Environmental and Green Audit Report

of

Pune District Education Association's

Seth Govind Raghunath Sable College of Pharmacy

Saswad, Dist. Pune

Auditing Agency –
Prathamesh Energy Solution,
A-302, Shiv Unnati Residency,
Kalepadal, Hadapsar
Pune- 411 028

Prathamesh Energy Solution
A-302, Shiv Unnati residency, Kalepadal, Hadapsar, Pune-411028

Ref: PES/ SCoPS/2025-26/10

Date: 20/10/2025

To,

The principal,

Seth Govind Raghunath Sable College of Pharmacy,

Saswad, Dist. Pune

Sub: Submission of Report on Environmental and Green Audit of College Campus

Respected Sir,

Please find enclosed herewith the report

Thanking you

Yours faithfully

For Prathamesh Energy Solution

Vandana

Authorized Signatory

Prathamesh Energy Solution

A-302, Shiv Unnati Residency, Kalepadal, Hadapsar, Pune 411028

Ref: EC/ SCoPS/2025-26/11

CERTIFICATE

This is to certify that we have conducted Environmental and Green Audit at **Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune,** in the Academic year 2025-26

. The College has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Green Campus
- Rain water Harvesting system

We appreciate the support of Management, involvement of faculty members and students in the process of making the Campus Energy Efficient.

For,

Vandana

Prathamesh Energy Solution,

M/s. Prathamesh Energy Solution Pune

IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Vaijanath Narharirao Raibhole

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

K S Venkatagiri
Executive Director
CII-Godrej GBC

V Suresh
Chairman
Indian Green Building Council

Gurmit Singh Arora
Vice-Chairman
Indian Green Building Council

200413

05 September 2020

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ACKNOWLEDGEMENT

We at Prathamesh Energy Solution, Pune, express our sincere gratitude to the management and Principal of Pune District Education Association & Pune District Education Association' Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune for awarding us the assignment of Environmental/Green Audit of their College campus located at Saswad, Pune.

We are also thankful to various Heads of Departments, IQAC Coordinator & other Staff members for helping us during the survey and field visit.

We are also thankful to all the technical staff and office staff for helping during the field visit and measurements at the college campus.

EXECUTIVE SUMMARY

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions

1. Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune, consumes electrical Energy in majority used for various gadgets & office operations.

2. The various projects already implemented by the College are

- Usage of Natural Day light in corridors specifically
- Usage of LED lighting for Admin & outdoor lighting
- Initiatives for water conservation through STP at the campus

3. Important Parameters: Electrical Energy:

Electricity is used for different purposes and at different sections in the college campus. The details of electricity distribution as mentioned below.

Sr. No.	Consumer No.	Electrical Meter No.	Location/Purpose	Payee
1	187271749433	055-X0635746	College building/building operation	The Principal, Seth Govind Raghunath Sabale College of Pharmacy, Saswad, Near Waghire College

The important parameters of electrical consumption as per Consumer no. in the campus are mentioned as below.

Sr. No	Consumer No.	Parameter	Max	Min	Average
1	187271749433	Units consumed, kWh	1128	157	561.5
		Electricity Bill amount	9307.97	1734.19	4840.122
		Total			4840.122

4. Important Parameters: CO_2 Emissions (Average, MT/Annum)

No	Consumer No.	Particulars	Value MT
1	187271749433	CO_2- Emissions- Electricity Usage	53.9
		Total	53.9

On the basis of annual electricity consumption CO_2 emission is 53.9 MT /annum.

5. Benchmark: In terms of Electrical Energy & CO_2 emissions:

We now present two important benchmarks in respect of Electrical Energy consumption & CO_2 emissions as under.

No	Parameter	Value	Unit
1	CO2 emissions	53.9	MT/annum
2	College area	73592	Sq. ft.
3	CO2 emission/sq. ft	0.73	Kg/Sq. ft

6. Recommendations:

We present herewith various proposals to reduce the Electrical Energy demand and reduce the CO_2 emissions

S. No.	Recommendation	Annual saving potential in kWh /Kg of LPG	Annual Saving Potential in MT of CO_2	Annual monetary gain, Rs.
1	Installation of 20kW Solar PV roof top on college building	33600 kWh	26.88	336000
2	Solar street lights	262.8 kWh	0.21	2628
3	Solar powered light for hoarding	-	-	-
4	Solar charging stations	-	-	-
	Total	**33862.8**	**27.09**	**338628**

Notes & assumptions:

1. 1 Unit of Electrical Energy releases 0.8 Kg of CO_2 into atmosphere
2. 1 Kg of LPG releases 3 Kg of CO_2 into atmosphere
3. Daily working hours-10
4. Annual working Days-280
5. Average Rate of Electrical Energy- Rs 10 per kWh

ABBREVIATIONS

DP	:	Double Pole
CFL	:	Compact Fluorescent Lamp
EESL	:	Energy Efficiency Services Limited
F P	:	Feeder Pillar
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd.
MEDA	:	Maharashtra Energy Development Agency
MIDC	:	Maharashtra Industrial Development Corporation
V	:	Voltage
I	:	Current
kW	:	kilo-Watt
kVA	:	Apparent Power
kVAr	:	Reactive Power
P F	:	Power Factor
kWp	:	Kilo Watt peak

CHAPTER-I
ENVIRONMENT AND GREEN AUDIT: INTRODUCTION

1.1 Objectives:

1. To Study tree plantation in college campus
2. To Study the present CO_2 emissions
3. To study Scope for usage of Renewable Energy
4. To study various measures for sustainable development

1.2 General Details of Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune:

No	Head	Particulars
1	Name of Institution	Pune District Education Association & Pune District Education Association' Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune
2	Address	Saswad, Dist. Pune
3	Year of Establishment	1993
4	Salient Features	Affiliated to Savitribai Phule Pune University
4	Courses offered	a. D. Pharmacy b. B. Pharmacy c. M. Pharmacy d. Ph. D.
5	No of Students	452
6	Total built up area	73592 Sq. ft.

