

2022- 2023

GREEN AUDIT REPORT



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**K.K.Wagh Arts,
Commerce, Science &
Computer Science
College, Kakasaheb Nagar,
Ranwad**

2022-2023

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A Complete Solution on Energy Auditing and Consulting

Ref.- EAS/KKWACSC / 2023-24/07

GREEN AUDIT CERTIFICATE

This is to certify that **GREENENCON SOLUTION** has successfully completed Green Audit at **K.K.wagh Arts, Commerce, Science & Computer Science College, KakasahebNagar(Ranwad), Nashik**. The work of Green Audit is completed on 20th Jan, 2023 for year 2022-23.

Thanking you and assuring you for our best services.

Audit Report by,

A handwritten signature in black ink, appearing to read 'Santosh D Jadhav', is written over a large, faint watermark of the company logo.

Mr. Santosh D Jadhav

For GREENENCON SOLUTION

A handwritten signature in black ink, appearing to read 'Santosh D Jadhav', is written over a large, faint watermark of the company logo.

Mr. Santosh D Jadhav

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Date: 25/01/2023

Place: Nashik



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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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PREFACE

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR, RANWAD is the acknowledged leader in education field. Today K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR, RANWAD 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, KAKASAHEBNAGAR, RANWAD 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, KAKASAHEBNAGAR, RANWAD 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, KAKASAHEBNAGAR, RANWAD, 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. A.S.Gaware**

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, KAKASAHEBNAGAR, RANWAD 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, KakasahebNagar(Ranwad) Nashik include all Courses in the same building affiliated with Savitribai Phule Pune University.

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad), Nashik started in 2004 with a current intake of 450 for the Arts, Commerce, Science & Computer Science course. Over the years, K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad), 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, KAKASAHEBNAGAR College(Ranwad), 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, KakasahebNagar(Ranwad) 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 Modi has declared the Mission of Swachh 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, KAKASAHEBNAGAR College(Ranwad). 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, KAKASAHEBNAGAR College(Ranwad), 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 resources Identify 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.

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

K. K. Wagh Education Society, by making education a tool for the development of rural areas, K. K. Wagh Arts, Commerce, Science and Computer Science College, Kakasaheb Nagar (Ranwad), is affiliated to Savitribai Phule Pune University started in 2004 having Total Campus Area 26587.84675 Sq.Meters.

In addition to the prevailing university curriculum, the college provides facilities such as guidance for competitive examinations, personality development, and exposure to the professional world, computer training etc. Various student welfare schemes, Nirbhay Kanya Abhiyan, Earn and Learn Scheme, Vidyarthini Manch, Special Mentoring schemes organized by Savitribai Phule Pune University are implemented in the college to develop the personality of the students. Under the Government of India and Savitribai Phule Pune University, the concept of National Service Scheme is implemented in the college and students are encouraged for the benefit of students and society. Students are guided in inter-college level debate competitions, elocution competitions, sports competitions. The library has reference books of all subjects, various newspapers, journals, as well as supplementary CDs of reference books and internet facility, LCD Facilities like projector, smart board are available. Similarly, all the materials required for various competitive exams are available and guidance is provided for the competitive exams from time to time. Lectures are organized by expert lecturers. Also well equipped Training and Placement Department, National Service Scheme, Student Development Board are functioning.

The college has resolved to create a youth generation who can dream of a bright future by combining knowledge, karma, manners and skills and to produce well-rounded students.

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 Information about watering to plant

K.K.Wagh Arts, Commerce, Science and Computer Science College, Kakasaheb Nagar has to provide water to the trees a bore well is installed, and the water from the bore is pumped into a tank with a capacity of 16000 liters. Drips have been installed at various places to provide water throughout the area. Also, the college has appointed four garden staff to take care of the trees. The said garden staffs do the work of giving water and fertilizers to the trees through drip every day.



Fig.1 Underground and Overhead water tank

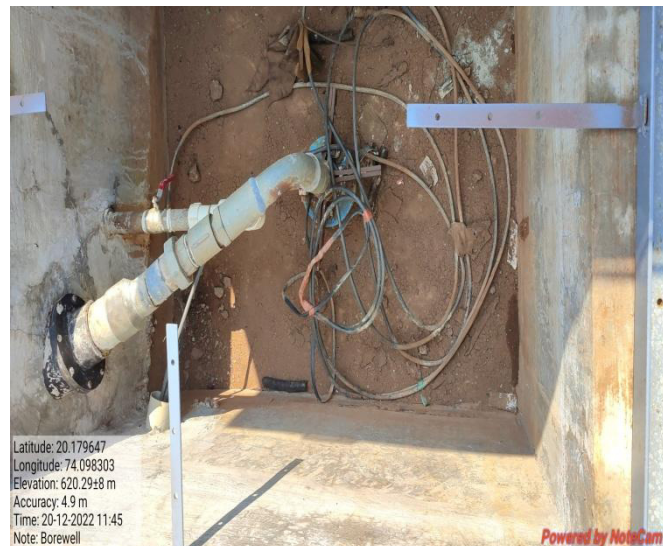


Fig.2 Bore Well

4.3 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, KAKASAHEBNAGAR College (Ranwad) needs to arrange awareness program on water conservation by motivating students and staff.
- Use rainwater harvesting system.

