±0.1 %

Luxmeter

Picture 2 Luxmeter

Indi 6171 Luxmeter was used to measure the lux levels. The lux levels at the workplaces were found to be adequate.

Digital Clamp Meter

Picture 3 Mastech M266 clamp meter

Mastech M266C Digital AC Clamp Meter is used to measure the instantaneous current. The temporary measurements were recorded for the Main feeder, Lightings panel, ducted air conditioners. Following are the specification for this clamp meter:

Specification	Range	Accuracy
DC Voltage	200mV	-1.005
	2V/20V/200V	-3.005
	1000V	-3.008
AC Voltage	200V	-5.01
	750V	-5.012
AC Current	20A	-5.04
	200A	-5.025
	1000A	-10.03
Resistance	200Ω	-5.01
	2KΩ/20KΩ/200KΩ/2MΩ	-8.01
Temperature	0□~400□(32□~752□)	-3.01
	401□~750□(752□~1382□)	-3.02
Insulation Test	20MΩ	-2.02
	2000MΩ(Note<500Ω)	-2.04
	2000MΩ(Note>500Ω)	-2.05

8. ANNEXURE (SOLAR)

1) Introduction

The solar energy has a great potential as future source of energy. With its availability in large quantity almost in every corner of the country, solar power has the distinctive advantage of generating power at local and decentralized levels and being one of the prime factors for empowering people at grassroots level. The solar mission, which is part of the National Action Plan on Climate change has been set up to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar energy competitive with fossil-based energy options. The solar photovoltaic device systems for power generation had been deployed in the various parts in the country for electrification where the grid connectivity is either not feasible or not cost effective as also some times in conjunction with diesel based generating stations in isolated places, communication transmitters at remote locations. With the downward trend in the cost of solar energy and appreciation for the need for development of solar power, solar power projects have recently been implemented. A significant part of the large potential of solar energy in the country could be developed by promoting solar photovoltaic power systems of varying sizes as per the need and affordability coupled with ensuring adequate return on investment.

2) Benefits of Solar Energy

a. Power from the sun is clean, silent, limitless and free.

b. Photovoltaic process releases no CO2, SO2, or NO2 gases which are normally associated with burning finite fossil fuel reserves and don't contribute to global warming.

c. Photovoltaic are now a proven technology which is inherently safe as opposed to other fossil fuel based electricity generating technologies.

d. Solar power shall augment the needs of peak power needs.

e. provides a potential revenue source in a diverse energy portfolio

f. Assists in meeting renewable portfolio standards goals.

This proposal is prepared for design, engineering, procurement / manufacture and installation of solar power generating system. The grid-tie solar photovoltaic power generation system is mainly composed of PV array, String Inverter, and PV mounting structure.

It also consists of supporting devices like AC / DC switchgears, Lighting Arrestor, Earth Electrodes, AC / DC cables. As there is no any battery, it's maintenance cost is negligible and initial investment per KW is very low.

3) Objective

- Provide reliable, clean, regulated, un-interrupted power on demand to the pre-identified critical loads
- System to provide low life cycle cost and maximize savings to the beneficiaries.

- To save diesel in institutions and other commercial establishments including industry facing huge power cuts especially during daytime.

4) Design Assumptions

General

a. The Solar Radiation Data's are based on standard books & simulation software as NASA and Metronome. The Mean Hourly Radiation Data is considered.

b. The module rating considered is tentative. The exact module sizing and rating will depend on the availability of cell grade and site suitability.

c. Solar Panels are roof/ground mounted in one location. Environmentally protected, closed, ventilated, inverter room at minimum distance from PV modules.

d. Application: Self consumption, captive grid or NET metering.

e. Emergency Backup: Generator or any other source in absence of Grid.

5) System Description

Solar Power Plant comprises of the main equipment and components listed below:

1. Solar PV Modules
2. String Inverter with MPPT
3. Module mounting system
4. Monitoring system
5. Cables & connectors

Each of the sub systems has been described for the functionality and operation modes. The physical construction of the system follows a modular approach, which is field-tested and is regularly used for delivery of power systems.

5.1 Solar PV Module (Electrical Features)

The PV modules convert the light reaching them into DC power. The amount of power they produce is roughly proportional to the intensity and the angle of the light reaching them. They are therefore required to be positioned to take maximum advantage of available sunlight within sitting constraints.