CHAPTER-II
GREEN AUDIT FOR AY-2025-26

Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune: is one of the leading higher technical educational Institutions of Pune under Savitribai Phule Pune University, Pune. It has been providing quality education in pharmacy to the students in various professional courses. The College is having beautiful green campus and a highly greenery maintenance college in Saswad, dist. Pune. We have prepared a green audit report after visiting the college campus by our team. This green audit report is based on the following major points.

1. Plantation in the campus
2. Carbon accounting
3. Illumination in class rooms
4. Water audit and Rainwater Harvesting
5. Waste disposal

1. Plantation in the campus

Plantation is playing very important role in the green audit and helping to save environment from damage. The campus plantation is very diverse and well maintained.

The different species are cultivated to increase greenery of the campus. The species included Trees, Shrubs, Herbs, Climbers, ornamentals etc. There are about 269 big and small trees present inside Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune campus.

After a daylong survey and records about the plantation in the campus is prepared which is as per following table.

Sr. No	Name of Tree	Qty
1	Neem	09
2	Chinch	32
3	Mango	7
4	Ramphal	2
5	Jambul	2
6	Eucalyptus	10
7	Pichkari	1
8	Subhabul	2
9	Saptparni	2
10	Mogra	2
11	Sonchafa	01
12	Coconut	27
13	Ashok	8
14	Pimpal	7
15	Wad	3
16	Chandan	3

17	Gulmohar	5
18	Sitaphal	5
19	Devdhar	2
20	Chitrak	1
21	Karanj	1
22	Kavat	2
23	Muchkund	1
24	Shindi	1
25	Shivan	1
26	Apta	3
27	Ritha	1
28	Hibiscus	4
29	Ashok	8
30	Narkya	1
31	Aloe	1
32	Bhokar	1
33	Guggul	1
34	Insulin	2
35	Kusumbm	1
36	Undi (sultan champa)	1
37	Turmeric (Ambahaldi)	1
38	Tulsi	1
39	Hirda	1
40	Curry Tree	1
41	RaktaChandan	1
42	Asana	1
43	Pomegranate (Dalimb)	2
44	Hadjod	1
45	Bael	2
46	Arjun	1
47	Premna	1
48	Kardal	2
49	Vijayasar (Bija)	1
50	Jackfruit	1
51	Ginger	1
52	Kulanjan	1
53	Madanphal	1
54	Papaya	5
55	Cassia	1

56	Adulsa (Vasaka)	2
57	Chikku	2
58	All Vitamin	1
59	Dikamali	1
60	Ashwagandha	1
61	Henna (Mehandi)	1
62	Lemon	1
63	Jambhul	2
64	Erandel	1
65	Vala	1
66	Amla	1
67	Ramphal	1
68	Kaner	1
69	Tetu	1
70	Behada	1
71	Vinca(Sadafuli)	1
72	Mint Japnees	1
73	Shatavari	2
74	Pandhrachafa	2
75	Betel leaf (Nagin Pan)	1
76	Owa (Ajwain)	1
77	Kalmegh	1
78	Lajalu	1
79	Menthol	1
80	Gavtichaha	1
81	Vekhand	1
82	Odomos	2
83	Rui (Crown flower)	1
84	Satap	1
85	Gulvel	1
86	Palm	27
87	Datura	1
88	Lantana	2
89	Shikakai	1
90	Padal	1
91	Golaphal	1
92	Kadamb	1
93	Kinhi	1

94	Dhawada	1
95	Tabobiya	1
96	Black Datura	1
97	Lichi	1
98	Bramhkamal	1
99	KapurTulas	1
100	Chicoo	1
101	Kate Savar	1
102	Kanchan	1
103	Karmal	1
104	Kuda	1
	Total	269

Photo-1: Tree plantation of Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune

Photo-2: Tree Plantation at Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune

Photo-3: Greenery at Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune

1.1 Calculation of amount of co_2 sequestered in trees per year

The carbon sequestration potential of the plant species present in green belt has been estimated and suitable plant with maximum sequestration of CO_2 was recommended. Carbon sequestration is nothing but capturing atmospheric carbon dioxide or anthropogenic CO_2 from large scale stationary sources like cement industry before it is released to the atmosphere. Once captured, the CO_2 gas is put into long term storage. CO_2 sequestration in plants has the potential to significantly reduce the level of carbon that occurs in the atmosphere. Terrestrial or biologic sequestration means using plants to capture CO_2 from the atmosphere and then storing it as carbon in the stems and roots of the plants as well as in the soil. The green belts in industrial area acts as sink for capturing and storing carbon dioxide released from the industries.

Assessment of carbon sequestration ability of trees for adopting in greenbelt of cement industries

The carbon dioxide sequestered in plant species are determined based on following method:

1. Determine the total (green) weight of the tree
2. Determine the dry weight of the tree
3. Determine the weight of carbon in the tree
4. Determine the weight of carbon dioxide sequestered in the tree
5. Determine the weight of CO_2 sequestered in the tree per year

1.2 Determination of Total (Green) Weight of the Tree

The algorithm to calculate the weight of a tree is:

For trees with D < 11: $W = 0.25D^2H$

For trees with D >= 11: $W = 0.15D^2H$

Where, W = Above-ground weight of the tree in pounds

D = Diameter of the trunk in inches

H = Height of the tree in feet

Depending on the species, the coefficient (e.g. 0.25) could change and the variables D^2 and H could be raised to exponents just above or below 1. However, these two equations could be seen as an "average" of all the species' equations. The root system weighs about 20% as much as the above-ground weight of the tree. Therefore, to determine the total green weight of the tree, multiply the above-ground weight of the tree by 120%.