5. SOLID WASTE MANAGEMENT

The college has a sprawling green campus and gives top priority to keep the campus clean and eco friendly. The faculties and students are regularly advised to reduce waste at lower extent. Waste Collection is processed as per the nature of the waste. To minimize the problem of waste disposal separate dust bins are kept. Green colored dust bin is kept for dry waste and Blue colored dust bins are used for wet waste also a dust bin is kept in every room to collect the dust waste.

There is a written communication with Ranwad Grampanchayat for collection and waste management. Old newspapers, old answer papers and raw paper material (Raddi) is Sold out.

i) Dry and wet waste bin in campus



Fig.3 Dry & Wet Waste Bin

ii) Solid Waste Disposal



Fig. 4. Solid waste transportation by Ranwad Grampanchayat Garbage Tractor Trolley



Fig.5.Vending and Disposal Machine

6 LIQUID WASTE MANAGEMENT

Well-constructed drainage systems leading to the closed collection tanks, the tanks are regularly cleaned to avoid stagnation of water and soil pollution.



Fig.6. Drainage Pipelines



Fig.7. Safety Tanks

During Practicals in the Chemistry laboratory chemical waste that is generated is initially diluted with water and thrown in chemical waste dustbin. The broken glassware are disposed in separate dustbin labeled as breakage (Glassware).

1. **Solid Waste** : such as filter paper, Match box sticks, pH paper, litmus paper, Cotton balls, gloves, rough pages (for weighing samples) etc
2. **Chemical Waste:**
 - i) Solid chemicals: such as Benzoic acid, Barrium chloride, binary mixtures etc.
 - ii) Liquid chemicals: diluted acid, diluted base, titrating solutions
3. **Breakage (Glassware):** Glassware such as conical flasks, burette, glass road, Beaker etc
4. **Hazardous chemicals:** chemical which are toxic, such as Phenol, liquor Ammonia, organic solvents etc

i) Chemistry lab (Chemical Waste):-



Fig.8. Chemical Waste

7 BIOMEDICAL WASTE MANAGEMENT

Department of Microbiology used micro level method to avoid contamination of Chemical waste that are produce during practical work. The prepare culture 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 labled as Breakage (Glassware). Chemical waste that are generated during Practicals are initially diluted with water and thrown in Chemical Waste Dustbin.

- i) Biodegradable Waste: Plant parts such as Roots, Stem, Leaves, flowers, fruits etc.
- ii) Breakage (Glassware): Glassware such as Pipettes, Petri dish, Cover slip, Glass slide, Beaker etc.
- iii) Chemical Waste: Staining Dyes such as Methylene Blue, Methyl Orange, Saffrine, Acetocarmine stain etc. and chemical such as acetone, sugar solution, sodium hydroxide etc.

i) Microbiology & Botany lab (Microbial) waste :-



Fig. 9. Microbial Waste

8 E- WASTE MANAGEMENT

The E-waste like spare parts of computers i.e monitors, CPU, printers and batteries etc are being stored properly. Some of the old computers are repaired and reused. In such a way, we reuse E waste. The dead E-waste material send to parents institute. Parent institute keeps this record.



Fig. 10. E-Waste

9 Hazardous chemicals and radioactive waste management:-

In chemical waste which is exit from the chemistry laboratory contains mainly acids, bases, phenols, halogen containing organic compounds, volatile organic compounds, glass broken apparatus, solid wastes these waste don't directly disposed in the environment it leads to pollution of air, water, soil so before its disposal we selectively collected each of these waste material and disposed the chemical waste in landfills which is not harmful for soil bacteria and other biotic factors.



Fig.11. Disposal of hazardous chemicals

10 WASTE RECYCLING SYSTEM

i) 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 vermi compost is utilized in college campus for gardening.



Fig.12. Erection of vermi compost beds

11 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.
- K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR 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, KAKASAHEBNAGAR should find more reliable professional waste disposal facilities.
- K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR should encourage the home made practices for compost from tree waste.

12 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, KAKASAHEBNAGAR College (Ranwad). campus. In an era of climate change and global warming carbon emission, carbon footprints, carbon sequestration, adaptations, mitigation are the keywords in academia.

