2022-2023

GREEN AUDIT REPORT

GREEN AUDIT REPORT

GREEN ENCON SOLUTION GES

Prepared for

K.K.Wagh Arts, Commerce,Science & Computer Science College,Chandori, Nashik

2022-2023

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ABBREVIATIONS

ABBREVIATIONS	EXPANSIONS
BEE	Bureau of Energy Efficiency
EE	Energy Efficiency
MT	Metric Ton
MTOE	Metric Ton of Oil Equivalent
No.	Number
GES	GreenEnCon Solution

DISCLAIMER

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GREEN ENCON SOLUTION
GES

PREFACE

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD is the acknowledged leader in education field. Today K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD has established a strong presence in the education field. This audit was conducted to seek opportunities to improve the energy efficiency of the campus as well as promote the green energy practices in college campus. Reduction of energy consumption while maintaining or improving human comfort, health and safety were of primary concern. Beyond simply identifying the energy consumption pattern, this audit sought to identify the most energy efficient appliances. Moreover, some daily practices relating common appliances have been provided which may help reducing the energy consumption. The report accounts for the energy consumption patterns of the academic area, central facilities based on actual survey and detailed analysis during the audit. The work encompasses the area wise consumption traced using suitable equipments. The report compiles a list of possible actions to conserve and efficiently access the available scarce resources and their saving potential was also identified. We look forward towards optimization that the authorities, students and staff would follow the recommendations in the best possible way. The report is based on certain generalizations and approximations wherever necessary. The views expressed may not reflect the general opinion. They merely represent the opinion of the team guided by the interviews of consumers.

ACKNOWLEDGEMENTS

GES places on record its sincere thanks to K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD for vesting confidence in GES to carry out the Green Energy Audit. A Green energy audit study is a joint venture exercise of consultant and institute to account and contain energy usage without sacrificing the purpose of energy use. The contribution of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD team is equally important in this venture. Team of technical experts from M/s GreenEnCon Solution, Nasik appreciates the keen interest shown by the management of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD, Nasik for their kind co-operation , furnishing required data and hospitality offered during our visits.

Our special thanks to,

- **Chairman- Mr. SAMEER BALASAHEB WAGH**
- **Principal – Dr. R.K. DATIR**

We are also thankful to other members of the institute for their diligent involvement and co-operation.

EXECUTIVE SUMMARY

Greenencon Solution has conducted a "Green Audit" of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, CHANDORI, NIPHAD for the academic year 2022-23. Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. The main objective to carry out green audit is to check green practices followed by college and to conduct a well formulated audit report to understand where we stand on a scale of environmental soundness.

Questionnaires prepared to conduct the green audit were based on the guidelines, rules, acts and formats set by Government of India, Ministry of Environment and Forest and Bureau of Energy Efficiency. Questionnaires were prepared for solid waste, energy, water, hazardous waste and e-waste. For audit purpose and suitability analysis of data the study area is grouped as administrative buildings, Seminar Hall, Laboratories, class rooms, Common rooms, Sick room, Computer centre & Language Lab. The audit was carried for solid waste, electricity and energy, water and wastewater, hazardous waste, air quality and green inventory including carbon sequestration and carbon foot prints. It also lists green initiatives taken by campus to save environmental resources. The "Green Audit" also gives a "Environmental Management Plan".

1. PREAMBLE

K. K. Wagh Arts, Commerce, Science & Computer Science College Chandori, Nashik include all Courses in the same building affiliated with Savitribai Phule Pune University.

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori, Nashik started in 2004 with a current intake of 750 for the Arts, Commerce, Science & Computer Science course. Over the years, K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori, Nashik has grown in leaps and bounds providing a stimulating learning environment in Nasik by providing a sprawling campus and state-of-the-art infrastructure. K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori, Nashik has students from many different areas across the state pursuing their education in Arts, Commerce, Science & Computer Science streams. This Institute is strategically located in the heart of the city and has a campus providing enlightening and inspiring, academic ambience. K. K. Wagh Arts, Commerce, Science & Computer Science College Chandori, Nashik is spearheaded by well-qualified, experienced, and dedicated staff.

1.1 ABOUT GREEN AUDIT

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, Campus Grants Commission has mentioned "Green Campus, Clean Campus" mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.2 OBJECTIVES

The objective of Green Energy Audit is to promote the idea of Energy Conservation in the Campus of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori. The purpose of the energy audit is to identify, quantify, describe and prioritize cost saving measures relating to energy use in the Departments and Institute Central Facilities.

The work eligible for Energy Audit Study should be directed towards Identification of areas of energy wastage and estimation of energy saving potential in Departments and Institute Central Facilities suggesting cost-effective measures to improve the efficiency of energy use. Estimation of implementation costs and payback periods for each recommended action. Documenting results & vital information generated through these activities. Identification of possible usages of co-generation, renewable sources of energy (say Solar Energy) and recommendations for implementation, wherever possible, with cost benefit analysis.