1.3 Determination of Dry Weight of the Tree

Taking all species in into account, the average tree is 72.5% dry matter and 27.5% moisture.
Therefore, to determine the dry weight of the tree, multiply the weight of the tree by
72.5%.

1.4 Determine the weight of carbon in the tree

The average carbon content is generally 50% of the tree's total volume. Therefore, to determine the weight of carbon in the tree, multiply the dry weight of the tree by 50%.
Assessment of carbon sequestration ability of trees for adopting in greenbelt of cement industries
Determine the weight of carbon dioxide sequestered in the tree
CO_2 is composed of one molecule of Carbon and 2 molecules of Oxygen.
The atomic weight of Carbon is 12.001115.
The atomic weight of Oxygen is 15.9994.
The weight of CO_2 is C+2*O=43.999915.
The ratio of CO_2 to C is 43.999915/12.001115=3.6663.
Therefore, to determine the weight of carbon dioxide sequestered in the tree, multiply the weight of carbon in the tree by 3.6663
Determine the weight of CO_2 sequestered in the tree per year
Divided the weight of carbon dioxide sequestered in the tree by the age of the tree.

2. Carbon Accounting

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities. The college uses electrical energy for operating various electrical gadgets.

We herewith furnish the details of electrical Energy consumption consumer number wise as under

4.1 Month wise Consumption of Electrical Energy: 187271749433

Sr. No	Month	kWh
1	Sep-2025	332
2	Aug-2025	428
3	July-2025	293
4	June-2025	869
5	May-2025	845

6	April-2025	1128
7	March-2025	640
8	Feb-2025	660
9	Jan-2025	538
10	Dec-2024	157
11	Nov-2024	501
12	Oct-2024	347
13	Total	6738
14	Average	561.5
15	Max	1128
16	Min	157

4.2 Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy are as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere

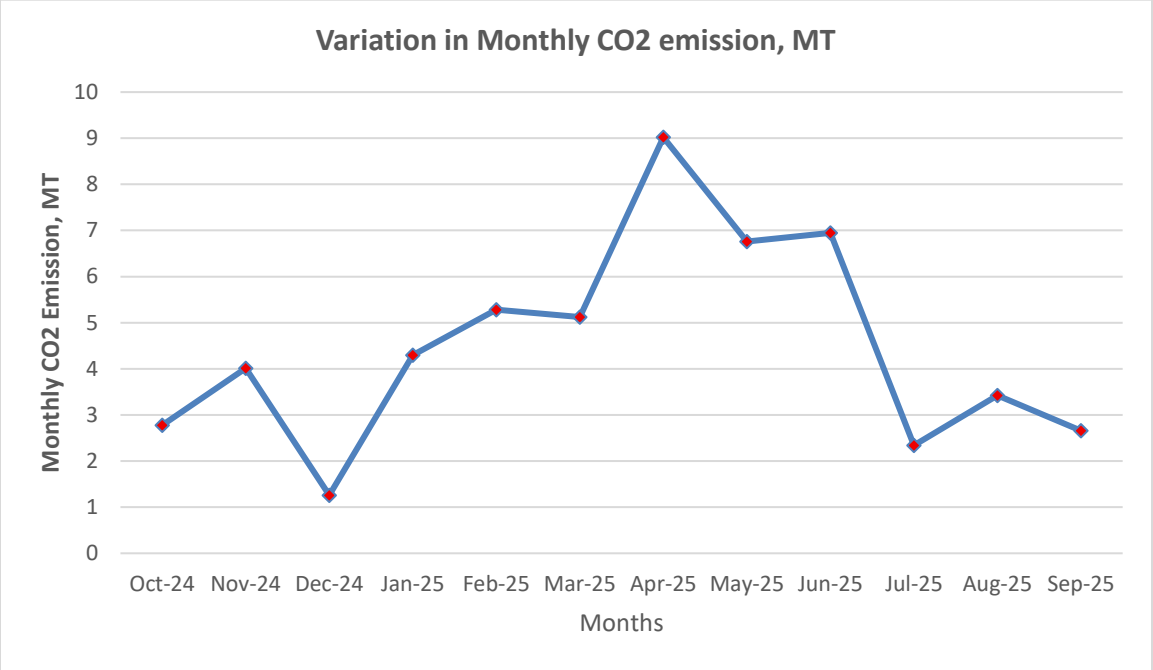
Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations.

4.3 Month wise CO2 Emissions: 187271749433

Sr. No	Month	Electrical Energy Consumed, kWh	CO2 Emissions due to Electricity, MT
1	Sep-2025	332	2.66
2	Aug-2025	428	3.42
3	July-2025	293	2.34
4	June-2025	869	6.95
5	May-2025	845	6.76
6	April-2025	1128	9.02
7	March-2025	640	5.12
8	Feb-2025	660	5.28
9	Jan-2025	538	4.30
10	Dec-2024	157	1.26
11	Nov-2024	501	4.01
12	Oct-2024	347	2.78
13	Total	6738	53.90

14	Average	561.5	4.49
15	Max	1128	9.02
16	Min	157	1.26

4.4 Representation of Month wise CO_2 emissions:



4.5 Benchmarking:

Now we compute the CO2 emissions per sq. ft. basis as under:

No	Parameter	Value	Unit
1	CO2 emissions	53.9	MT/annum
2	College area	73592	Sq. ft.
3	CO2 emission/sq. ft	0.73	Kg/Sq. ft

3. Use of Renewable energy options for saving the environment

3.1 Installation of 10 kWp Solar PV roof Top on Seth Govind Raghunath Sable College of Pharmacy building:

During the Audit, it was revealed that the College has ample space on the Terrace. Solar roof top of capacity 10kWp is installed on the building terrace. The system caters the Day load demand of the College.