5.2 Solar PV Module (Mechanical Features)

Solar Module design will conform to following Mechanical requirements:

- Toughened,
- low iron content,
- High transmissivity from glass.
- Anodized Aluminum Frame.
- Ethyl Vinyl Acetate (EVA) encapsulating.

- Tedlar/Polyester trilaminate back surface.
- ABS plastic terminal box for the module output termination with gasket to prevent water & moisture.
- Resistant to water, abrasion hail impact, humidity & other environment of actors for the worst situation at site.

5.3 Module Mounting Structure

The structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site. The array structure shall have tilt arrangement to adjust the plane of the solar array for optimum tilt.

5.4 Junction Box

The junction boxes shall be dust, vermin and waterproof and made of FRP/ABS Plastic with IP65 protection. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable marking shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification

5.5 String Inverter

The STRING INVERTER is A combination of Solar Charger (MPPT), Inverter and synchronization unit for two different AC supplies, all housed in a single unit. Maximum power point tracker (MPPT) shall be integrated into it to maximize energy drawn from the solar array. The Inverter converts the DC available from the array into an AC output. The output of the inverter is filtered to reduce the harmonics to an acceptable level (less than 5%). MPPT shall be microprocessor/micro controller based to minimize power losses and maximize energy utilization. The efficiency of MPPT shall not be less than 90% and shall be designed to meet the solar PV Array capacity.

5.6 AC /DC Cables

We use DC & AC cables of Lap, Apar, Polycab, Havels, Finolex or equivalent make to ensure minimum losses in transmission.

In order to complete the energy study that leads to the construction of a photovoltaic installation, hourly series of global horizontal irradiation values for a complete year are used, which resume the irradiation and other meteorological parameters behavior over a long term. We use PV. SYST. Software to workout optimum power production at site with minimum loses.

5.7 Grounding and Lighting Protection

- A protective earth (PE) connection ensures that all exposed conductive surfaces are at the same electrical potential as the surface of the Earth, to avoid the risk of electrical shock. It ensures that in the case of an insulation fault (a "short circuit"), a very high current flows, which will trigger an over current protection device as fuses and circuit breakers that disconnects the power supply.
- A functional earth connection serves a purpose other than providing protection against electrical shock. In contrast to a protective earth connection, a functional earth connection may carry a current during the normal operation of a device.
- Lightning protection is a very specialized form of grounding used in an attempt to divert the huge currents from lightning strikes. A ground conductor on a lightning arrester system is used to dissipate the strike into the earth.
- Lightning ground conductors must carry heavy currents for a short period of time. To limit inductance and the resulting voltage due to the fast pulse nature of lightning currents, lightning ground conductors may be wide flat strips of metal, usually run as directly as possible to electrodes in contact with the earth.
- In proposal, the entire system is fully provided with the required lighting and grounding protection.

6) Solar PV Locations

Buildings Considered for Solar Power Installation

Details of Building:

Average Unit Consumption / year of Building is **146159** Units (Ref. 12 months Electricity Bills)

Sr. No.	Name of Building	Length (ft.)	Width (ft.)	Area (Sq. ft.)	Plant Installed (kW)
1	Shatabadi Building	120	8	960	12
2	Block J	50	40	2000	25
3	Hostel-I	40	30	1200	15
4	Hostel-I	40	8	320	4
5	Hostel-II	90	40	3600	45
6	Moorna Building	100	60	6000	75
7	Admin Building	80	30	2400	30
8	Block-E	150	10	1500	18.75
9	Block-D	60	40	2400	30
10	Block-C	200	40	8000	100
Total				**28380**	**354.75**

Total Available Area = 28380 Sq. Ft. & As per available shadow free Area maximum 354.75 KW Plant can be installed on I & II buildings as per details mentioned in above table.

7) Capacity Evaluation

Calculation for Required Solar Capacity plant to fulfill In-house Requirement

Calculation to Fulfill Building Total Load Requirement			
Sr. No.	Details	Value	Unit
1	Average electrical consumption per year	146159	KWh
2	Units generated per day per KWp	4.5	KWh/KWp/day
3	Units generated per Year per KWp (330 days / Year)	1485	KWh/KWp/Year
4	Solar KW capacity For 146159KWh consumption / year	98	KWp

As per electrical consumption (Building Load), capacity of Solar Power Plant required is 8 KWp. As per shadow free space available on college building maximum 355 KWp plant can be installed which is more than the actual requirement of full Electrical Load.