1.3 GOALS OF GREEN AUDIT

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori, has conducted a green audit with specific goals as:

1. Identification and documentation of green practices.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.
4. Analyze and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. Identify and assess environmental risk.
8. Motivates staff for optimized sustainable use of available resources.
9. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.4 SCOPE OF WORK

- Conduct a survey to know the ground reality about green practices.
- Analyze and suggest solution for problems identified from survey.
- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identify and assess environmental risk.
- Motivates staff for optimized sustainable use of available resourcesIdentify different green practices in college campus

2. METHODOLOGY

The methodology adopted for this audit was a three step process comprising of:

1. Data Collection– In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, interviewing key persons, and measurements.

2. Data Analysis- Detailed analysis of data collected was done using ms Excel report

3. Recommendation– On the basis of results of data analysis and observations, some steps for reducing power consumption without affecting the comfort and satisfaction were recommended along with their cost analysis.

2.1 Data Collection

The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste. Maintaining records of the handling of solid and hazardous waste is much important in green audit.

For suggesting any corrective measures to reduce power consumption, it is first necessary to know the power consumption pattern in detail. For this, the exhaustive data collection exercise was performed at all the departments, academic centers, and other supporting entities such as library, institute hospital, computer centre etc.

Following steps were taken for data collection:

- The team went to each department, centre, etc.
- Information about the different trees & plants was collected by observation and interviewing.

2.2 Data Analysis

In data analysis, the data collected is processed to draw significant conclusions to pinpoint loopholes and identify the areas to focus upon. Analysis of the existing green campus was used to obtain the green practices and also to get the information about the points where more focus is needed. Analysis of the water consumption observations obtained was used to obtain the water consumption pattern and also identify the losses. This helped to identify the areas with maximum water and energy saving potential

2.3 Recommendations

Energy as well as cost analysis of different areas were performed and recommendations were made based on the capital cost recovery time.

Following were the steps involved in this process:

- The capital cost involved green practices was estimated.
- If capital cost recovery time is less than the product life, the move can be supported.

3. ABOUT THE UNIT

The college was established in the year 2004, this institute is started in rural area & the 16-year journey has been a story of hard work, sincere effort toward quality enhancement, quantitative growth & expansion.

During this short span the number of students has increased considerably & characteristically almost 70% of the students have been girl students. Visa-vis there's been growth in infrastructure - a large campus with Gymkhana, Smart Classroom, a large Playground, Computer Lab, well equipped Departments, Language Lab, Commerce Lab and Psychology Lab and experienced qualified faculty.

4. WATER AND WASTE WATER AUDIT

Water which is precious natural national resource available with fixed quantum. The availability of water is decreasing due to increasing population of nation, as per capita availability of utilizable water is going down. Due to ever rising standard of living of people, industrialization, urbanization, demand of fresh water is increasing day by day. The unabated discharge of industrial effluent in the available water bodies is reducing the quality of these ample sources of water continuously. Hence, the national mission on water conservation was declared by the then Hon. Prime Minister Narendra Modi as 'Jal Shakti Abhiyan' and appealed to all citizens to collectively address the problem of water shortage, by conserving every drop of water and suggested for conducting water audit for all sectors of water use.

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

4.1 Importance of water Audit

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water. The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools require 2 liters per student; 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

4.2. Water Audit

Water usage can be defined as water used for all activities which are carried out on campus from different water sources. This includes usage in all residential halls, academic buildings, on campus and on grounds. Wastewater is referred as the water which is transported off the campus. The wastewater includes sewerage, residence, hall water used in cooking, showering, clothes washing as well as wastewater from chemical and biological laboratories which ultimately going down in sink or drainage system.

4.3. Water Consumption in Campus

From the data collected for water audit of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori,. Campus, Nashik the water distribution and water consumption pattern is noticed as follows. The water is distributed and consumed in various sectors such as Bathroom, Toilet, Urinals, Garden, Drinking, Wash Basin, Laboratories, etc. It is recommended to install water meter at inlet of each sector to measure the water consumption.

4.4. Sustainable water Practices

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori. Campus has adopted various sustainable water practices to conserve the water and also going to adopt new sustainable water practices.

4.4.1. Rainwater Harvesting

Fig.1.: Rain Water Harvesting System

Rooftop Rain Water Harvesting is the technique through which rain water is captured from the roof catchments and stored in reservoirs. Harvested rain water
can be stored in sub-surface ground water reservoir by adopting artificial recharge techniques to meet the daily needs through storage in tanks.The Main Objective of rooftop rain water harvesting is to make water available for future use. Capturing and storing rain water for use is particularly important in dry land, hilly, urban and coastal areas. Rooftop Rain Water Harvesting is carried out at Main Administrative Building.

4.4.2. Water filtration Plant

Fig.2.: Water Softener Equipment

The Campus has boar well as a water resource and hence there is need of water treatment for drinking purpose. Campus has constructed Mini Water Treatment plant in the campus at Administrative building.

4.4.3. Drip Irrigation and Sprinkler Irrigation

Fig.3.: Drip Irrigation System

K.K.W.College. has green campus surrounding the buildings. Efforts have been made on to bring part of land under cultivation of medicinal plants as well as other productive plants through various activities in college campus. Drip irrigation and sprinkler irrigation system have been installed at gardens which helps to save water and nutrients by allowing water to drip slowly to the roots of plants. The goal is to place water directly into the root zone and minimize evaporation to save water.