12.1 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.

12.1.1 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, KAKASAHEBNAGAR has decided to enumerate the green cover of campus and quantify the carbon sequestration of existing tree population.

12.1.2 Objectives

- To study woody green cover of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus.
- To study species diversity of woody vegetation in the K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) 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, KAKASAHEBNAGAR College (Ranwad). 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, KAKASAHEBNAGAR College (Ranwad) campus.

12.1.3 Methodology

12.1.3.1 Study Area

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) college is situated at North-West side of Maharashtra at 20.173138 N, 74.111778 E in the heart of Nashik City and it is at the altitude of 550m above sea level. K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus covers an area of 26587m². Out of this 5260m² area is covered with plants & 5076 m² by Botanical garden area.

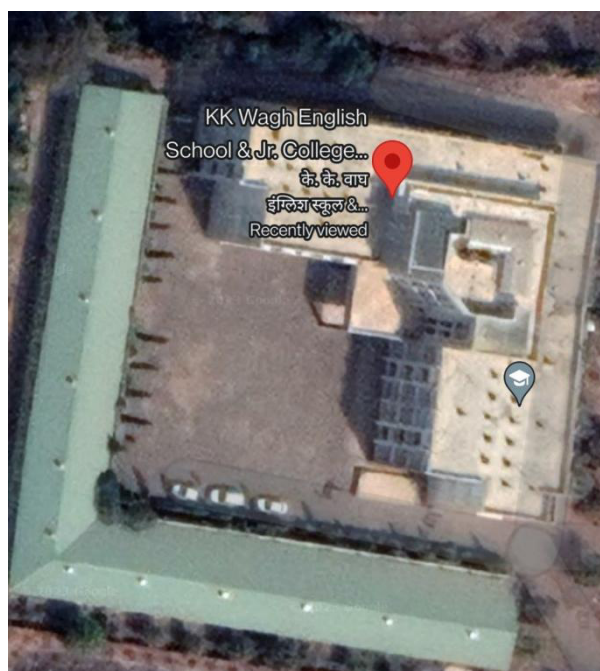


Fig.13..: Aerial view of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad)

12.1.3.2 Field Survey

Field Survey was carried out with the help of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus staff. Field 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, KAKASAHEBNAGAR College (Ranwad) campus.

12.1.3.3 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 (CO₂) sequestered in the tree:

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

12.1.3.4 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 feet. The average diameter of the crown was calculated. Using the average diameter canopy cover area was estimated.

12.1.3.5 Findings

Total number of trees enumerated in K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus:

The total 8093 m² area of K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) Campus has 350 m² areas of plantation. Total 12 numbers of trees with 10 cm or more girth and height 4 ft or more have been enumerated. Girth and height of every tree has been measured by using tailoring tape and chalks.



Fig.14.: Various Plants in K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR campus

Total No. of tree species identified in K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus:

There are total 63 tree species have been identified during the census. It shows rich plant diversity on campus.

12.1.3.6 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	Local Name	Common name	Scientific Name	Medicinal Use	Quantity
1	चिंच	Tamarind	Tamarindus indica	1) Tamarind leaves are considered to be very effective in easing joint pain and swelling because of their anti-inflammatory properties. 2) It is rich in ascorbic acid, Vitamin C and tartaric acid that help in building your immunity naturally.	18
2	दिनकाराजा	jessamine	Cestrum diurnum	1) Leaves of Cestrum diurnum are reported as a source of vitamin D3. Aerial parts are also reported to have cytotoxic and thrombolytic activities.	15
3	फिस्टलपाम	Caryota urens	Caryota	1) The leaves are triangular and sharp, the edges earning them the name 'fishtail'. 2) This tree is a source of jaggery, toddy and palm wine.	15
4	बहावा	Amaltas	Cassia fistula	Cassia fistula also used in the treatment of cancer, constipation, convulsions, delirium, diarrhea, dysuria, epilepsy, gravel, hematuria, pimples and glandular tumors.	15
5	बेल	Bel	Aegle marmelos	Bael fruits are a power punch of various nutrients like beta-carotene, protein, riboflavin and vitamin C.	03
6	रामफळ	Custard Apple	Annona reticulata	reticulata are used as source of medicine and also for industrial products. It possesses several medicinal properties such as anthelmintic, analgesic, anti-inflammatory, antipyretic, wound healing and cytotoxic	09

