

GREEN AND ENVIRONMENTAL AND ENERGY AUDIT REPORT

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Prepared for
Skylark Foundations
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Prepared by
Adya Environmental services, Baramati

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INTRODUCTION

Urbanization and industrialization have resulted in increasing amounts of municipal, industrial and health care waste in the country. Central pollution control board (CPCB) has estimated current quantum of solid waste generation in India to the tune of 48 million tons per annum. Each year everyone in India throws away more than 0.4 tons of waste. Management of such high quantum of waste puts enormous pressure on solid waste management system. Throwing thing away is waste of natural resources and energy which have been used to make the product. Waste has to put somewhere. Most of it is sent to landfill sites or incinerated (burnt), using up land and releasing greenhouse gasses. On an average in India 12% of waste is recycled/composted, 79% is sent to landfill site and 9% is incinerated (burnt)

SOLID WASTE GENERATION

VISUAL ANALYSIS OF MONTHLY SOLID WASTE GENERATION

Garden waste is the main contributor of campus solid waste by volume. Every week near about 2000 to 3000 gm of Garden waste is removed from college campus. Variation in Garden waste quantity is also found due to the seasonal variation. Paper waste also contributes a lot to the solid waste volume.

As an educational institute, college's paper and hard paper waste like cardboard, paper covering, printing paper is also notable. Tea cups are also grouped into paper waste. Paper and Hard paper waste accounts for near about 35% by volume. Skyalark Foundation Art's , Science and Commerce College, Arvi (hereinafter referred to as CEA) converts some quantity of its garden waste to manure by composting. Food waste is not included in visual analysis of solid waste for college building. College staff and students bring back their food waste (Tiffin waste) to home.

SOLID WASTE ACCOUNTING BY WEIGHT

TABLE 1 WEEKLY WASTE OF OFFICES, CLASSROOMS & LIBRARY IN GM APX

Place	Paper	Hard paper	Polythene	Hard Plastic	Glass	Chalks	Biomass + other	E-waste
Library and computer lab	20	40	1	10	2	NEG	NEG	5
Main office	35	60	1	8	2	NEG	15	5
Classrooms	50	80	1	10	1	50	NEG	NEG
Total	105	180	3	28	5	50	15	10

TABLE 2 WEEKLY SOLID WASTE OF NON-BUILT-UP OF COLLEGE CAMPUS APX (GM)

Place	Paper	Hard paper	Polythene	Hard Plastic	Glass	Chalks	Garden waste	E-waste
Solid Waste of non built-up area	10	20	1	50	2	NEG	2000 (depends on the season)	5

TOTAL WEEKLY WASTE GENERATION OF CAMPUS

Here we can see that Garden waste is the main contributor of campus solid waste by weight. Paper comes after that. Sanitary pads and hard paper are the third and fourth main contributors. If we differentiate between degradable and biodegradable waste biodegradable waste shows comparatively large figure compare to Non – degradable waste (glass, electronic, waste, and plastic).

Weekly Biodegradable waste of college is around 2.5 kg while non biodegradable waste of campus comparatively small and is around 0.5 kg. But these are non-biodegradable substances and disturb

natural processes. So College should take steps towards waste reduction, reuse and recycling to make its campus more Eco-friendly.

	Waste Type	Percentage
1	Paper	25 %
2	Hard paper	10 %
3	Garden waste	50 %
4	Hard plastic	5%
5	Polythene	5 %
6	Glass	1 %
7	Electronic waste	2%
8	Miscellaneous	2%

Table : Visual Analysis of Waste (apprpx)

	Waste Type	Weight (gm)
1	Paper	115
2	Hard paper	200
3	Polythene	4
4	Hard Plastic	78
5	E – waste	15
6	Glass	7
7	Chalks	50
8	Garden waste	2015
9	Miscellaneous Organic waste	-
10	Sanitary pads	300

Table Waste by weight (apprpx)

KEY CONTRIBUTORS OF CAMPUS SOLID WASTE

CHALK WASTE

Chalk waste is an important contributor of College's Solid waste. Chalk dust is also an allergic irritant for many students and teachers. Chalk is mostly made up of limestone or gypsum. It can be reused or recycled.