4.5. Recommendations

- Water meters should be installed at the entry of each sector to measure the water consumption.
- Non-teaching staff or peons in the concerned section should take responsibility of monitoring the overflow of water tanks.
- Large amount of water is wasted during the practical process in Science laboratories. Designs of small water recycle system helps to reuse of water.
- Pipes, overhead tanks and plumbing system should be maintained properly to reduce leakages and wastages of water.
- Use automation system for filling the overhead tank to avoid wastage of water flow.
- K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori needs to arrange awareness program on water conservation by motivating students and staff.

5. SOLID WASTE MANAGEMENT

The college has a sprawling green campus. It has given top priority to keep the campus clean and eco-friendly. The faculties and students are regularly advised to reduce waste. The students put waste in separate bins kept at different places in the college campus.

The Red & Green coloured dustbins are placed separately for degradable and non-degradable waste at every corner of the corridor, wash rooms and common room. The dry dustbins are also placed in laboratories, library, classrooms, etc. Old newspapers, used papers and journal files, workshop scrap etc. are given for recycling to external agencies.

The solid waste is regularly collected by Chandori Gram Panchayat.

The plant materials such as grass and dry leaves are used for vermin compost plant. The solid waste is segregated as dry & wet as well as easily disposable & non disposable. The boards with meaningful slogans are displayed to create environmental consciousness among the students as well as stakeholders. The vending & burning machine has been installed in the ladies' room to ensure cleanliness.

The NSS volunteers regularly conduct cleanliness campaign in the campus and contribute to keep campus neat and clean. The students from Earn and Learn Scheme are also assigned the responsibility of collecting litter. A gardener and lady workers are appointed by the College. The College sees to it that no environmental hazards are created in the campus.

Fig.4. Solid Waste Management

Fig.5. Campus Cleaning Activity

Fig.6.Vending and Disposal Machine

LIQUID WASTE MANAGEMENT:

There is a drainage system to manage the liquid waste of the college. All waste water lines from toilets, bathrooms etc. are connected with Municipal drainage.

Preferentially diluted solutions are used for experimental purpose. Concentrated solutions are thrown in sink only after dilution.

After treatment (steam sterilization or using chemical disinfectants) liquid wastes are disposed of in the diluted forms through the drainage system.

Fig.7. Water storage Tank

Fig.8. Water Pump

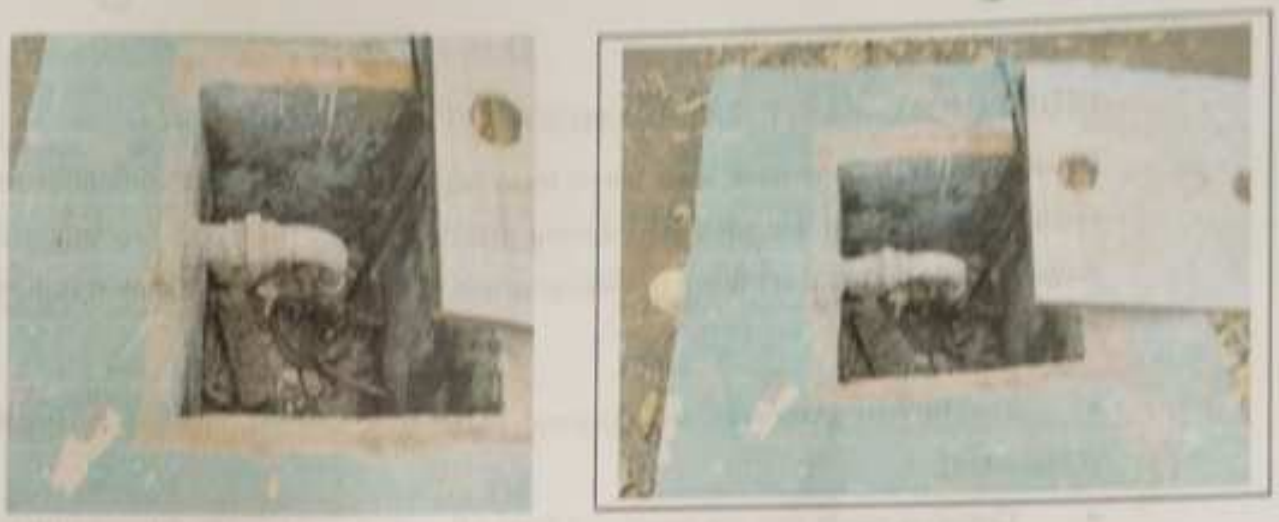

Fig.9. Bore Well

Fig.10. Storm water pipeline & Drainage system

BIOMEDICAL WASTE MANAGEMENT :

Department of Botany uses Semi micro level-based method to avoid contamination of Chemical waste that are produced during practical work. The Plant raw material or unused waste material are taken in Biodegradable waste dustbin and further it is dumped in soil.