				effects.	
7	सिताफळ	Custard Apple	Annona squamosa	1) Good for Cancer treatment 2) Helps in weight loss 3) Relief from Colic	05
8	आपटे	Bidi leaf tree	Bauhinia racemosa	1) It is used in the treatment of headache, fever, skin diseases, blood diseases, dysentery and diarrhoea.	02
9	आंबा	Mango	Mangifera Indica	1) Various parts of plant are used as a dentrifice, antiseptic, astringent, diaphoretic, stomachic, vermifuge, tonic, laxative and diuretic and to treat diarrhea, dysentery	10
10	आवळा	Amla	Phyllanthus emblica	Amla is useful in ulcer prevention, for diabetic patients, and for memory effects. Amla Tonic has a hematinic and lipalytic function useful in scurvy, prevents indigestion, and controls acidity as well as it is a natural source of anti-aging.	02
11	उंबर	cluster fig tree	Ficus racemosa	Ficus racemosa Linn. (Moraceae) is a popular medicinal plant in India, which has long been used in Ayurveda, the ancient system of Indian medicine, for various diseases/disorders including diabetes, liver disorders, diarrhea, inflammatory conditions, hemorrhoids, respiratory, and urinary diseases.	02
12	पारिजात	Parijat	Nyctanthes arbor-tristis	Nyctanthes arbortristis used in various ailments like fever, enlargement of the spleen, malaria, blood dysentery, cough and gastritis.	01
13	बांबू	Giant bamboos	Bambusoidea	bamboo leaves are described in the traditional <i>medicine</i> for treating hypertension, arteriosclerosis, cardiovascular disease, and certain forms of cancer.	20
14	बोगणवेल	Paper Flower	Bougainvillea glabra	The aqueous extract and decoction of this plant have been used as fertility control among the tribal people in many countries.	100

				Furthermore, it has been shown to possess anticancer, antidiabetic, antihepatotoxic, anti-inflammatory, antihyperlipidemic, antimicrobial, antioxidant, and antiulcer properties.	
15	पपई	Papaya	Carica papaya	Carica papaya can be used for treatment of a numerous diseases like warts, corns, sinuses, eczema, cutaneous tubercles, glandular tumors, blood pressure, dyspepsia, constipation, amenorrhoea	03
16	चाफा	Common White Frangipani	<i>Plumeria rubra</i>	The juice of the bark is considered an effective treatment for gonorrhoea and venereal sores. The sap is used to treat stings of wasps and bees, as well as centipede bites	16
17	निवडुंग	cactus	Cactaceae	cactus is used for iabetes, high cholesterol, obesity, alcohol hangover, colitis, diarrhea, and benign prostatic hypertrophy (BPH). It is also used to fight viral infections. In foods, the prickly pear juice is used in jellies and candies.	40
18	कवट	wood-apple / elephant-apple	<i>Limonia acidissima</i>	The bark of the tree are used in several medicinal preparations for the treatment of excessive menstruation, liver disorders, bites and stings, and nausea.	07
19	काटेसाबर	silk cotton tree	Bombax	The young roots are diuretic and tonic. They are used in the treatment of cholera, tubercular fistula, coughs, urinary complaints, nocturnal pollution, abdominal pain due to dysentery, and impotency. The gum is astringent, demulcent and tonic	15
20	जास्वंद	Chinese hibiscus	<i>Hibiscus rosa-sinensis</i>	The leaves of <i>Hibiscus rosa-sinensis</i> L. (Malvaceae) are used for the treatment of dysentery and diarrhea, to promote draining of abscesses and as analgesic agent in the traditional medicine of Cook Islands, Haiti, Japan and Mexico.	10

21	सुगंधीवेल	Butter Tree./ Mahua, Illipe	Bassia latifolia	The flowers are regarded as cooling, tonic and demulcent. They are used in the treatment of coughs, colds and bronchitis.	10
22	गोल्डनडोरंडा	Duranta erecta	Duranta repens	It has been shown to possess antimicrobial, antioxidant, and insecticide properties. Its phytoconstituents such as alkaloids, flavonoids, glycosides, phenolics, saponins, steroids, tannins, and terpenoids are reported as the basis of its efficacious therapeutic properties.	01
23	करवंद	<i>karvand</i>	Carissa carandas	Its fruit is used in the ancient Indian herbal system of medicine, Ayurvedic, to treat acidity, indigestion, fresh and infected wounds, skin diseases, urinary disorders and diabetic ulcer, as well as biliousness, stomach pain, constipation, anemia, skin conditions, anorexia and insanity.	06
24	रिठा	Indian soapberry	Sapindus	he powdered seeds are employed in the treatment of dental caries, arthritis, common colds, constipation and nausea ⁸ . The seeds of Sapindus mukorossi are used in Ayurvedic medicine to remove tan and freckles from the skin.	41
25	वड	Indian banyan	Ficus benghalensis	it is astringent to bowels; useful in treatment of biliousness, ulcers, erysipelas, vomiting, vaginal complains, fever, inflammations, leprosy. The aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver etc.	01
26	पेरू	guava	Psidium guajava	Psidium guajava (guava) is well known tropic tree grown in tropic areas for fruit. It is found to be effective in diarrhea, dysentery, gastroenteritis, hypertension, diabetes, caries, pain relief, cough, oral ulcers and to improve locomotors coordination and liver damage inflammation.	01
27	कडुलिंब	neem tree	Azadirachta	Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach	05