Photo-4: Solar roof top on Seth Govind Raghunath Sable College of Pharmacy building

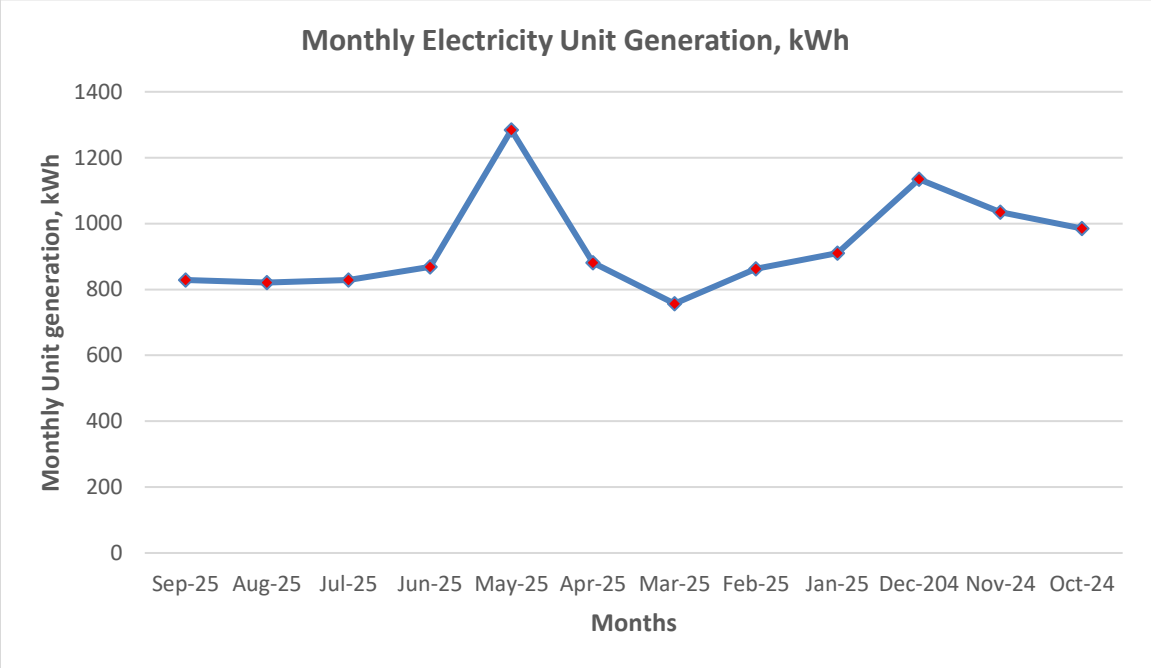
Photo-5: Inverters on Seth Govind Raghunath Sable College of Pharmacy building

The electricity generation by solar roof top in last 12 months as mentioned below in Table.

Sr. No.	Months	Electricity units generated in kWh
1	Sep-2025	829

2	Aug-2025	821
3	July-2025	829
4	June-2025	869
5	May-2025	1284
6	April-2025	881
7	March-2025	757
8	Feb-2025	863
9	Jan-2025	910
10	Dec-204	1135
11	Nov-2024	1035
12	Oct-2024	985

The graphical representation of electricity unit generation in last 12 months is as shown below.



3.2 Installation of 20 kWp Solar PV roof Top on Seth Govind Raghunath Sable College of Pharmacy building.

During the Audit, it was revealed that the College has ample space on the Terrace. It is proposed once construction completes Solar Photovoltaic roof top with net meter of capacity **50 kWp can be installed.** The system will cater the Day load demand of the College.

We furnish herewith the saving potential as under

No	Particulars	Value	Unit
1	Installed Capacity of Solar PV Pack	20	kWp
2	Daily working period	6	Hrs./Day
3	Daily units generated	120	kWh/Day

4	Annual working days	280	Day/annum
5	Annual saving in Grid Electrical Energy	33600	kWh/annum
6	Annual CO_2 saving potential	26.88	MT/Annum
7	Present Energy Charges	10	Rs/kWh
8	Annual monetary Gain	336000	Rs/Annum
9	Investment required	12,00,000	Rs lump sum
10	Payback period	3.57	Years

3.3 Solar Water heater

Today we are facing the shortage problem between supply and demand of electric energy especially during peak summer and winter seasons. The situation further worsens during early hours of peak winter season when enormous heating load is switched 'ON'. This has been a consistent problem. If the heating load is switched over to non-conventional source of energy, from conventional energy sources, the gap can be bridged considerably. 'Solar Energy' is an unlimited source of non-conventional energy. Solar energy can provide cost-effective solutions to fight climate change and reduce our dependency on expensive and polluting fuels. A solar water heater is an efficient and reliable technology that converts sunlight into heat to produce your hot water. At present Seth Govind Raghunath Sable College of Pharmacy, Saswad campus uses solar water heater of capacity 3000 LPD.

Photo-6: Solar water heaters on Seth Govind Raghunath Sable College of Pharmacy building

3.4 Solar powered light for hoarding

Lighting solar systems are the fixed installations designed for domestic as well as small scale commercial application. The component of the solar lighting system includes solar PV module (solar cells), charge controller, solar battery and lighting system (lamps & fans). Modules are installed in the open on roof/terrace - exposed to sunlight and the charge controller and battery are kept inside a protected place in the house.

Figure-1: Solar powered light for Hoarding

This system comes with multiple benefits such as:

- **Economical:** Since the sun provides energy free of charge, 30% power savings on the electricity bill can be availed with longer back up lighting system at zero running cost.
- **Non-Polluting:** Powered by the sun's renewable energy, the system is energy neutral and an absolutely clean source of illumination. 1kWp solar installation reduces 1⁄2 ton of CO_2 (carbon dioxide) per annum.
- **No Maintenance:** The system has few moveable parts – reducing the risk of breakage. Once installed, it lasts for long time and requires little attention.