GLASS, PAPER AND HARD PLASTIC

On an average 82g of hard plastic and plastic is weekly disposed off by campus. Approx 315gm of paper and hard paper waste goes to dustbin every week. Out of that some of paper waste is sold out to Raddiwala. On an average 7gm of glass goes to waste. There should be a separate storage bin for these waste types. College staff reuses some of the waste paper for their daily office work. Separate

storage bins should be provided for three categories of waste (at one place). And it should be given to waste recycler after possible reuse of waste.

ORGANIC WASTE

Organic waste of this college mainly includes garden waste. Weekly on an average 2015gm of garden waste (depending on season) is removed from college premises plus other organic waste (other than gardening area) which further goes for composting. Garden maintenance is done once in a month. And this waste also goes to vermicompost unit..

Biological technique is most appropriate technique for organic and high-moisture wastes. It includes two main processing mechanisms – composting and anaerobic digestion/ bio-methanation.

Challenge for students and staff:
As students, to last a whole semester with one

USE AND THROW TYPE PENS

Nowadays many people use 'use and throw' type pens. Nobody goes to refill the pen with ink. This adds more plastic to our dustbin. Same picture can be found at this College campus. 98% of students of CEA use 'use and throw' type pens. This adds near notable quantity of hard plastic to solid waste per year.

ELECTRONIC WASTE

A college gives its E-waste to a vendor company.

SANITARY PADS:

Menstrual Hygiene Management (MHM) is an integral part of the Swachh Bharat Mission Guidelines (SBM-G). The MHM Guideline (Dec 2015) is issued by the Ministry of Drinking Water and Sanitation to support all adolescent girls and women. It outlines what needs to be done by state governments, district administrations, engineers and technical experts in line departments; and school head teachers and teachers.

As the usage of sanitary napkins is increasing, the amount of sanitary waste generated every day is also increasing. It is equally important to address the issue of efficient disposal of this infectious waste. Currently as we see, a major part of this waste is dumped into landfills leading to tremendous land pollution. Sanitary napkins are flushed down the toilet under the name of convenience. All the drains ultimately meet the rivers in the city and thus water pollution increases.

So if we see the chart of UNSAFE to SAFE practices i.e burning and use of small incinerators is comparatively safe option. Currently college is using controlled burning option.

RECOMMENDATIONS

CEA College should improve its Waste Management Plan to achieve its goal of Carbon neutral campus.

2. WATER AUDIT

INTRODUCTION

A water audit is a systematic review of a site that identifies the quantities and characteristics of all the water uses. The site may vary from a public water utility, facility (institutional or commercial properties like malls, office, schools etc.) or a household. The overall objective of conducting a water audit is to identify opportunities to make system or building water use more efficient. Elevation of the study area i.e. CEA is about 556 msl. Aquifer of the region is of fractured basalt type. Premonsoon DTW of the area is 5.5 mbgl. While post monsoon DTW is 3.9 mbl. EC of the area is 2789 Ms/cm.

Current Water Status of Haveli region:

According to government reports wells in Haveli tehsil are ranging in depth from 24.50 to 201.30 m bgl and the zones have been encountered in the depth range of 4.50 to 158.0 m bgl. The discharge of these wells varies from traces to 12.88 liters per second and static water level varies from 2.54 to 22.52 m bgl. Haveli tehsil falls in moderate rainfall intensity zone. The annual rainfall of the area is 722mm.. It is observed that the concentration of high EC more than 3000 has been observed in isolated wells in Haveli tehsil.