			indica	upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions.	
28	गुलमोहर	royal poinciana	Delonix regia	regia plant is reported to contain polyphenolic compounds, viz., flavonols, anthocyanins, and phenolic acids as bioactive secondary metabolites, which are responsible for their antioxidant activity and correlated with medicinal uses, including antiulcer, anthelmintic, hepatoprotective, antimicrobial, anti-rheumatic.	02
29	सिल्वर ओक	Southern silky oak	Grevillea robusta	They were also used by Australian Aborigines as traditional bush medicines to treat wounds and sores, skin diseases, diarrhoea and dysentery and as bactericidal preparations.	03
30	बदाम	almond	Prunus dulcis	Sweet almond oil, prepared by pressing the kernels, is used to make medicine. Sweet almond is used as a mild laxative, and as a remedy for cancer of the bladder, breast, mouth, spleen, and uterus.	02
31	एरंड	Ricinus	Ricinus communis	communis have been widely used in traditional medicine such as abdominal disorders, arthritis, backache, muscle aches, bilharziasis, chronic backache and sciatica, chronic headache, constipation, expulsion of placenta, gallbladder pain, period pain, menstrual cramps, rheumatism, sleeplessness, and insomnia.	13
32	घायपात	Century plant	Agave americana	Agave americana was used as an herbal remedy for weak digestion, intestinal gas, and constipation. The juice has antibacterial properties and can be used internally to control the growth of decay bacteria in the stomach and intestines.	01
33	करंज	Pongame	Millettia	Wound and gastric treatment, gonorrhoea, cleaning gums, teeth, and ulcers, and is used	03

		oiltree	pinnata	in vaginal and skin diseases.	
34	अशोका	Ashoka tree	Saraca asoca	Ashoka has been traditionally used in Indian Ayurveda as a uterine tonic and has been indicated in menstrual irregularities ESP in DUB. Ashoka happens to be a uterine stimulant and increases uterine contractions. It also stimulates the ovarian tissue.	25
35	चंदन	Indian sandalwood	Santalum album	sandalwood oil has been widely used in folk medicine for treatment of common colds, bronchitis, skin disorders, heart ailments, general weakness, fever, infection of the urinary tract, inflammation of the mouth and pharynx, liver and gallbladder complaints and other maladies.	02
36	सायकस	Cycas Tree	Cycascircularis	Cycas revoluta is commonly known as Sago palm which belongs to gymnosperm species, cycadaceae family and has been used as a traditional medicine to cure blood vomiting, flatulence, skin diseases, hypertension, gastrointestinal distress, cough, blood pressure, hair growth, astringent, diuretic, snake bite.	01
37	नेफ्रोलेपिस	Nephrolepis	Nephrolepis xaltata	Juice of root tubers is taken to treat fever, indigestion, headache, cough, cold and hematuria. Whole plant is used to cure renal, liver and skin disorder	02
38	बॉटलब्रश	Bottle Brush	Callistemon rigidus	It is used for treatment of diarrhoea, dysentery and rheumatism. It is also used as a water accent, anticough, antibronchitis and insecticide in folk medicine .	01
39	कण्हेर	Nerium	Nerium oleander	the plant is widely used in treating ulcers, haemorrhoids, leprosy, to treat ringworm, herpes, and abscesses.	01
40	अशोक वृक्ष	Ashoka	Polyalthalonia gifolia	Ashoka powder helps in managing skin related problems and maintain clearer skin by removing toxins from the body due to its antioxidant property. It also helps in managing cancer, diabetes, piles, ulcers,	01