This system can be used to power the huge hoardings in the college campus.

Solar powered hoarding lighting system proposed will provide a better, faster, cheaper (and cleaner) alternative with solar. Since this product competes with diesel or conventional fuels, we needed to ensure we beat the cost of a diesel solution. In order to achieve that with solar, we consider the following system:

1. Highly Efficient Solar Panel

2. Charge Controllers with MPPT Technology – increases solar electricity production by up to 30% compared to conventional charge controllers

3. LED Projection Light – consumes 10-times less electricity compared to conventional bulbs, and has a 50,000 hour warranty.

Features:

- Auto on off

- 4 Days Battery Back Up
- Robust housing
- Weather proof

With this entire put together, we ended up with systems that provide 6 hours of lighting each night with 4 -lamp system to light up boards up to 15′x30′, and a 8-lamp system to light larger boards up to 20′x40′.More importantly, with these options, payback of the system will come around 2.5 years. This system provides a way to reduce the lightings costs, get rid of all the operational hassles of owning a diesel generator, plus brand benefits from being “green” with the use of renewable energy like solar powered light hoarding board.

3.5 Solar charging stations

Solar cell phone chargers use solar panels to charge cell phone batteries. They are an alternative to conventional electrical cell phone chargers and in some cases can be plugged into an electrical outlet. Solar mobile charger is a device which can charge mobile phones using solar radiation. Its major component is a compact solar panel. This solar panel traps solar energy and produces an output voltage. But, since the light radiations falling on the solar panel can vary, the output voltage becomes unstable. For charging a mobile phone, stable voltage is required. So, to make the output voltage stable and regulated, voltage regulator circuit along with the solar panel is used.

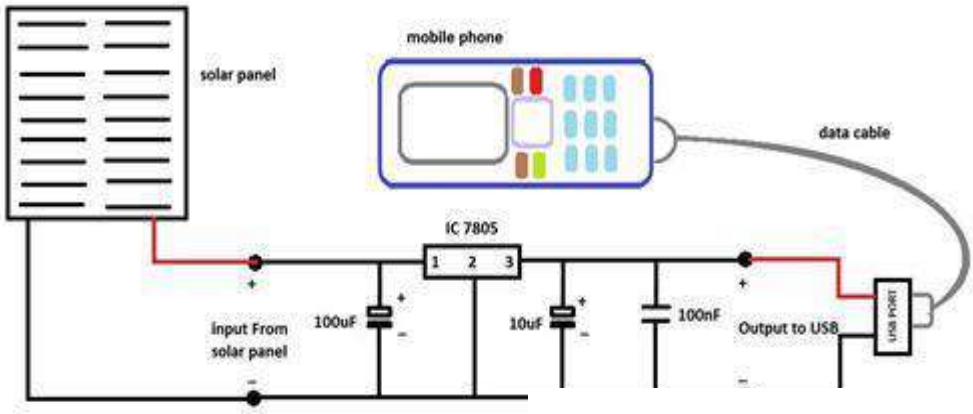


Figure-2: Solar charging Stations

Most of the mobile phones have computer connectivity via USB cable. USB port establishes 4 connection terminals. The connection terminals at the two extreme ends are the supply terminals. In a female USB connector (port via which we plug in USB devices to computer), these terminals carry 5V DC. When a mobile phone is connected to the USB port of a computer, it utilizes this 5V supply to recharge battery. This feature is used in a solar mobile charger. It converts and regulates solar energy to 5V DC and the output will be available through the female USB connector. To this connector, we can easily connect a mobile phone via data cable.

4. Water Audit and Rain water harvesting

A water crisis is a very sensitive issue these days all over the world. Recently we are facing water crisis in major part of Maharashtra like Marathwada, Khandesh, Pachim Maharashtra and North Maharashtra. Seth Govind Raghunath Sable College of Pharmacy, Saswad, Dist. Pune has taken a good initiative for maintaining greenery in the campus and less concrete zone, it means that college campus is allowing the rainwater to absorb under the ground and maintain the underground water level. In addition to this as per the survey and site location following activities can be implemented for the conservation of water.

4.1 Water storage and consumption

Seth Govind Raghunath Sable College of Pharmacy, Saswad campus is having water supply from the well to mitigate the need of requirement water for various activities. The college campus has temporary water storage capacities in terms of overhead tanks on the Institute building. Water is temporarily stored in the campus for various activities. There is a provision of sparkler system to supply the water in garden to maintain greenery. The details of water storage in the campus as mentioned below.

Sr. No.	Tank	Capacity(litre)	Quantity
1	Underground domestic water tank	20000	1
2	Overhead domestic water tank	15000	2
3	Overhead domestic water tank	10000	1
4	Overhead domestic water tank(Sintex)	500	3
5	Overhead domestic water tank (Animal House) (Sintex)	5000	1

4.2. Rain water harvesting

The system of rain water harvesting is an integral part of any educational institution. This system helps to conserve the rain water and also to use during the time of its desirable. This system helps the students to understand the basic concepts of rainwater harvesting system and their effective use in the real life.

Already Seth Govind Raghunath Sable College of Pharmacy, Saswad have provisions of collection of gray waste water from all the building taken through some specific path and charged in the ground below building to maintain the ground level water. It is suggested to charge the rain water through ring well in the campus.

Photo-7: View of rain water collection from building

Photo-8: Rain water collection from building

Advantages of rain water harvesting

(a) Promotes adequacy of underground water

(b) Mitigates the effect of drought

(c) Reduces soil erosion as surface run-off is reduced

(d) Decreases load on storm water disposal system

(e) Reduces flood hazards

(f) Improves ground water quality / decreases salinity

(by dilution)

(g) Prevents ingress of sea water in subsurface aquifers in coastal areas

(h) Improves ground water table, thus saving energy (to lift water)

(i) The cost of recharging subsurface aquifer is lower than surface reservoirs

(j) The subsurface aquifer also serves as storage and distribution system

(k) No land is wasted for storage purpose and no population displacement is involved

(l) Storing water underground is environment friendly.