- The Broken glassware are disposed in separate dustbin labelled as Breakage (Glassware).
- Chemical waste that are generated during Practicals are initially diluted with water and thrown in Chemical Waste Dustbin.
- Biodegradable Waste: Plant parts such as Roots, Stem, leaves,flowers, fruits etc.
- Breakage (Glassware): Glassware such as Pipettes, Petri dish, Cover slip, Glass slide, Beaker etc.
- Chemical Waste: Staining Dyes such as Saffrine, Methylene Blue, Acetocarmine stain, Methyl Orange etc. and chemical such as acetone, sugar solution, sodium arbonate etc.

Fig.11. Chemical Waste

Vermi compost

To keep the environment eco-friendly, We are adding the composite culture layer by layer with proper aeration .After semi decomposition we add earthworms for future process and vermicomposting.

A good quality of vermin compost is obtained from this process. This vermin compost is utilized in college campus for gardening.

Fig.12, Vermicompost Plant

E-WASTE MANAGEMENT :

The parent institute has provided a mechanism for E-waste management. The committee members of this mechanism decide the E-waste material i. e. laboratory equipment's, computers, monitors, printers etc. As per their advice, the college dispatches the same to the store of K.K. Wagh Education Society, Nashik for disposal.

HAZARDOUS AND RADIOACTIVE WASTE MANAGEMENT:

There is a mechanism to dispose the hazardous chemicals of the Chemistry laboratory.

Fig.13. Hazardous Waste Management

5.1. Recommendations

- Paper waste is generated by all departments. Especially, building Block A is using more one one side papers for printing and writing which is a good practices.
- Answer sheets, old bills and confidential reports are sent for shredding, pulping and recycling after completion of their preservation period.
- Campus has banned use plastic for any administrative as well as other purpose and therefore very less amount of plastic waste is generated in the Campus.
- Glass waste is generated from laboratory mainly in the form of bottles; Many times bottles are reused for storing of other chemicals and liquids.
- must form a dedicated team to gather data, analyze current practices and make recommendations for improvement.

- K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori should encourage the home made practices for compost from tree waste.

6. CARBON SEQUESTRATION AND GREEN COVER INVENTORY

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO2) the atmosphere locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO2 .The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO2. On this background it is a need of time to cover the research areas interrelated with climate change.

The "Carbon Sequestration and Green cover inventory" is a current status of tree cover and vegetation carbon storage assessment of area under K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori. campus. In an era of climate change and global warming carbon emission, carbon footprints, carbon sequestration, adaptations, mitigation are the keywords in academia.

6.1. Carbon Sequestration

Carbon sequestration is a process of converting atmospheric carbon i.e. CO2 in to other sinks of carbon such as vegetation, soil, ocean etc. in various forms to mitigate global warming audit is one of the important clauses of Kyoto Protocol.

6.1.1. Need of Study

While transforming ourselves, it is a responsibility of such campus to face the global future challenges and try to find out possible solutions for them. It is a social and environmental responsibility of Government Institutes, Universities, National and International Organizations to respond positively for various global issues at local level and should percolate the generated knowledge in to the society. Global warming and climate change are current environmental issues need to be addressed scientifically and

efficiently. As Universities are provided with skilful human resource supported by analytical infrastructure, it is our duty to bring such ideas in practice. While understanding the call of time the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori . has decided to enumerate the green cover of campus and quantify the carbon sequestration of existing tree population.

6.1.2. Objectives

- To study woody green cover of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus.
- To study species diversity of woody vegetation in the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus.
- To understand biomass and carbon stock accumulated by woody vegetation in the campus.
- To explore carbon sequestration potential of woody vegetation in the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus.
- To explore potential of woody vegetation of the campus as an oxygen source.
- To measure canopy cover of the trees on the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus.

6.1.3. Methodology

6.1.3.1. Study Area

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori College is situated at North-West side of Maharashtra at 20.012705 N and 73. 822161 E in the heart of Nashik City and it is at the altitude of 584m above sea level. K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus covers an area of 8093m^2 . Out of this 350 m^2 area is covered with plants.

Fig.14.: Aerial view of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori

6.1.3.2. Field Survey

Field Survey was carried out with the help of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandoricampus staff. Filed survey is done with the help of measuring tape, chalks, writing pad, etc. A tree with girth (circumference of tree) more than 10 cm at chest level and height more than 4 feet were considered as tree and taken for enumeration. Girth of each tree was measured with the help of tape and approximate height by visual method. Identification of tree species was done with the help of field guides, web source and with the help of expertise of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus.

6.1.3.3. Data Analysis

All the collected data was tabulated and analyzed with the help of MS- Excel spreadsheets and objected findings were extracted by using various factors given by Intergovernmental Panel on Climate Change (IPCC). All the tabulated data is analyzed by following standard formulae.

A.Measurement of circumference of the tree:

To estimate the biomass of the each individual tree species, non- destructive method was used. The circumference Diameter at Breast Height (DBH) can be determined by measuring tree Girth at Breast Height (GBH), approximately at 1.3 meter from the ground. The Girth at Breast Height of trees having diameter which greater than 10 centimeters were measured directly by measuring tape.