				worm infestation, fever, etc.	
41	थुजा	Thuja	Thujaoccidentalis	it is commonly used to treat liver diseases, bullous bronchitis, psoriasis, enuresis, amenorrhea, cystitis, uterine carcinomas, diarrhea, and rheumatism.	01
42	अडुळसा	Adulasa	AdatodaVasica	The medicinal uses of Adulsa leaves are attributed to its antitussive, antimicrobial and anti-inflammatory properties. Its leaf juice is the most common home remedy for cough, respiratory diseases and bleeding disorders. It is also a highly effective natural medicine for respiratory infections.	01
43	सीताफळ	Annona	Annona squamosa	leaves are used to treat headaches, insomnia, cystitis, and cancer, the seeds are used to treat parasitic infections	01
44	अमॉर्फॉफॅलस टायटॅनम	corpse flower	Amorphophallus titanum	treatment of gastrointestinal diseases viz. hemorrhoids, vomiting, anorexia, dyspepsia, flatulence, constipation, etc.	01
45	कमळ	Lotus Variety	Nelumbonucifera	People use lotus for bleeding, cough, fever, liver and stomach problems, and other conditions	04
46	इचोर्निया	Echhornia	Pontederiacassipes	The leaf extract of this plant contains flavonoids, alkaloids, tannins, phenols and others which have biological activities such as antiviral, antifungal, antitumor and antibacterial agents	02
47	हाइड्रिल्ला	Hydrilla	Hydrillaverticillata	used to provide complete nutrition, to improve digestion and gastrointestinal function, circulation, neurological health, blood sugar control	02
48	गुलाब	Rose variety	Rosa rubiginosa	Rose flowers are Anti-depressant, anti-spasmodic, aphrodisiac, astringent, increase bile production, cleansing, anti- bacterial and antiseptic.	04

49	शेवाळ	Spirullina	Arthrospira platensis	antioxidant, pain-relief, anti-inflammatory, and brain-protective properties.	01
50	लिली	Lily	Lilium longiflorum	Lily-of-the-valley is used for heart problems including heart failure and irregular heartbeat.	02
51	बिग्नोनिया	Bignonia	Bignonia carpeolata	It has been very effective to cure liver problems, digestive anomalies, body inflammation and fungal infections.	01
52	ड्रॅकेना	Dracena	Dracaena zeylanica	It is used in headaches, fevers, and skin problems.	01
53	इक्सोरा	Ixora plant	Ixora Coccinifera	Roots and flowers are used in dysentery, dysmenorrhea, leucorrhoea, hemoptysis, and catarrhal bronchitis.	01
54	अश्वगंधा	Ashwagandha	Withania somnifera	It is useful for different types of diseases like Parkinson, dementia, memory loss, stress induced diseases, malignoma and others.	01
55	सर्पगंधा	Sarpagandha	Rauwolfia serpentina	treatment of high blood pressure, insomnia, asthma, acute stomach ache and painful delivery and for mental illness such as neuropsychiatric disorders, psychosis, and schizophrenia.	01
56	मंजिष्ठा	Manjistha	Rubiacordifolia	Manjistha is an effective herb to promote healthy liver function. This is because it helps to improve the digestive fire that makes digestion easy and reduces the load on the liver.	01
57	मधुमालती	Madhumalti	Quisqualis indica	Madhumalti ki Bel is used in traditional medicine to treat various health conditions, including inflammation, digestive disorders, and skin conditions.	01
58	गोकर्णी	Gokarna	Clitoria ternata	The leaves, roots and stems of the Gokarna plant have anti-inflammatory, anti-bacterial,	01

			ea	and anti-viral properties, making it useful in the treatment of several diseases such as fever, headache, and skin diseases.	
59	जाईजूई	Jai Jui	Jasmin molle	asmine has been used for liver desease, pain due to liver scarring (cirrhosis), and abdominal pain due to severe diarrhea (dysentery). It is also used to prevent stroke, to cause relaxation (as a sedative), to heighten sexual desire and in cancer treatment.	01
60	जास्मिन	Kunda	Jasminummu ltiflorum	Roots are made used in snake poisoning. In Asthma, kundam flowers along with long pepper is given to drink with rice washed water	02
61	लवंग	Clove	Syzygiumaro maticum	Contain important nutrients. High in antioxidants. May help protect against cancer. Can kill bacteria. May improve liver health. May help regulate blood sugar. May promote bone health. May reduce stomach ulcers.	01
62	कळंब	Cadamba	Neolamarcki acadamba	cadamba are used in the treatment of various ailments such as fever, uterine complaints, blood diseases, skin diseases, tumour, anaemia, eye inflammation and diarrhoea.	01
63	पेरू	Guava	PsidiumGuaj ava	It is the most common and popular traditional remedy for gastrointestinal infections such as diarrhea, dysentery, stomach aches, and indigestion.	01
Total					463

12.1.3.7 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 biomass and 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, KAKASAHEBNAGAR College (Ranwad) has taken initiative for increase in biomass in the college campus.

12.1.3.8 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.

12.1.3.9 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, KAKASAHEBNAGAR College (Ranwad) campus in the form of woody vegetation by enumerating every tree species.