It is suggested to install Solar Plant of Capacity 98 KWp, which can be installed on New building itself & it covers all required load.

The SPV power plant with proposed capacity of 98 KWp would be connected to the main electrical distribution panel. The system would meet full load requirement of the connected load during the day. Advance control mechanism in the Power Conditioning Unit will ensure that the maximum power generated by PV modules will be utilized first and the balance requirement of power will be met by either grid or DG set

The 98 KWp SPV Power Plant is estimated to afford annual energy feed of 146159 KWh/year (After considering all losses) considering efficiency of the solar module as 15.16%, Power Conditioning Unit (PCU) efficiency as 98.3% and losses in the DC and AC system as 3%.

8) Budgetary Estimation of the Project

Details	Value	Unit
Shadow free space required for approx. 1 KWp Solar Plant	80	Sq.Ft
Shadow free space available on college building	28380	Sq.Ft.
Solar Plant capacity to be Installed on college building	98	KWp
Solar Plant Requirement as per actual consumption	98	KWp
Installation Cost Per KW for 1KWp Solar Plant	0.5	Rs. In Lakh
Gross Estimated System cost (For 98 KWp Grid Connected Solar Plant)	49	Rs. In Lakh
Unit generated per day per kWp	4.5	KWh
Electricity generation per day for 98 KWp Grid Connected Solar Plant	441.9	KWh/day
Electricity generation per year for 8 KWp Grid Connected Solar Plant (330 days / year)	146159	KWh/year
Average Electricity Unit Cost	6	Rs./KWh
Electricity cost saved per year	1.02	Rs. In Lakh
Simple payback period	**5.61**	Years

9. Site Photograph





2021

Energy Audit Report

EcoShastra

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Shri Shivaji Education Society Amaravati's

Shri Shivaji College of Arts, Commerce and Science, Akola (MS)

Energy Audit Report

Submitted by

EcoShastra

Consultancy & Services

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Shri Shivaji Education Society, Amravati's

Shri Shivaji College of Arts, Commerce & Science, Akola.

Shri Shivaji Education Society, Amravati's Shri Shivaji College of Arts, Commerce and Science, Akola is situated in the western Vidarbha region of Maharashtra and is affiliated to Sant Gadge Baba Amravati University, Amravati. The institution always strives for quality sustenance and enhancement in higher education. Shri Shivaji Education Society, Amravati, was founded in 1932, by Late DR. Punjabrao Deshmukh, the first agriculture minister of independent India, and a member of the "Constitution Draft Committee" for the Government of India. It is one of the premier institutions of higher education in the Vidarbha region. It is worth mentioning that, under its canopy, there are in all 277 institutions including Medical, Agriculture, Engineering, Science, Law, Education as well as Higher Secondary Schools, High Schools, Middle Schools, and Primary Schools. The society has bagged many prestigious awards from the state government in recognition of its dedication to the field of education. Shri Shivaji College of Arts, Commerce and Science, Akola was established in 1963 and has already completed fifty glorious years of its existence in 2013. We can proudly say that it has indeed grown from a seedling into a tree that has not only sheltered thousands of youngsters but also has molded them into great personalities, now scattered across the globe. Since a large number of our students come from economically weaker sections of the society, we try to imbibe in them good values so that they become responsible citizens of this great country. The College aims at catering to the academic excellence of the students and providing them with facilities to develop their inherent talents. In its continuous efforts to impart quality education, Shri Shivaji College was reaccredited with an "A" grade with CGPA

3.11 in January 2010. The college has also earned a special reputation for being conferred with the status of a “College with Potential for Excellence” by the U.G.C. in the first phase and now for the second phase up to 2019 Since the institution has completed the second cycle, now it has intended to go for the third cycle in accreditation. Efforts have been made to fulfill the recommendations made by the peer committee for the overall development of the Institution. Due consideration has been given to the post-accreditation activities and it continues to plan for academic excellence by imparting quality education.