B. Height measurement:

Tree height is the important factor for the calculating tree biomass and evaluating tree life history. There are number of different methods which are used for the measurement of tree heights from the ground. For the present tree census, the height of individual tree is measured by visual method.

C. Above Ground Biomass (ABG) of tree:

The above ground biomass is the most abundant and visible pool of carbon in its all the forms. The above ground biomass of tree includes branches, stem, fruit, whole shoot and flowers.

The specific wood density is used from the standard guidelines. By using the guidelines the AGB of all the tree species were calculated.

D. Estimation of carbon:

Generally, in any plant species the 50 % of its biomass is considered as the carbon.

E. Determination of weight of carbon dioxide (CO_2) sequestrated in the tree:

Trees are the autotrophs, which make their own food by using photosynthesis. They took CO_2 and release O2 . The sequestrated CO2 is calculated by using the Carbon Sequestration Factor is used given by the standard guidelines by IPCC.

6.1.3.4. Canopy Cover

Canopy cover is measured by using standard guidelines. A canopy cover of tree is measured by tape using crown area cover. All the collected data was tabulated and analyzed with the help of MS- Excel spreadsheets. The crown cover areas of the trees were measured during the day time. The diameter of crown at its widest point (A) as well as the diameter of the crown perpendicular to its widest point (B) was measured in feets. The average diameter of the crown was calculated. Using the average diameter canopy cover area was estimated.

6.1.3.5. Findings

Total number of trees enumerated in K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori **campus:**

The total 29906 m^2 area of K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori Campus has 100 m^2 areas of Botanical Garden, 464 m^2 areas of Green lawns & 12666 m^2 area of playing ground. Total 12 numbers of trees with 10 cm or more

girth and height 4 ft or more have been numerated. Girth and height of every tree has been measured by using tailoring tape and chalks.

Fig.15.: Various Plants in KKWACS&CS campus

Total No. of tree species identified in K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus:

There are total 37 tree species have been identified during the census. It shows rich plant diversity on campus.

6.1.3.6. Tree Species

The total tree species categorized into 4 groups

1) Vegetables
2) Fruits
3) Flowers
4) Medicinal

Table1: List of plants in campus according to their medicinal & any other uses.

Sr. No.	Botanical Name	Common Name	Number
1.	*Terminalia arjuna*	Arjun	22
2.	*Adhatoda vasica*	Adulsa	01
3.	*Eugenia jambolana*	Jamun	03
4.	*Sapindus mukorossi*	Reetha	04
5.	*Aloe vera*	Aloe vera	03
6	*Moringa oelifera*	Drumstick Tree	03
7.	*Hibiscus rosa sinensis*	Hibiscus	05
8.	*Murraya koenigii*	Curry Leaves	04
9.	*Aegle marmelos*	Bael	02
10.	*Pongamia pinnata*	Indian Beech tree	20
11.	*Acacia nilotica*	Babul	09

12.	*Ocimum sanctum*	Tulsi/basil	05
13.	*Azadirachta indica*	Neem	04
14.	*Khaya senegalensis*	Mahogany	26
15.	*Platyclades orientalis*	Juniper	06
16.	*Araucaria columnaris*	Christmas Tree	02
17.	*Caryota mitis*	Fishtail Palm	28
18.	*Plumeria obtusa*	White Frangipani	3
19.	*Plumeria rubra/ aurelia*	Red Frangipani	2
20.	*Tabebuia aurea*	Caribbean Trumpet Tree	15
21.	*Tamarindus indica*	Tamarin	08
22.	*Phyllanthus emblica*	Amla	09
23.	*Cestrum diurnum*	Jessamine	13
24.	*Ficus benjamina*	Banyan	108
25	*Senegalia Catechu*	Black Catechu	06
26	*Castanospermum australe*	Black Bean	02
27	*Psidium guajava*	Guava	01
28	*Polyalthiya longifolia*	Ashoka	10
29	*Annona squamosa*	Custard Apple	02
30	*Sesbainia grandiflora*	Agathi	03
31	*Ekevergia capansis*	Cape ash	05
32	*Tabebuia rosea*	Pink Tecoma	13

33	*Nerium olender*	Nerium	01
34	*Eucalyptus obliqua*	Nilgiri	06
35	*Mangifera indica*	Mango	05
36	*Dypsis wtescens*	Bamboo Palm	12
37	*Dracaena draeo*	Dragon Tree	02
Total Plants			**407**

6.1.3.7. Total Biomass

In ecology, the mass of living biological organism in a given area or ecosystem at a given time is called as biomass. Biomass can refer to species biomassand community biomass. The species biomass is the mass of one or more species. The community biomass, which is the mass of all species in the community. It includes microorganisms, plants or animals. The mass can be defined as the average mass per unit area, or as the total mass in the community. K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori has taken initiative for increase in biomass in the college campus.

6.1.3.8. Carbon Stock

The main carbon sink in tropical forest ecosystems includes the living biomass of trees, understory vegetation, dead mass of litter, woody debris and soil organic matter. The carbon stored in the Above Ground Biomass (AGB) of trees is the largest pool and is directly impacted by deforestation and degradation. Trees and forests act as natural carbon stores, but this carbon is released when the trees are felled and the area deforested. The amount of carbon stored within an area of land varies according to the type of vegetation present in the campus.