12.1.3.10 Oxygen Release

Woody vegetation in K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus has released ample tons of oxygen in their lifetime till date. Released oxygen is directly proportional to CO₂ 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, KAKASAHEBNAGAR College (Ranwad) campus are supporting many people on and around the campus.

12.2 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.

12.3 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, KAKASAHEBNAGAR College (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.

12.3.1 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 50,369 Kwh/annum which (approximately) liberates 18,697 kg of CO₂ per year.

12.3.2 Vehicle Footprint

The vehicles are the source of CO₂ and other greenhouse gases. The number of vehicles passed through the campus daily are 105, which emits the 49 kg of CO₂ daily in the atmosphere. Burning 1 Ltr of Gasoline produces 2.3 Kg of CO₂.

12.3.3 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.

12.4 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.

13 GREEN INITIATIVES BY COLLEGE

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) college is situated at North-West side of Maharashtra at 20.173138 N, 74.111778 E in the heart of Nashik City and it is at the altitude of 550m above sea level. K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus covers an area of 26587m². Out of this 5260m² area is covered with plants & 5076 m² by Botanical garden area. The college aims to protect and conserve its biodiversity, fresh and clean ambience through many initiatives.

13.1 Carbon Sequestration on the college campus

K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) campus has 463 trees in the campus and therefore, college campus is considered as a carbon sink for carbon sequestration. This woody vegetation helps in sequestering 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.7. Tree Plantation Activity in college Campus

13.2 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.15. Tree Plantation Activity outside Campus

13.3 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 CO₂.

13.4 Plastic free Campus

The K.K.WAGH ARTS, COMMERCE, SCIENCE & COMPUTER SCIENCE COLLEGE, KAKASAHEBNAGAR College (Ranwad) has 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.16. Plastic free Campus

13.5 Water purification Plant

The institute has installed an advanced water purification system. Through this every person in the institute department, Guest house, Hostels, etc. get benefitted by the pure drinking water. This has reduced waterborne diseases on the campus.

13.6 Solar Rooftop System

The institute has installed Solar rooftop system with 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



Fig.17.- Solar Rooftop Project

Photos of various related programs conducted by Institute



Use of Bicycles and Battery powered vehicles



No vehicle day



”Rally on the occasion of Road Saefy”.



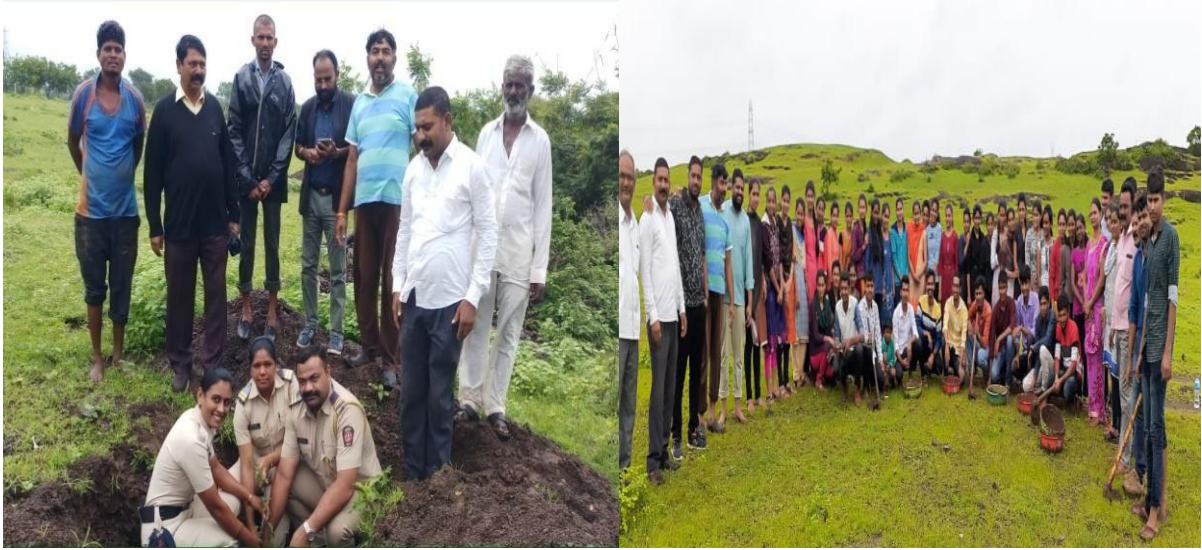
World Environmental Day



जागतिक पर्यावरण दिन प्रसंगी वृक्षारोपण करतांना



जागतिक वृक्षारोपण दिनानिमित्त प्राज्ञानोबा ढगे वृक्षारोपण करतांना. जागतिक वृक्षारोपण दिनानिमित्त प्राध्यापिका वृक्षारोपण करतांना



जागतिक वृक्षारोपण दिनानिमित्त वृक्षारोपण करताना प्राचार्य, पिंपळगाव पोलिस अधिकारी, प्राध्यापक, विद्यार्थी आणि ग्रामस्थ.