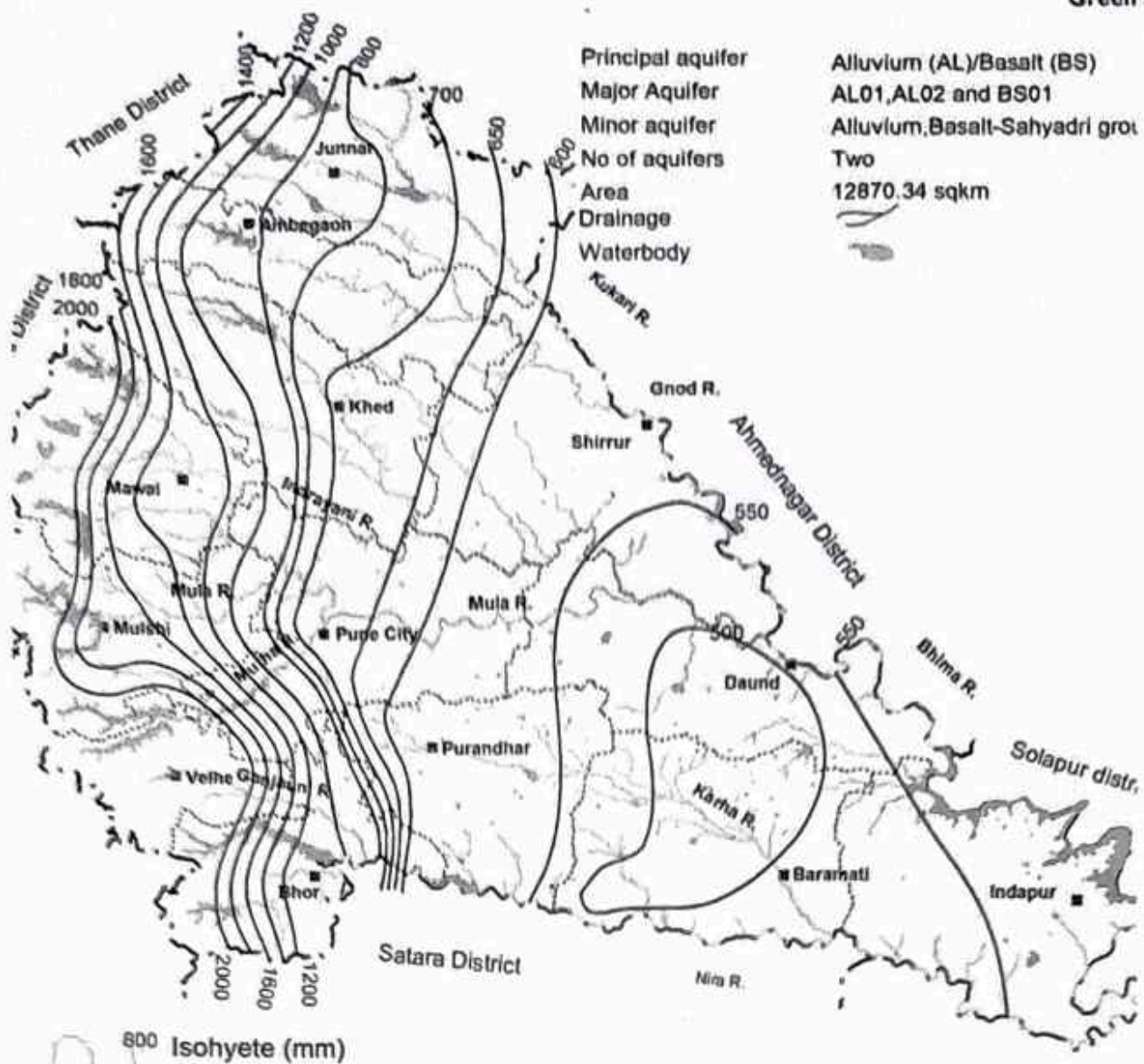


Figure Normal rainfall isohyets

**Current Water Status of Indapur region:**

The Primary source of CEA potable and Non-potable water is well water. This Private well is located in Kondhanpur village. The pipeline from this is connected to storage tanks located on the terrace. Water from three tanks of 3000 liter is connected to drinking water, Toilets and wash basin.

As per the daily pumping observations to overhead 3 tanks of 3000 liter water, College daily uses about 1000 liters of water. Although on certain days there is a sudden jump & increase in the amount of water which is generally attribute to increase in certain water uses like different events, workshops etc.

There are two borewells located within campus premises and were drilled in 2008.