Energy Audit Committee

Sr. No.	Name	Designation
1.	Dr. R. M. Bhise	Chairman (Principal)
2.	Dr. H. S. Patil	Lead auditor
3.	Dr. A. S. Raut	Coordinator
4.	Dr. S. B. Sawarkar	Internal Energy Auditor
5.	Mr. A. S. Mahadik	External Energy Auditor
6.	Dr. G. S. Wajire	Energy Audit Expert
7.	Dr. A. J. Kaware	Energy Audit Expert

Energy Audit Report

Introduction:

Our nation has potential in intelligence but was on the back foot in terms of quantity and quality of education. Today our nation is marching towards a developed nation in numerous fields. Among these fields, we have to meet energy demand and produce clean sustainable energy. Our world is now in an energy crisis, we as world facing energy shortage, in future it may increase. This causes a lack of energy for institutional work. Thus, we need institutional management in saving electricity, using it smartly, and producing electricity effectively for socio-economical purposes.

For energy, our nation is entirely dependent upon fossil fuels. India has huge potential in producing energy in the renewable sector. In India, 35% of electrical energy is used by the industrial sector, 28% by the domestic sector, 21% agriculture sector, 9% Commercial sector, and the rest of electricity is used by common public applications. Energy conservation is the solution to the energy crisis, meaning a reduction in energy consumption without compromising the quality and quantity of work. Energy Conserved is the start of energy management, it leads to an adequate rating of the equipment, replacing it with efficient (high rating), and improving habits to save more energy. It will vital to being a self-sufficient organization in terms of electricity.

In the present study, an energy audit has been done. For these audit laboratories, instruments, air conditioners, fans, lights, fans, computers and its peripheral devices are considered in the study. The study also includes the total economic budget of college for the electricity. We have calculated the exact number of tubes, computer instruments, etc. We studied all these mentioned things by collecting exact data from the survey.

Experimental and data collection:

In the building, in every room, how many fans, computers, instruments, AC, etc. were measured. According to the survey following data is collected.

Total Power requirement of various types of equipment:

Appliance	Total	Current	Voltage	Total power
Ceiling Fans	759	80	230	303600
Laptop	6	100	230	3000
Wall Fans	158	60	230	47400
Exhaust Fans	61	80	230	24400
1.5 Ton Air Conditioners	15	1200	230	90000
Photo Scanners	7	60	230	2100
LCD Projector	17	300	230	25500
LED Bulbs	173	18	230	15570
CFL Bulbs	35	15	230	2625
Inverters with Batteries	14	12.6	230	882
UPS with Batteries	13	2340	230	152100
Air Coolers	14	250	230	17500
Refrigerators	23	750	230	86250
Water Coolers	11	1000	230	55000
Submersible Pump : 1	5	746	230	18650
Submersible Pump : 3	1	2238	440	11190
Mono Block Pump	1	746	230	3730
Tubes regular	355	40	5	71000
Tubes CFL	95	28	5	13300

Appliance	Total	Current	Voltage	Total power
Tubes LED	610	20	5	61000
TV Screen	10	180	2	3600
Computer Screen	405	35	5	70875
CPU	248	75	5	93000
Printer	106	500	1	53000
PA system	16	75	0.5	600
Xerox machine	2	1500	1	3000
Street lights	34	50	10	17000
Water purifier	16	60	2	1920
Total Consumption in a day(KW)				1247.792
Total Consumption in a month(KW)				37433.760

Consumption by various equipment:

According to given power consumed by different types of equipment:

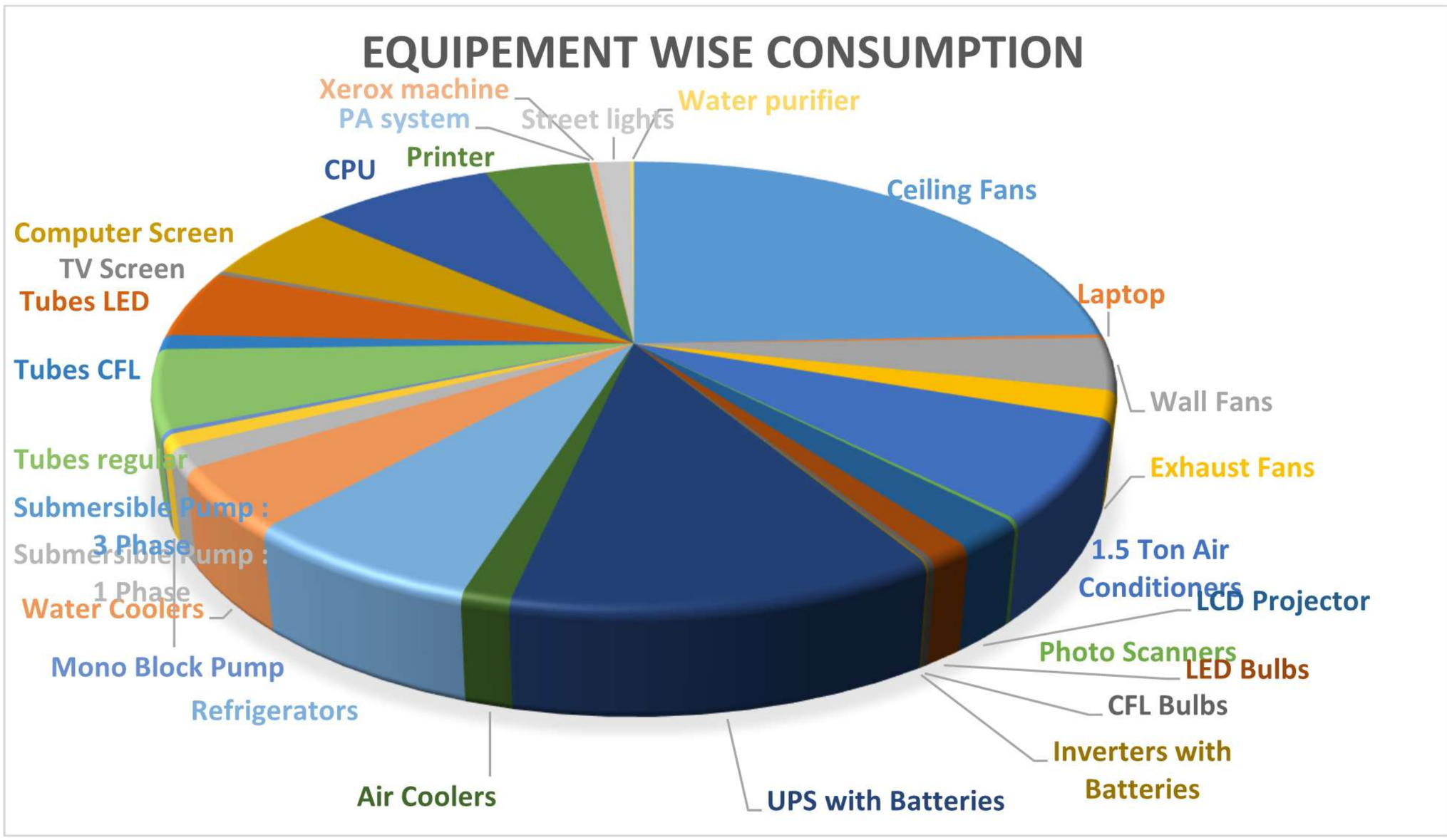

Fig. Power consumption by various equipment

Consumption Unit:

Sr. No.	Month	Consumption Unit (KW)
1.	May 2020	8335
2.	June 2020	10318
3.	July 2020	19338
4.	August 2020	5623
5.	September 2020	9774
6.	October 2020	9217
7.	November 2020	11829
8.	December 2020	7590
9.	January 2021	14400
10.	February 2021	7081
11.	March 2021	6654
12.	April 2021	6685
Total Power Consumption in Yearly (Units)		116844
Average Power Consumption in Monthly (Units)		9737