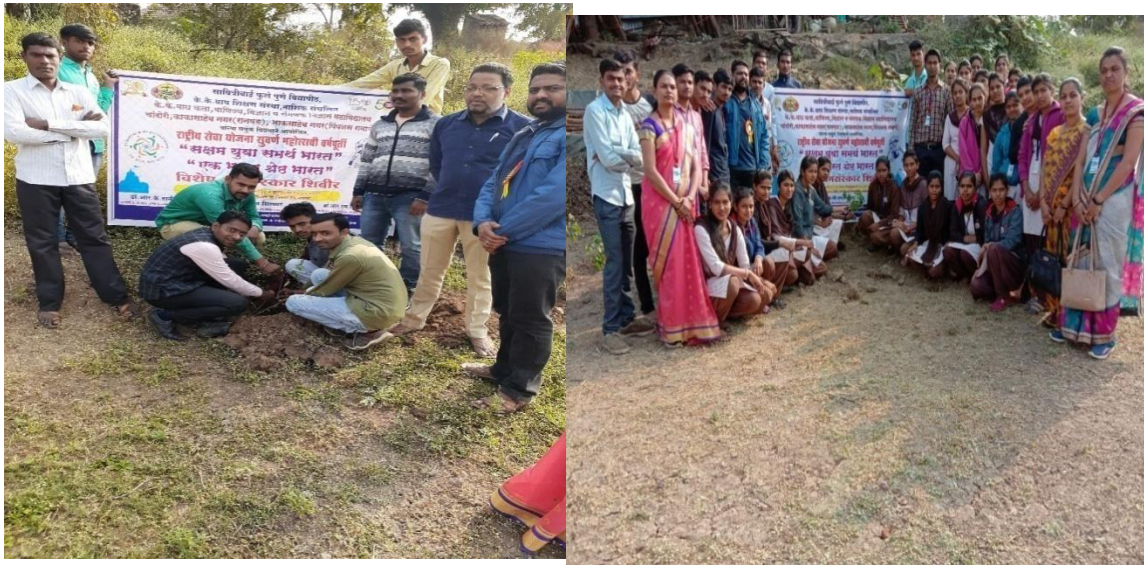
पर्यावरणपुरक गणेशमूर्ती कार्यशाळा



” स्वच्छता अभियान “निमित्तरॅलीमध्ये सहभागी प्राचार्य महाविद्यालयीन विद्यार्थी इतर शिक्षक वर्ग



”स्वच्छता” आभियानां अतर्गत महाविद्यालयीन मैदानावर सफाई करतांना महाविद्यालयीन विद्यार्थी तसेच प्राचार्य विकास शिरसाठ सरवप्राशेख .एन.एजाज ..



Tree Plantation at Adopted Village Chatori under NSS Camp in presence of Prof. V.G.Shinde, Prof.S.S.Jagtap, Prof S.P.Bankar, Prof. Jagdish Sable.



Environment Awareness Rally at Adopted Village Chatori under NSS



NSS Student and staff Cleaning college campus



Tree Plantation at K.K.Wagh Senior College Kakasaheb Nagar



World Ozone Day





Tree Plantation

14 SUMMARY, CONCLUSION AND RECOMMENDATIONS

Summary :

Green Audit is one of the important tool 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. Installation of solar panels provides ample amount of electricity. Such solar modules should be installed wherever possible in the campus.
5. Use of LED lamps and Tube Lights is minimum and is to be encouraged.
6. Rain water Harvesting in the campus proved to be one of the best watershed management program for making the institute self reliant in water.
7. Toilets and bathrooms are consuming more water in the departments. The replacement of old taps can be beneficial for solving this issue
8. RO drinking water has solved the major problem of safe drinking water in all departments,

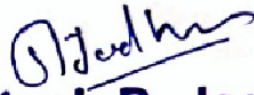
9. No Vehicle Day“ proves to be one of the good practice to save the fuel and help for green and clean environment on the campus.
10. The overall ambient air quality on the campus is good while some air quality issues may arise due to developmental activities on the campus should be addressed.
11. The sound levels on the campus is good except due to some transportation and construction activities.

Recommendations:

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

- 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 solid waste should be reused or recycled at maximum possible places.
- Installation of solar panels and rain water harvesting system to every terrace of building will be useful in conserving the natural resources.
- Regular checkups and maintenance of pipes, overhead tanks and plumbing system should be done to reduce overflow, leakages and corrosions.




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