WATER USAGE

CEA building has three floor. To conduct a building water audit, water consumption data for all the users were required to be monitored and recorded. Toilet water use including flushing and face/hand washing along with drinking was clubbed under personal water use. In order to collect primary data and to ensure accuracy, a brief survey of students was conducted.

Water users (2022-23)	Numib
Students	254
Teaching	07
Non-teaching	02
Total	263

Table 8 Total water users of the CEA campus

The total personal water use was calculated from flow rates, questionnaire and total water users (occupancy of the building). We measured the flow rates of taps and pumping lines.

In total there are 8 washroom blocks for students in campus premises, three for girls and three for boys. There are two toilet blocks for staff. One for gents staff and one for ladies staff.

WATER CONSUMPTION CALCULATION

Total daily water Intake of water,

is 1200 lit/day

*Calculated from flow rate and daily water pumping operation to overhead tanks

I. POTABLE WATER CONSUMPTION (DAILY)

- 6 College uses filtered well water for potable water use

CALCULATION ON THE BASIS OF QUESTIONNAIRES AND FLOW RATES

- i. Daily potable water consumption by staff and students: $206 \times 1.5 = 309$ liters/day

Total water use of drinking water is = 309 liters/day

2. NON POTABLE WATER CONSUMPTION FROM CAMPUS WELL (DAILY)

College uses well water directly for non potable water use

CALCULATION ON THE BASIS OF QUESTIONNAIRES AND FLOW RATES

- i. Water used for flushing by students and staff $\times 3$ liters = 618 liters/day
- ii. Water use for mopping = Water per washing of wiper \times Number of washing = 100
liter $\times 2 = 200$ liters/day
- iii. Water used for hand and face washing = Average time the tap left open \times Number of times
the hand and face washed) \times Average flow rate of taps per second
= 10 seconds $\times 1$ times $\times 0.1 = 1$ liters per capita

So, Total non potable water use by students and staff for hand and face washing = 1
liters $\times 206 = 206$ liters.

So, the total water use for flushing and washing = $618 + 200 + 206 = 1024$ liters/day

* College fulfills its irrigation water demand directly from well water, so this use is not included.

OVERALL WATER CONSUMPTION

Therefore based on the above recordings, monitoring and calculation, the total potable water consumption for CEA College is 309 lit/day and non potable water consumption is 1024 liters/day. Overall water consumption is $309 + 1024 = 1333$ liters per day. If gardening is excluded, then the per

capita use for non potable water is around 5.1 liters day.

	Heads	Water use (in liters)
1	Average daily water supply, to the overhead tanks from the underground tank, approx	1200
2	Total calculated water consumption from the water audit, approx	1333
3	Difference between water consumption from overhead tanks and actual water use for various purposes	133

Table : Total water supply and use at CEA College

DATA COMPARISON AND ANALYSIS

There is notable variation in the average amount of water that is pumped to the overhead tanks every day for various purposes and the average water consumption calculation. The average water supply (quantity) was based on time taken to overhead the tanks, flow rates and monitoring. The amount of water based on survey, flow rate and water users is 1333 liters per day while the daily water need to overhead all the tanks is 1200. The calculated water amount is 1.1 times greater than the amount of water which is used pumped in the tanks.

THIS DIFFERENCE COULD BE ATTRIBUTED TO THE FOLLOWING FACTS

- The staff and students present per day in the college were assumed to be 100 % present. In real this percentage varies.
- The observations from questionnaire for personal water use were a representative observations and not a complete study.
- Along with this some staff and students living in nearby areas, they also don't use the college washrooms. Some of them bring drinking water from home.

WASTE WATER GENERATION BY CEA

Every building generates waste water amounting to almost 80% of total water consumed. The major source of CEA waste water includes grey water from wash basins, lab basins, and black water from toilets. Out of that Black water of CEA toilets goes retention tank

ESTIMATION OF WASTE WATER GENERATED BY CEA

Waste water generated = 80% of water used

So, waste water generated by CEA based on water audit

$$= 80\% \text{ of } 1333 \text{ liters per day} = 1066 \text{ liters/day}$$

Waste water generated by CEA based on pumped quantity

$$= 80\% \text{ of } 1200 \text{ liter per day} = 960 \text{ liters/day}$$

THE KEY WATER CONSUMING AREAS

TOILETS: Water consumption is more for flushing application in any building. College has single flushing system in Toilets

IRRIGATION/WATERING OF CAMPUS PLANTS

Plants in the garden are watered in the evening to reduce evaporation losses.