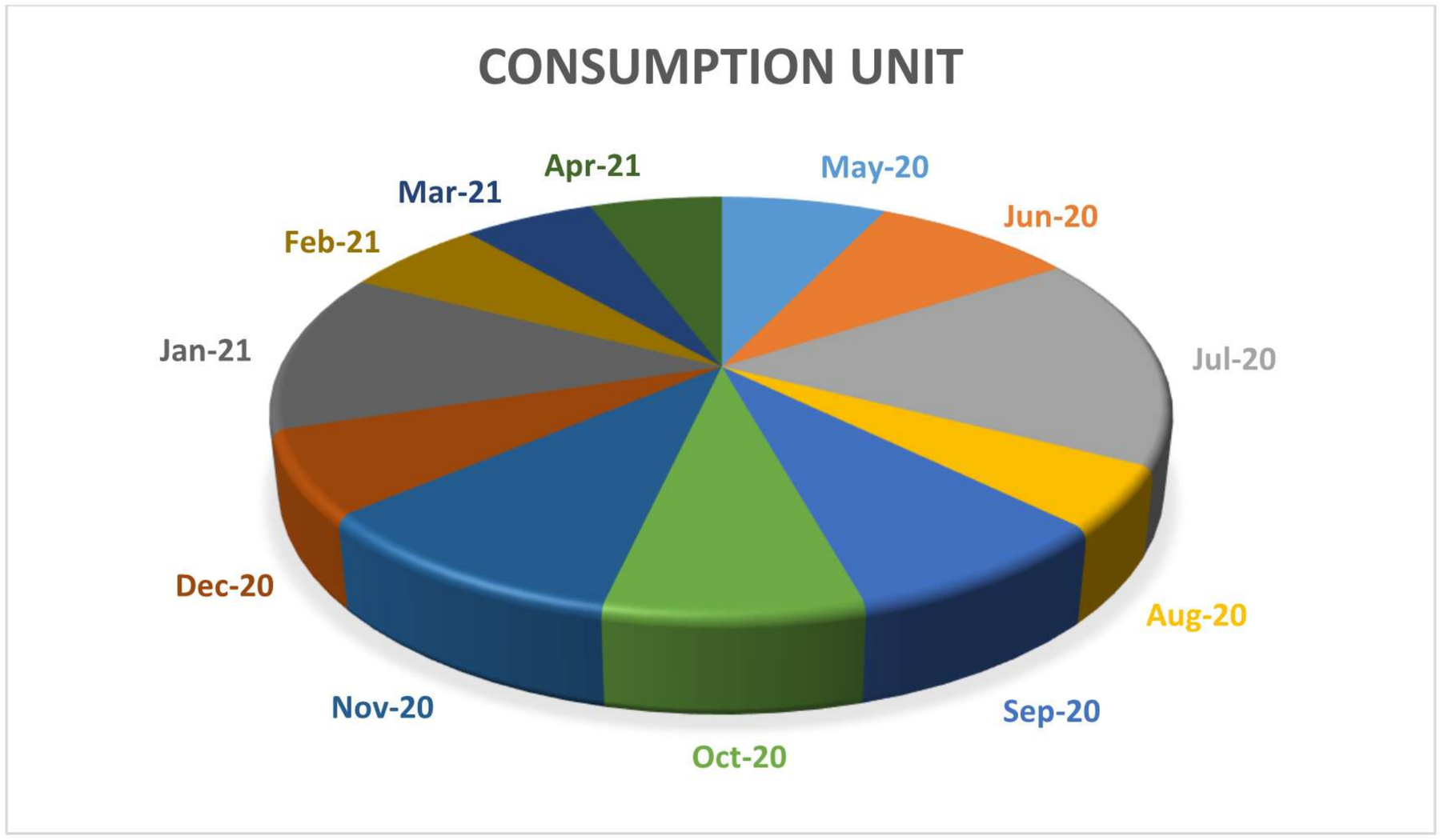

Fig. Graphical representation of the contribution of various Instruments in total energy consumption

Best practices:

i. The college has an air turbine as a ventilation system which reduces the energy consumption required for cooling.

ii. The college has installed 3 solar panel systems each of 5KVA capacity.

It generates electricity using three Solar Panel Systems each of 5 KVA.

Total Power Generated = 5 KVA + 5 KVA +5 KVA = 15 KVA.

It produces total electricity of around 15 KW. (By considering power factor 1)

This produced energy saves 21,600 units per year.

Fig. Rooftop installed 5KVA Solar Panel system

iii. The college uses a solar motor which is having the following details:

02 motors each of 24 V, 2.5A DC are used for the fountain. (Near Bhausaheb Statue)

iv. The College has installed 10 solar lights each of 12 watts (Near Bhausaheb Statue)

Fig. Solar lights installed near Bhausaheb Statue

v. College uses N-computing which reduces unwanted power consumption.

Conclusion:

i. Data generated in an energy audit is useful to understand the energy distribution and utilization of college.
ii. The college needs 116844 KW of electricity. This is on average 9737 KW/month. There are some types of equipment that are not included because they are less or often used.
iii. The college runs during day time so there is very little electricity consumption.
iv. The use of solar energy is appreciable.

Recommendations:

1. Replace all regular tube lights and CFL tube lights with LED bulbs, to save more power.
2. Use stabilizers for AC, Xerox, and other heavy load machines.
3. Use more Renewable energy sources like Solar, Wind for Power Generation.

Results and Discussion:

As per the energy audit, the electricity audit is done in Shri Shivaji College of Arts, Commerce and Science, Akola. We have collected data by considering tube lights, fans, computers, printers, and other instruments. The total energy required is 116844KW.