Rain water harvesting potential

The total amount of water that is received in the form of rainfall over an area is called the rain water endowment of that area. Out of this, the amount that can be effectively harvested is called rain water harvesting potential.

All the water which is falling over an area cannot be effectively harvested, due to various losses on account of evaporation, spillage etc. Because of these factors the quantity of rain water which can effectively be harvested is always less than the rain water endowment. The collection efficiency is mainly dependent on factors like runoff coefficient and first flush wastage etc. Runoff is the term applied to the water that flows away from catchments after falling on its surface in the form of rain.

Runoff depends upon the area and type of catchment over which it falls as well as surface features. Runoff can be generated from both paved and unpaved catchment areas. Paved surfaces have a greater capacity of retaining water on the surface and runoff from unpaved surface is less in comparison to paved surface. In all calculations for runoff estimation, runoff coefficient is used to account for losses due to spillage, leakage, infiltrations catchment surface wetting and evaporation, which will ultimately result into reduced runoff. Runoff coefficient for any catchment is the ratio of the volume of water that run off a surface to the total volume of rainfall on the surface. The runoff coefficient for various surfaces is given in following table.

Sr. No.	Type of catchment	Coefficient
1	**Roof Catchments**	
	Tiles	0.8-0.9
	Corrugated metal sheets	0.7-0.9
2	**Ground surface coverings**	
	Concrete	0.6-0.8
	Brick pavement	0.5-0.6
3	**Untreated ground catchments**	
	Soil on slopes less than 10%	0.0-0.3
	Rocky natural catchments	0.2-0.5

Based on the above factors, the water harvesting potential of site could be estimated using the following equation:

Rain Water harvesting potential = Amount of Rainfall x area of catchment x Runoff coefficient

Rain water harvesting methods

(a) Storing rain water for direct use

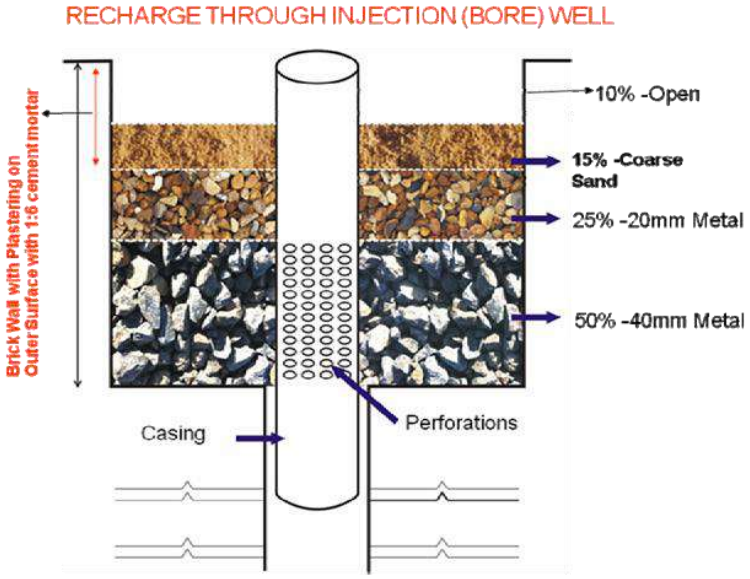
(b) Recharging ground water aquifers, from roof top run off

(c) Recharging ground water aquifers with runoff from ground area

According to the site of Seth Govind Raghunath Sable College of Pharmacy, Saswad campus the method of recharging ground water aquifiers from roof top run off may be suitable.

Recharging ground water aquifers from roof top run off

Rain water that is collected on the roof top of the building may be diverted by drain pipes to a filtration tank (for bore well, through settlement tank) from which it flows into
the recharge well, as shown in following Figure. The recharge well should preferably be shallower than the water table. This method of rain water harvesting is preferable in the areas where the rainfall occurs only for a short period in a year and water table is at a shallow depth. The schematic diagram of recharging water aquifers from roof top run off is as follows.



5. Waste disposal

The present Prime Minister of India, Shri Narendra Modiji launched " Swach Bharat Abhiyan" (Clean India Mission), on 2nd October, 2014. In this mission, the proper use of dustbins is one of the major priorities. For the successful implementation of this mission collective mass effort is necessary. The higher education institutions like Seth Govind Raghunath Sable College of Pharmacy, Saswad Dist. Pune need to play a major role in this regard to keep their campus neat and clean. Proper use of dustbins is not only the solution for the generating garbage in the college campus. Now days, its proper treatment should be given a major priority.

Characteristic and Disposal Practices of Solid Wastes Waste Management

Sr. No.	Waste Category	Method of disposal
1	Solid waste from trees droppings and lawn	Vermi Composting Organic Manure
2	Canteen waste	Vermi Composting Organic Manure
3	Plastic waste	Through Authorized recycler after segregation
4	Chemical waste generated in chemistry	The college need to have a very good practice to use dilute chemicals for the experimentation in these labs. These dilute chemicals can be further diluted and disposed in the pit near

		the lab.
6	E-waste and defective items from computer and electronics lab	The institution collects e-waste and delivered to authorized agency in order to dispose E-waste in scientific manner.
7	Sanitary Napkins	The institution has installed vending machine along with incinerators at required locations in the college campus.

5.1 Vermiculture Composting Culture

Vermicomposting is basically a managed process of worms digesting organic matter to transform the material into a beneficial soil amendment. The main purpose of this is to reduce disposable waste in the college campus and after complete process of vermi composting it is used as manure for plantation and greenery in the campus. It is also used for the demonstration and awareness in farmers to implement organic farming and its importance.