CONCLUSION AND RECOMMENDATIONS

1. The water meter should be installed for CEA's college at the inlet of well water and This installation will give correct amount of bore well water used by CEA's
2. The installation of water meter will give correct information about amount of wastewater produced by the college. Along with this characteristics of waste water will help to decide selection of treatment process. The use of best available waste water technique will improve the quality of treated water and it can be used for irrigation.
3. **WATER TAPS** Use of low flow faucets along with other water saving devices such as auto control valves, pressure reducing devices, aerators wherever possible will minimize wastage of water.

3. NOISE AUDIT

Actual noise monitoring is carried out with the help of sound level meter on various locations shown in figure. We have taken the samples within the free field. The comprehensive study was done inside the campus to calculate the noise level at various important locations such as class room areas, playground, parking area, library location and the data is interpreted for solutions.

Noise level readings (dB) was taken using noise meter

The readings were taken in certain period of interval and specific timings such as mornings, evenings, afternoon.

DISCUSSIONS

CEA is situated in near Arvi village. Campus is surrounded by Agricultural fields and vegetation and greener fields. The famous Sinhagad fort is only 10km far from the college. There is no major outside noise source. The area in the vicinity of outside road is mainly used for administration purpose. So there is no direct impact of road rush on teaching and learning process. Road rush is intermittent type of noise, noise that stops and starts, is considered to be more annoying than continuous noise. Any noise tends to become bothersome during summer than winter. Thanks to the summer vacations.

Parking area of any educational institute is notable noise producer. In CEA staff vehicular parking is far from classrooms. So there is negligible effect of parking area.

At road ward side of college building i.e. administration area, 8 noise level observation fall within standards. Out of 10 average noise recordings taken in middle of college i.e classroom area, 8 noise levels observations falls within standards. The laid down noise monitoring standard for Silence zone is 50 dB (A) for a day time. As per the CPCB guidelines educational institutes comes under Silent zones.

We have taken the samples in free field where there are no reflected sound waves. So this clears that the Noise level decreases towards classroom areas.

COMMENTS

Green Audit

- Silence is an important factor in education. CEA campus is located in noise free area.
- As per CPCB guidelines silence zone is referred as areas up to 100 meters around such premises as hospitals, educational institutions and courts.
- Tree-shrubs-climber canopies do acoustic buffering of outside noise and acts as noise barriers for outside noise. College should plant trees-shrubs-climbers having canopies of different height.. Focus should be given to plant native vegetation.
- Parking area of any educational institute is notable noise producer. In CEA vehicular parking is at ideal distance from classroom area.

4. BIODIVERSITY AUDIT

A TREE CENSUS AND INVENTORY

The present Tree census and inventory study was done to quantify, to create an inventory and to understand phyto-ecological structure of CEA College

OBJECTIVES

1. To make an inventory of tree individuals and tree species in the campus.
2. To undertake phyto-ecological analysis with the help of
 - a. Species composition
 - b. Abundance, Relative abundance, density

SAMPLING

Since the purpose of the study was to create a detailed inventory of Tree individuals and species, the "Census" was used as a sampling technique. Campus was surveyed and each tree was counted. Within each plot all individual trees were identified, measured, and recorded. The diameters at breast height of the species were measured using a measuring tape.

RESULTS

SPECIES COMPOSITION OF TREES

Species composition shows the different tree species found in the study area. A total of 19 species were recorded belonging to 15 families of trees and 18 genera. Tree inventory shows good diversity in the plant species and their families found in the campus. A total of 55 tree individuals species were recorded in the study site.