6.1.3.9. Carbon Sequestration

Carbon sequestration is long-term storage of carbon dioxide or other forms of carbon to avoid climate change. It has been considered as a way to slow the atmospheric and marine accumulation of greenhouse gases, which are released by burning fossil fuels. Vegetation carbon pool having the potential of 560 Pg (Pg: Pentagram= billion ton) of carbon storage globally. In the current study the focus is given on the assessment of existing carbon stock stored in K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus in the form of woody vegetation by enumerating every tree species.

6.1.3.10. Oxygen Release

Woody vegetation in K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori. campus has released ample tons of oxygen in their lifetime till date. Released oxygen is directly proportional to CO 2 sequestrate.Single tree supports oxygen demand of two people for their life. Thus, the trees in the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori (Ranwad) campus are supporting many people on and around the campus.

6.2. Recommendations

To maintain green cover and carbon sequestration potential of Institute following precautionary measures have to be taken by every stake holder of the College.

- Plantation of endemic species like *Acasia catechu, Alstonia scolaris, Butea monosperma, Azadirachta indica* etc. will be helpful for conservation of native biodiversity.
- The plantation of tree species like *Acacia nilotica subsp. indica, Albizia lebbeck, Azadirachta indica, Citrus aurantium* works as green belt which can maintain the ecological balance in the environment as well as act as sink for the harmful gases and improve air quality.
- Plantation activity should be taken yearly to increase the green cover on the campus.
- Avoid plantation of exotic species like *Gliricidia sepium* which is fast growing species with less ecological values.

6.3. Carbon Footprints

In today's world one of the biggest issues faced by all of us is global warming. Global warming refers to an increase in average global temperature of mother Earth. The main cause of global warming is increase in the concentration of greenhouse gases (GHGs) in the atmosphere due to anthropogenic activities and their level is determined with the help of global warming potential (GWP) and expressed as Carbon Footprint (CF). Carbon Footprint is another phenomenon used for GHGs or carbon dioxide emission in terms of CO2 equivalents. There are various definitions of carbon footprint are in literature. But the most recognized definition given by Wiedmann "the Carbon footprint is the measure of carbon dioxide emissions directly or indirectly caused by an activity or accumulated over the life stages of a product." In other words, "A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organization, event or product." As the K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori (Ranwad) considered as institutional organization, the various energy resources like electricity, fuels, Liquefied petroleum gas (LPG) are used. It is necessary to calculate the carbon footprint of the Institute to upgrading the Clean Developmental Mechanism (CDM) in various processes. All the data from the various sources were collected from all the sectors where energy resources are used. The collected data is calculated by using standard emission factors.

6.3.1. Electricity Carbon Footprint

In the College campus, electricity is used for various purposes like residential, office use and in the laboratories. The total electricity used in the institute is 7,51,264 Kwh/annum which (approximately) liberates 2,78,719 kg of CO2 per year. **Vehicle Footprint**

The vehicles are the source of CO2 and other greenhouse gases. The number of vehicles passed through the campus daily, which emits the CO2 in the atmosphere which add tons of CO2 as vehicle footprint. Burning 1 Ltr of Gasoline produces 2.3 Kg of CO2.

6.3.2. Paper Footprint

The papers are used in the institution for various purposes like exam answer sheets, circulars, notices, office work etc. The papers are responsible for the emission of CO2. In the College campus various departments follows paperless methods of communication to reduce the footprint by use of papers. The various sections on the campus save 2000

papers per years. The paperless work reduces approximately 100 kg of CO2 approximately.

6.4. Reducing the Carbon Footprints

- Installation of solar panels or solar energy generation devices should be enhanced to reduce the electricity footprint of the campus. Terrace of each building can be utilized to produce electricity from solar modules.
- The Green computing or E- work is helping the organization to reduce footprint very effectively.
- The solar energy based street lamps on campus will reduce carbon footprint.
- The awareness should be made among the faculty, students and other employees regarding

Clean Development Mechanism (CDM) to reduce the consumption of electricity and natural resources.

7. GREEN INITIATIVES BY COLLEGE

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori college is situated at North-West side of Maharashtra at 20.013175620996442 N, 73.82213376136573 E in the heart of Nashik City and it is at the altitude of 584m above sea level. K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus covers an area of 8093m^2. Out of this 350m^2 area is covered with plants. The college aims to protect and conserve its biodiversity, fresh and clean ambience through many initiatives.

7.1. Carbon Sequestration on the college campus

K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandori campus has 120 trees on the campus and therefore, college campus is considered as a carbon sink for carbon sequestration. This woody vegetation helps in sequestrating tons of CO2 with the liberation of oxygen annually. Thus, the campus is working as a good carbon sink and a productive oxygen park.

Fig.16. Tree Plantation Activity in college Campus

7.2. Plantation and Nurturing program

The College on its campus takes many plantation drives. Every year on 5th June i.e. World Environment Day, the college takes Plantation activity. The garden department looks after tree plantation activities. The trees are watered by drip irrigation system to conserve the water. Students of various departments make the plantation and nurturing programmes successful.