The main benefits of the process are to reduce the waste in the environment and utilized for some useful purpose and also it is cost savings process.

The earthworms being voracious eaters consume the biodegradable matter and give out a part of the matter as excreta or vermi-castings. The vermi-casting containing nutrients is a rich manure for the plants. Vermicompost, apart from supplying nutrients and growth enhancing hormones to plants, improves the soil structure leading to increase in water and nutrient holding capacities of soil. Fruits, flowers and vegetables and other plant products grown using vermicompost are reported to have better keeping quality. A growing number of individuals and institutions are taking interest in the production of vermicompost utilizing earthworm activity. As the operational cost of production of this compost works out to less than ` Rs. 2.0/Kg., it is quite profitable to sell the compost even at Rs. 4.00 to 4.50/Kg.

Process:

The process of composting crop residues / agri wastes using earthworms comprise spreading the agricultural wastes and cow dung in gradually built up shallow layers. The pits are kept shallow to avoid heat built-up that could kill earthworms. To enable earthworms to transform the material relatively faster a temperature of around 30^0C is maintained. The final product generated by this process is called vermicompost which essentially consist of the casts made by earthworms eating the raw organic materials. The process consists of constructing brick lined beds generally of 0.9 to 1.5 m width and 0.25 to 0.3 m height are constructed inside a shed open from all sides. For commercial production, the beds can be prepared with 15 m length, 1.5 m width and 0.6 m height spread equally below and above the ground. While the length of the beds can be made as per convenience, the width and height cannot be increased as an increased width affects the ease of operation and an increased height on conversion rate due to heat built up.

Cow dung and farm waste can be placed in layers to make a heap of about 0.6 to 0.9 m height. Earthworms are introduced in between the layers @ 350 worms per m3 of bed volume that weighs nearly 1 Kg. The beds are maintained at about 40-50% moisture content and a temperature of 20–30^0 C by sprinkling water over the beds. When the commercial scale

production is aimed at, in addition to the cost of production, considerable amount has to be invested initially on capital items. The capital cost may work out to about Rs. 5000 to 6000 for every tonne of vermicompost production capacity. The high unit capital cost is due to the fact that large units require considerable expenditure on preparation of vermi beds, shed to provide shelter to these beds and machinery. However these expenditures are incurred only once.

Under the operational cost, transportation of raw materials as also the finished product are the key activities. When the source organic wastes and dung are away from the production facility and the finished product requires transportation to far off places before being marketed, the operational cost would increase. However, in most of the cases, the activity is viable and bankable. Following are the items required to be considered while setting up a unit for production of vermi-compost.

Components of a Commercial Unit

Commercial units have to be developed based on availability of cow dung locally. If some big dairy is functioning then such unit will be an associated activity. Commercial units must not be designed based on imported cow dung.

1. Sheds

For a vermi-composting unit, whether small or big, this is an essential item and is required for securing the vermi beds. They could be of attached roof supported by bamboo rafters or steel trusses. Locally available roofing materials or HDPE sheet may also be used in roofing to keep the capital investment at reasonably lower level. If the size is so chosen as to prevent wetting of beds due to rain on a windy day, they could be open sheds. While designing the sheds adequate room/pathways has to be left around the beds for easy movement of the labourers attending to the filling and harvesting the beds.

2. Vermi-beds

Normally the beds have 0.3 to 0.6 m height depending on the provision for drainage of excess water. Care should be taken to make the bed with uniform height over the entire width to avoid low production owing to low bed volumes. The bed width should not be more than 1.5 m to allow easy access to the center of the bed.

3. Fencing and Roads/Paths

The site area needs development for construction of structures and development of roads and pathways for easy movement of hand-drawn trolleys/wheel barrows for conveying the raw material and the finished products to and from the vermi-sheds. The entire area has to be fenced to prevent trespass by animals and other unwanted elements. These could be estimated based on the length of the periphery of the farm and the length and type of roads/paths required. The costs on fencing and formation of roads should be kept low as these investments are essential for a production unit, yet would not lead to increase in production.

4. Water Supply System

As the beds have to be kept moist always with about 50% moisture content, there is a need to plan for a water source, lifting mechanism and a system of conveying and applying the water to the vermi-beds. Drippers with round the clock flow arrangement would be quite handy for continuous supply and saving on water. Such a water supply system requires considerable initial investment. However, it reduces the operational cost on hand watering and proves

economical in the long run. The cost of these items would depend on the capacity of the unit and the type of water supply chosen.

5. Transportation

For any vermi-composting unit transport arrangement is a must. When the source of raw material is away from the production unit, an off-site transport becomes major item of investment. A large sized unit with about 1000 tonnes per annum capacity may require a three tonne capacity mini-truck. With small units particularly with the availability of raw material near the site, expending on transport facility may become infructuous. On-site transport facilities like manually drawn trolleys to convey raw material and finished products between the storage point and the vermi-compost sheds could also be included in the project cost.

Design calculations

The size of the bed can selected as per the space available and convenient to the customer. Brick lined beds generally of 0.9 to 1.5 m width and 0.25 to 0.3 m height are constructed inside a shed open from all sides. On the basis of site survey and suitability of operation lets consider following dimensions for the bed. Generally, earthworms are introduced in between the layers @ 350 worms per m3 of bed volume that weighs nearly 1 Kg.

L= 3 m

W = 1.5 m

H = 0.6 m

Volume of the bed = 2.7 m^3

$$Input = \frac{15\ kg\ of\ organic\ residue}{m3 \times 15\ days} = \frac{1\ kg\ of\ organic\ residue}{m3 \times 1\ day}$$

It means for 2.7 m^3, 270 kg of organic residue is required. Therefor for a month approximately 8100 kg (8.1 Ton) of organic residue is required.

The financial viability on the basis of available data of the vermicompost system is shown below.