Dominant families recorded in the study area according to descending order (based on number of species

type in each family) are Arecaceae (3) Moraceae (2) and Annonaceae

ABUNDANCE From the 15 families of trees recorded in the study sites, the Arecaceae had the highest number of species (26) which belongs to two genera followed by the Moraceae with 2 species and 1 genera. A total of 18 genera were recorded in the study site. *Dypsis lutescens* (Arecaceae) having 20 individuals was the most abundant tree species. This was followed by the species *Hyphorbe lagenicaulis*, *Mangifera indica*, *Polyalthia longifolia*, *Ficus benjamina* having 4,4,3,3 individuals respectively.

DISCUSSION

The canopy of the campus is characterized by mixed species i.e. Exotic as well as Native. The most dominant trees in this campus are *Dypsis lutescens*, *Hyphorbe lagenicaulis*, *Mangifera indica*, *Polyalthia longifolia*, *Ficus benjamina*. The Arecaceae, Annonaceae and Moraceae were observed to be the most prevalent family. This may be due to their massive plantation, good survival rate and adaptability.

Out of 19 tree species, 9 species of the campus are exotic species and which is not a good sign for biodiversity of the study area and nearby area.

The campus does not contain tallest layer of vegetation. No emergent and canopy trees found.

CONCLUSION

1. Arecaceae is the dominant family and *Dypsis lutescens* is the dominant species of this area.
2. It does not include Trees of a rare, vulnerable or endangered species
3. This site does not contain tallest layer of vegetation
4. Large population of single species is one of the reasons for low value of evenness

BIRD DIVERSITY

In nature birds occur in a variety of habitats – from deserts to the tropical rain forests; the short dry to the tall wet grasslands and on the alpine meadows in the high altitudes; from sea level to above 4000 meters above sea level; on rocks, cliffs in caves and mud banks; along fresh water estuaries, seas and shores. They also occur on man modified lands such as agricultural fields, airfields, along roadsides and hedgerows and gardens, among human habitations and dwellings.

CEA College comes under habitat of man modified lands 7 bird species were recorded from the campus.

Common Name	Scientific Name	College campus
Cattle Egret	<i>Bubulcus ibis</i>	4
Blue Rock Pigeon	<i>Columba livia</i>	5
Common Myna	<i>Acridotheres tristis</i>	2
Red vented bulbul	<i>Pycnonotus cafer</i>	4
Asian Koel	<i>Eudynamys scolopacea</i>	1
Crow	<i>Corvus splendens</i>	3
House sparrow	<i>Passer domesticus</i>	5

Table List of birds reported at CEA campus

MAMMAL DIVERSITY

The mammal commonly seen on campus – House Rat (*Rattus rattus*). Indian hare *Lepus nigricolis*

REPTILES OF THE CAMPUS

Pheretima posthuma, and earthworm of *Lumbricus* genus is found in the campus. Lizard of species *Hemidactylus frenatus* is found on the building walls of the campus. Asian snake-eyed skink (*Ablepharus pannonicus*) is found in the campus.

Recommendations

College should take necessary steps to make campus a protective natural habitat of nearby native flora and fauna.

Environmental quality : Soil Quality

Introduction

Knowledge of chemical and physical properties of soils has been assessed to understand the capacity of campus soil to support existing green cover. The concept of soil quality includes assessment of soil properties of campus as they relate to ability of soil to function effectively as a component of a Plant health at CEA campus. In present study soil quality was assessed to know the capacity of a soil to produce biomass. As front campus is physically locked due to fencing of cement wall, so movement from outside – campus – outside is significantly restricted.

Status of soil in Maharashtra

The state of Maharashtra represents a mixed landscape with hill ranges, thick forest cover and coastline. The soils of Maharashtra are residual, derived from the underlying basalts. The land in the river basins of Godavari, Bhima, Krishna and Tapi has a deep layer of fertile black basalt soil rich in humus. The rest of the semi-dry plateau has a medium layer black regur soil which is clayey with high moisture retention capacity, rich in iron but poor in nitrogen and organic matter. The peaks of Sahayadri Mountains, the districts of Ratnagiri and the western regions of Kolhapur and Satara are composed of laterite soil. The Konkan coast has sandy loam soil. A variety of red soil and sandy soil is found in the Vidarbha region. Maharashtra's soils are highly deficient in nutrients when compared with the soils of other Indian states. They are lacking in Nitrogen (N), Phosphorous (P) and Potassium (K) and mainly because farmers in rain-fed areas use very little fertilizers. Further, excessive use of water for irrigation also leads to increasing salinity of soils.