Fig.17. Tree Plantation Activity outside Campus

7.3. Green Computing practices

Being an academic institution, papers are used for various purposes like exam answer sheets, circulars, notices, office work , for document printing and Xeroxing. Since the trees are cut for paper manufacturing, the sequestration of carbon is reduced increasing carbon foot print. To cut down the carbon footprint, the institute administration and various departments follows paperless methods of communication by using emails. Through such practices, it was estimated that overall 2000 papers per years were saved during the routine work. The paperless work was helpful in reducing approximately 100 kg of CO_2 .

7.4. Plastic free Campus

The K. K. Wagh Arts, Commerce, Science & Computer Science College, Chandorihas banned use of plastic on the campus and campus of college is "Plastic free campus". In all functions, workshops and conferences, the plastic mineral water bottles, tea cups, straws, bouquets and gifts with plastic covering, decorations and unwanted plastic use is strictly avoided. Instead of mineral water bottles, the drinking water is made available through traditional water pots or steel water.

Fig.18. Plastic free drive in Campus

7.5. Installation of Solar PV System

The institute has installed Solar rooftop system with 20 kw capacity . Among the renewable sources of energy, solar energy has a huge potential for power generation in Maharashtra. There are 250-300 days of clear sun with an available average radiation of 4 to 6 kWh/sq.metre over a day.

As oil prices have gone up and other energy sources remain limited, nations are increasingly searching for safe, reliable long-term sources of power. In this scenario solar energy proves to be an abundant energy source which can be put to use. Solar electricity is being clean (pollution free), silent, limitless and free will play a great role in the times to come in the present energy driven civilization.

The solar rooftop project helps the institute financially as well as environmentally.

The solar rooftop project helps in reducing the monthly electricity bill as well as it helps in mitigation of carbon footprint. The existing Solar rooftop PV system generates 2400Kwh of energy annually which helps in mitigating 310 tonnes of CO2 and it is equivalent to plantation of 490 trees.

Fig.19. Solar PV System

7.6. Photos of various related programs conducted by Institute

8. SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary :

Green Audit is one of the important tools to check the balance of natural resources and its judicial use. Green auditing is the process of identifying and determining whether institutional practices are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. The main objective to carry out green audit is to check the green practices followed by institute and to conduct a well-defined audit report to understand whether the institute is on the track of sustainable development. This is the first time to conduct green audit of college campus. After completing the audit procedure of College campus for green practices, there are following conclusions, recommendations which can be followed by college in future for keeping campus environment friendly.

Conclusion:

From the green audit following are some of the conclusions which can be taken for improvement in the campus.

1. Institute takes efforts to dispose majority waste by proper methods. The Green computing i.e. Online payment system, online circulars and examination procedures are helpful for reducing the use of papers and ultimately reducing carbon footprint.
2. Reducing the use of one time use plastic bottles, cups, folders, pens, bouquets, decorative items will be useful to solve the problem of plastic pollution to some extent.
3. Biodegradable waste is used efficiently for composting and vermicomposting. There is a scope to utilize the organic matter for biogas generation or manure production.
4. Rain water Harvesting in the campus proved to be one of the best watershed management program for making the institute self-reliant in water.
5. RO drinking water has solved the major problem of safe drinking water in all departments,
6. No Vehicle Day" proves to be one of the good practice to save the fuel and help for green and clean environment on the campus.

7. The overall ambient air quality on the campus is good while some air quality issues may arise due to developmental activities on the campus should be addressed.

8. The sound levels in the campus is good except due to some transportation and construction activities.

Recommendations:

Following are some of the key recommendation for improving campus environment:

- There is need of increase in solar plant capacity to fulfill the college demand at the earliest to reduce the carbon footprint and indirectly saving the money of college.
- An environmental policy document has to be prepared with all the recommendations and current practice carried by campus.
- A frequent visit should be conducted to ensure that the generated waste is measured, monitored and recorded regularly and information should be made available to administration.
- The College should develop internal procedures to ensure its compliances with environmental legislation and responsibility should be fixed to carry out it in practice.
- The solid waste should be reused or recycled at maximum possible places.
- Reuse of glass bottles for storage of chemicals should be encouraged or the bottles should be sent to again suppliers for reuse.
- Regular checkups and maintenance of pipes, overhead tanks and plumbing system should be done to reduce overflow, leakages and corrosions.