Sr. No.	Particulars	Expenditure Cost (Rs.)
1	Bed construction	Already available 10,000/-
2	Fencing including roof	5000/-
3	Water Dripper	3000/-
4	Electrical connections	1000/-
5	Earthworms	1000/-
6	Salary & wages	20000/-
7	Sale of Vermicompost (@ Rs.100 /kg at 30% conversion)	121500/-
	Net Benefit	**81500/-**

Details of Vermicomposting in College Campus

1. Compartment- 3
2. Compartment Size – 4 ft x 6 ft x 2.5 ft
3. Cow dung – Change after 4 Months / Batch
4. Cow dung quantity – one trolley / Batch
5. Earthworm - 15 kg earthworm use in 4 Months / Batch
6. Garden Waste – Leaves, Flowers, Soil.
7. Capacity to produce vermicompost- 500 kg /4 Months / Batch
8. Water Source – Bore well

Process of vermicomposting

Step 1	Processing involving collection of wastes, shredding, mechanical separation of the metal, glass and ceramics and storage of organic wastes.
Step 2	Pre digestion of organic waste for twenty days by heaping the material along with cattle dung slurry. This process partially digests the material and fit for earthworm consumption. Cattle dung and biogas slurry may be used after drying. Wet dung should not be used for vermicompost production.
Step 3	Preparation of earthworm bed. A concrete base is required to put the waste for vermicompost preparation. Loose soil will allow the worms to go into soil and also while watering, all the dissolvable nutrients go into the soil along with water.
Step 4	Collection of earthworm after vermicompost collection. Sieving the composted material to separate fully composted material. The partially composted material will be again put into vermicompost bed.
Step 5	Storing the vermicompost in proper place to maintain moisture and allow the beneficial microorganisms to grow.

Photo-9: Beds for Vermi-compost at college campus

6. Green campus initiatives: Institute has initiated the following activities towards green campus:

a. Celebration of environment Day
b. Nirmalya Collection Campaign
c. Best from Waste competition
d. Cleanliness Drive
e. Water treatment plant visit
f. Garbage plant visit
g. Plastic collection drive
h. Swachh Wari, Nirmal Wari, Harit Wari" Initiative

Photo-10: Celebration of environment day

Photo-11: Nirmalya Collection Campaign

Photo-12: Best from Waste Competition at Saswad Municipal Corporation Hall

Photo-13: Best from Waste Competition

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Photo-14: Cleanliness drive

Photo-15: Visit at Water treatment plant

Photo-16: Visit at Garbage treatment plant

Plastic Collection Campaign Report

On the occasion of birthday celebration of Hon.Shri.Ajitdada Pawar. Deputy Chief Minister Govt.of Maharashtra and President. Pune District Education Association Pune. plastic collection compaign started from 22nd July 2022. On 22nd day of every month. teaching and non-teaching staff & students collect the plastic garbage generated in their neighborhood and submit it in the college under this drive. This activity is started to create environmental awareness.
The details of campaign are as below…..

Sr. No.	Date	Plastic garbage collection from	Plastic garbage collection		Report Submitted	Process of disposal
1	23 Feb.2024	College campus	SGRS	10.400 Kg	06.05.2024	With Co-ordination of Health Division of Saswad Municipal Council. Saswad
2	22 Mar.2024	College campus	SGRS	9.800 Kg	06.05.2024	
3	23 Apr.2024	College campus	SGRS	3.900 Kg	06.05.2024	
4	22 May 2024	College campus	SGRS	6.700 Kg	24.05.2024	
5	22 June 2024	College campus	SGRS	8.500 Kg	22.06.2024	
6	22 July 2024	College campus	SGRS	5.100 Kg	26.09.2024	
7	22 Aug. 2024	College campus	SGRS	6.200 Kg	26.09.2024	
8	23 Sept. 2024	College campus	SGRS	4.900 Kg	26.09.2024	
9	22 Oct.2024	College campus	SGRS	8.500 Kg	23.10.2024	
10	23 Nov. 2024	College campus	SGRS	2.200 Kg	25.11.2024	
11	23 Dec. 2024	College campus	SGRS	6.500 Kg	23.12.2024	
12	22 Jan. 2025	College campus	SGRS	10.500 Kg	13.02.2025	
13	23 Feb. 2025	College campus	SGRS	7.500 Kg	24.02.2025	
14	23 Mar. 2025	College campus	SGRS	5.900 Kg	23.04.2025	
15	22 Apr. 2025	College campus	SGRS	5.200 Kg	23.04.2025	
16	22 May 2025	College campus	SGRS	4.500 Kg	24.06.2025	
17	24 June 2025	College campus	SGRS	26.500 Kg	24.06.2025	
18	26 July 2025	College campus	SGRS	4.200 Kg	28.07.2025	

Photo-17: Swachh Wari, Nirmal Wari, Harit Wari" Initiative

Chapter III
SUGGESTIONS AND RECOMMENDATIONS

Following are the suggestions and actions on the basis of green and environmental audit are suggested to implement in the campus on the basis of funds availability and institute preferences.

Green Audit: Environment conservation opportunities:

- Plants/Trees in the college campus may be designated with botanical name and specific number on the basis of year of plantation. There will be brick arrangement at the bottom to supply water to the plant.
- Water management system must be in place. Reduction in water consumption by addressing leakages of taps and other miscellaneous utilities. Installation of flow meters which will help in reduction of water consumption. TOD can be implemented for water pumping application.
- Rainwater harvesting pipe which collects rain water from respective building may have filter and properly charge the ground through ring well.
- Provide required nos. of dustbins at respective locations in the college campus.
- Vermi-culture composting plant should be in working condition and the organic compost from the same will be either utilized for the plants/trees and maintaining greenery in the college campus or sell for organic farming.
- It is suggested to display Energy conservation slogans boards in the college campus and classroom to make awareness about importance of energy saving.