Soil characteristics

In order to assess the soil quality CEA educational campus, a collective soil samples were taken from different sites. Soil samples between 0-20 cm depths were collected. Collected soil samples are analyzed by using water soluble extract of soil samples.

Sample	pH	Organic carbon	Available N Kg/hect	Available P Kg/hect	Available K Kg/hect
Native soil	7.4	0.43%	100	17.0	313

Table Physico-chemical analysis of soil samples collected from Campus

Chemical characteristics

pH is an important parameter indicative of the alkaline or acidic nature of the soil. It greatly affects the microbial population as well as the solubility of metal ions and regulates nutrient availability. The pH of original soil of the campus is 7.4 and so is conducive for the growth of plants.

As per the soil testing report organic carbon is also not very good. And since Organic matter is an indicator of available nitrogen status of the soil, thus the soil of the investigating area is also dominantly low in respect of its available nitrogen. Available phosphorous is comparatively good while potassium is litter higher than desired level.

Recommendations and conclusions

- Soil at different locations of the campus is varying in texture and having mixture of native and exotic soil. So soil sample is selected from original landscape area of the campus.
- The pH of the soil sample can be categorized as near to neutral.
- Nitrogen content of the soil is not sufficient for plant growth. So it is suggested- To apply the organic matter, phosphate rich fertilizer, vermicompost manure as an important source of nutrient.
- Soil analysis shows that campus terrain fertility status has to be improved for gardening and cultivation.

8. Water Quality

Drinking water supply in CEA College campus

The Primary source of CEA Non-potable and potable water is Well water. The College receives its water from bore well located in Kondhanpur Village.

Water sampling and analysis

Water sample were collected from daily drinking water supply i.e filtered water source to assess water quality.

Source	Sample No.
	D1

Table Water samples of CEA campus

The results are,

pH	Turbidity	Cl	Mg	NO3	SO4	Cl	Fe	F	Mn	Zn	Cu	Na	Alkalinity	Coliform	Free Cl
7.3	0.2	23	9.73	6.15	7.4	140	0.02	0.09	0.01	0.07	0.03	89.75	240	2	0.2

Conclusion and Recommendations

The water sample analysis indicated that current water source follows all drinking water as per BIS (IS: 10500:2012). So the current water source is safe for drinking purpose.

Introduction

Increasing levels of carbon dioxide in the atmosphere are of growing concern globally and locally, and urban forests have a role to play in the battle against climate change. Urban forests can reduce atmospheric carbon directly and indirectly. As long as trees are growing, they remove CO₂ from the air in a process called carbon sequestration, transforming CO₂ into carbon and making use of it to build living matter - leaves, stems, trunk, roots, etc. The Biomass carbon sequestration potential was measured for CEA campus.

Total biomass assessment

The assessment of above ground and belowground biomass of CEA campus was carried out within campus

Biomass carbon = (aboveground biomass carbon + belowground biomass carbon)

Conclusion

Total 0.1 tons of carbon is locked in the study area of CEA campus by trees.

7.VEHICULAR EMISSIONS

The emissions inventory is the foundation upon which the regulatory strategy can be formulated. There are many emission sources that contribute to the urban air pollution such as point sources, non-point or area sources, motor vehicles, non-road mobile and natural. Magnitude of contribution from each of the sources depends upon the individual emission rates and the activity level.

The on-road motor vehicle emission inventory can be summarized as the product of an emission rate (e.g., gram/km) and an associated vehicle activity (e.g., km/day).

Survey was conducted to count the vehicles used by CEA 'ians. Survey was done for one week at 9 am.

On an average number of 5 bicycles were counted per day. Around 20 two wheelers are used daily by CEA students and staff. While 3 four wheelers daily come to the campus. Most of the college students come to college by S.T bus and walking.