GREEN ENCON SOLUTION GES

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Date: 08/01/2022

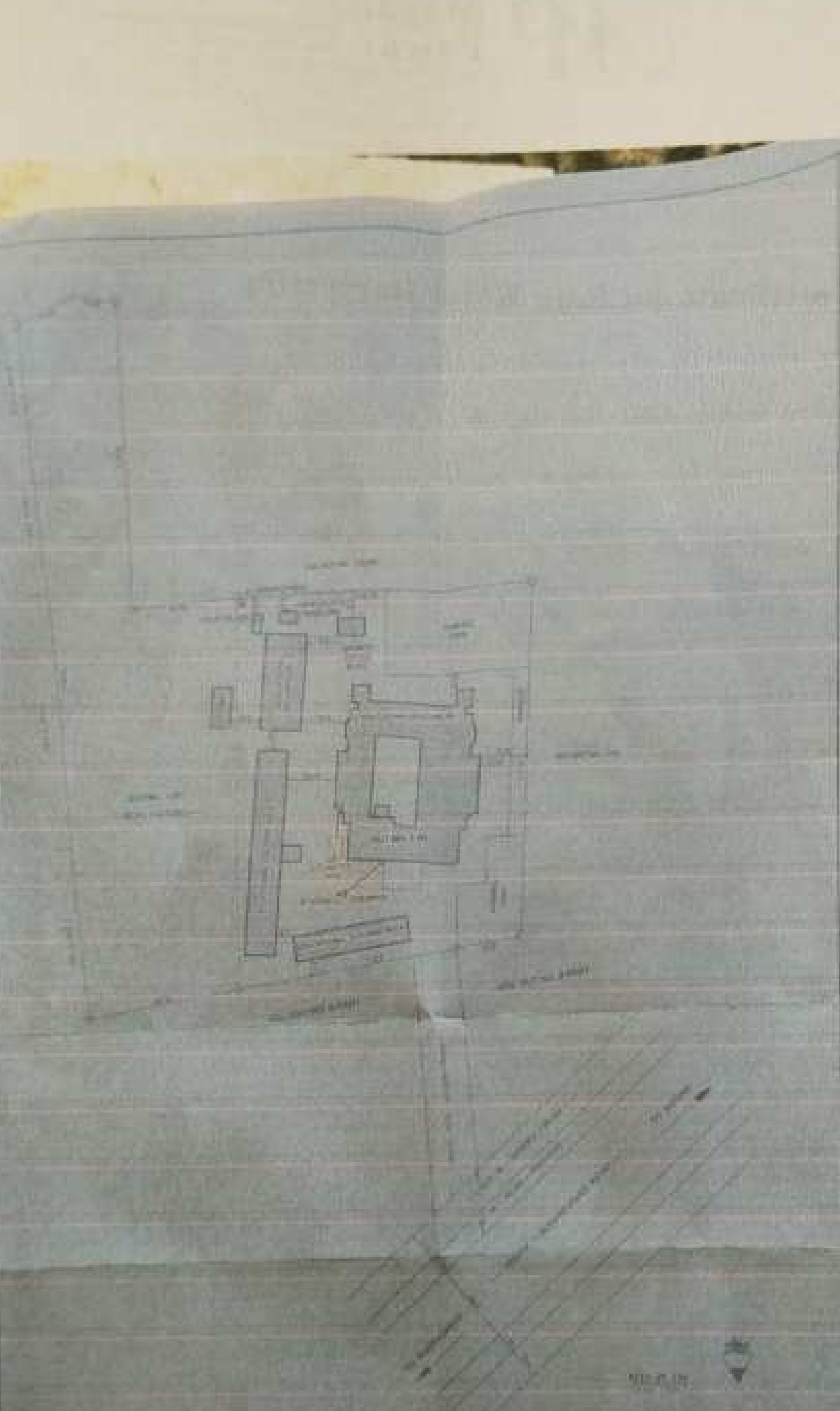
Certificate for Rain Water Harvesting

This is to certify that the roof top rain water of Educational Building No.1 in G.No.1-P, 6-P, 8-P @ Chandori, Tal-Niphad, Dist-Nashik of K.K.Wagh Education Society is collected by down take rain water pipes & connected to Bore well & U/G Water storage tank thro' filtration chambers.

The filtered rain water is percolating to the resource thro' Bore well. The water stored from roof top in U/G water Tank is used for gardening & recharging the bore well.

M. D. PAWAR
FOR MAGAR PAWAR ASSOCIATES

Shri Wadghule - Record / NAAC
10/1/22



RAIN WATER HARVESTING DETAILS
OF EDUCATIONAL COMPLEX IN GUT NO.
1-P & P 6-P AT CHANDORI, TAL. NIPHAD,
DIST. NASHIK FOR
K.K. WAGH EDUCATION SOCIETY

Architect - P. B. MATHKAR - Mumbai

ENGINEER

Magar
Patwar

Santosh D Jadhav
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GREENENCON SOLUTIONS

A Complete Solution on Energy Auditing and Consulting

GREEN & ENVIRONMENTAL AUDIT

CERTIFICATE

This is to certify that **GREENENCON SOLUTION** has successfully completed Green & Environmental Audit at **K. K. Wagh Arts, Commerce, Science & Computer Science College** Chandori, Nashik. The work of Energy Audit is completed on 1st Feb., 2023 for year 2022-23.

Thanking you and assuring you for our best services.

Audit Report by,

Mr. Santosh D Jadhav
Energy Auditor (BEE cert.)
Regn. No.- EA-21802

Santosh D. Jadhav
Energy Auditor
BEE Certified
Regd.No.EA-21802

Date: 01/02/2023
Place: Nashik

For **GREENENCON SOLUTION**

Mr. Santosh D Jadhav

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