Pollutants	Emissions Factor	Number of Vehicle/ day	Emissions (gm/km)	Average Travel (km)	Total Emissions per day
CO	1.4	10	14	7	98
HC	0.7	10	7	7	49
NOx	0.3	10	3	7	21
PM	0.05	10	0.5	7	3.5
CO2	33.83	10	338.3	7	2368

Total emissions by two wheelers

If we consider CO2 emissions only, we can see that 2368 gm/day of CO2 is emitted by two wheelers of CEA campus. So the CO2 emitted by two wheelers per year is,
= 0.56 tones/year

Pollutants	Emissions Factor	Number of Vehicle/ day	Emissions (gm/km)	Average Travel (km)	Total Emissions per day
CO	4.3	2	8.6	20	172
HC	2.05	2	4.1	20	82
NOx	0.11	2	0.22	20	4.4
PM	0.08	2	0.16	20	183.2

CO2	72.50	2	145	20	2900
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Table : Total emissions by Four wheelers

Emission factors by four wheelers are higher than two wheelers. So the emissions per vehicles are also high as compared to two wheelers. If we consider CO2 emissions only, we can see that 2900 gm of CO2 is emitted by two wheelers of CEA campus. So the CO2 emitted by two wheelers per year is,

$$= 0.69 \text{ tones/year}$$

$$\text{Total Emissions by ACCS vehicles per year} = 2W + 4W = 0.56 + 0.69 = 1.25 \text{ tones/year}$$

From above figure it can be analyzed that though the number of 4W are less as compared to 2W, they do notable contribution in total CO2 emissions of the campus.

CARBON DIOXIDE EMISSIONS AND ITS ASSIMILATION BY CAMPUS TREES

In green audit college has also assessed carbon sequestration by campus trees. Study shows that every year 0.1 tons/year tones of carbon is sequestered by campus. This capacity gets increased by every year.

If we quantify CO2 flux to carbon dioxide,

$$0.1 \text{ tones of Carbon} = 100 \text{ kg of carbon}$$

To determine the amount of CO2 that the trees removed from the atmosphere, we have to multiply the carbon value by 3.67. This value is the mass conversion factor for carbon to carbon dioxide.

$$100 \text{ kg of carbon} * 3.67 = 367 \text{ kg of CO2} = 0.36 \text{ tones CO2 per year}$$

Conclusion:

So it can be concluded that campus trees has capacity to assimilate 0.36 tonnes of CO₂ per year.

While the vehicular emissions study showed that total emissions of CEA vehicles is 1.25 tones/year.

This value is 3.4 times greater than Carbon dioxide assimilation capacity of the campus.

ENERGY SCENE

Primary source of energy at College of Education, Arvi is electricity. Electricity is used for all electrical appliances like lighting, fan, pumps, computer and lab instruments. Also water is used for drinking, domestic & gardening purpose.

ENERGY: SOURCES & UTILIZATION

Primary energy / natural resources utilized at the service center are electricity & water. These sources are consumed for the generation of motive power and water for drinking, washing & domestic usage, gardening respectively. The Past source of electrical power for the service center is from MSEDCL grid while currently college uses renewable energy i.e Solar power

Objectives

- Collect historical data to analyze background activities
- Collect & analyze* current monthly billing data after installation of Solar Power.

Sr. No.	Parameter	Value	Unit
1	Avg. Unit Consumption (Electricity bill) 2015	145	Units/Month
2	Current Avg. Unit Consumption (Electricity audit)	120	Units/Month
3	Average Monthly unit consumption after Solar power installation	00	Units/Month

Conclusion:

- Average monthly MSEDCL unit's consumption before Solar power installation was about 145 units and average monthly consumption shown by current electricity bill is zero units. Moreover CAE exports its extra solar power Units to MSDECL.
- Renewable Energy emits less CO₂ than fossil fuels. In fact, renewable like Solar power –apart from construction and maintenance don't emit any Co₂ at all. Using renewable option like College of Education, Arvi we can create a more sustainable and comfortable world for generations to come