

GV/ GA/ 04-22/ 72

Green Audit Certificate

is awarded for **2019-20 and 2020-21** to the Esteemed Institution

Tikkavarapu Rami Reddy Government Degree College

Kovur Road, Kandukur, Prakasam District

Andhra Pradesh - 523105, India

As part of the Institution's initiatives for a Healthy & Sustainable College the audit was conducted.
We appreciate the immense efforts taken by Staff and students towards the Efficient Management of Premise.

Issued on **Wednesday, 13 April 2022** valid till **April 2023**


Ar. Nahida Shaikh

Architect, IGBC Accredited Professional, ASSOCHAM GEM Certified Professional (Regn. No. 22/718)

Project Head and Green Building Professional-Consultant

Sustainable Academe

Sustainability Department of Greenvio Solutions, Naigaon

An environment Design and Consultancy developing Healthy and Sustainable Environments

sustainableacademe@gmail.com | **greenviosolutions@gmail.com**



Environment Audit Certificate

GV/ ENVT/ 04-22/ 73

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GREEN AUDIT

STUDY PERIOD (ONE YEAR) 2022 – 2023

Sustainability study

RENEWAL AUDIT REPORT

Studied for

**Tikkavarapu Rami Reddy
Government Degree College**

Kovur Road, Kandukur, Prakasam District,
Andhra Pradesh - 523105, India

Studied in the capacity of

Accredited and Certified
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Studied by

Website: <https://thegreenviosolutions.co.in/>

Email: greenviosolutions@gmail.com

Valid till **31 October 2024**

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The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and Institute. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

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Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

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RENEWAL REPORT

1. Introduction

1.1 About the functioning of the Institution

Right from the day of its inception in 1966 TRR Government Degree College aims at scattering the seeds of knowledge that only brings light and colour to the lives of rural poor and needy.

1.2 Statements of the Institution

Vision

Their vision is fired with the belief that education should communicate not only the knowledge but power - power to emerge high, power to decide right, power to think noble and at the end power to serve the society. To turn this high goal a reality they provide suitable learning environment.

Mission

- To develop this rural area into a Hub for Higher Education and cater the needs of all sections of the society.
- To impart State of the Art skills to the poor students along with knowledge and empower them to stand high and overcome all the impediments in life.
- To inculcate skills that will enable our students to withstand the competition in the job market and enable them to reach good positions.
- To design teaching learning resources that help in the all round development of the students and enable them to evolve into individuals with broad and critical thinking and human approach
- To create an atmosphere where women are respected and Girl students are treated on par.
- To provide opportunities to faculty to update and enhance their knowledge so as to inculcate the spirit of inquiry among the students.
- Also guided the Core Values of Team Work, Integrity, Transparency, Institutional Social Responsibility.

1.3 Populace analysis for Academic year 2022-2023

1.3.1 Students data

The student data shows the premises had **385 male and 182 female students**.

1.3.2 Staff data

The staff data shows the premises had 20 male and 07 female staff members.

1.3.3 Non-teaching staff data

The staff data shows the premises had 15 male and 07 female Non-teaching staff members.

1.4 Site and building spread area

The **site area is 50 acres** and the **Built-up area of the Institute is 87,040 sq. ft.**

1.5 Timeline of activities for research

As the Institute had undergone a renewal for Academic year 2022-2023, process was:

- Allotment and Initiation by the Institute
- Process discussion with team
- Data submitted by Institute
- Submission of the files

1.6 Assessment of the Institute

The Institute has received Accreditations with the following academic councils for providing various courses:

- **NAAC Accredited with B++ Grade with CGPA of 2.84 on 19-5-2023** - College has made an appeal against the grading in August 2023. The NAAC has considered their appeal and ordered for Re-DVV and Re-Visit of NAAC Peer Team. Shortly the college is expecting the NAAC Peer Team Re-visit.
- **ISO 9001 : 2015 Certified Institution**

2. Compliance

The compliance study was carried out through investigative ways. This was done to understand the **extent of suggestions and their implementations based on previous report of Academic years 2021-2022.**

2.1 Compliance status

The details of compliance are analysed on previous year Report (Academic year 2021-2022)

| S. No. | Recommendation Title | Compliance Status |
|--------|--|--|
| 1. | MoU w.r.t Green Building initiatives of Campus | Undertaken recently |
| 2. | Plant as a gift | This practice is being implemented meticulously |
| 3. | Environmental awareness | Steps are being initiated to paint pictures on the walls |
| 4. | Twin Dual Litter Dustbin Bins | Dustbins have been placed at Strategic locations for collection of waste. |
| 5. | Signages on waste collection | Signages have been placed at certain locations |
| 6. | Dustbins at every 100m | Dustbins have been placed at Strategic locations |
| 7. | Waterless urinals | Steps have been initiated and the proposals for funds have been sent to the Higher authorities |
| 8. | Water flow stopper | Water flow stopper has been installed |
| 9. | Avoid burning waste | Waste is never burnt on the campus |
| 10. | Pest control program | Steps are taken to avoid pests. |

Table 1: Details of the compliance study

2.2 Compliance technical study

The Campus is a 'Rural Model Green College' and has undertaken certain exceptional steps in the recent year as follows:

2.2.1 Mushroom Cultivation

The department of Botany was organized awareness camp on Azolla Culture, Vermicompost and Mushroom cultivation in College premises in association with Central Tobacco Research Institute, Krishi Vignana Kendram, Kandukur. The CTRI Director and their staff participated in the programme and delivered a talk on above mentioned activities. In this programme, progressive farmers near by villages, students and Teaching staff participated.

As part of MOU between CTRI and Department of Botany, the department had taken up initiation to cultivate mushrooms in college campus with BZC pursuing students. Krishi Vignana Kendram, Kandukur has arranged P. Madhava Rao, He is eminent expert farmer in the field of Organic farming and Mushroom cultivation. He trained students on Milk Mushroom cultivation.

The department procured Mushroom spawn material from M/S: S' Mushroom Agri Tech Industry, Hyderabad at the rate of Rs.1500/kg. Initial investment for Culture room and Incubation room Rs.30000/-, other requirements collected from local region with cost of 5000/-. Our students successfully cultured Milky mushroom and received good yields.

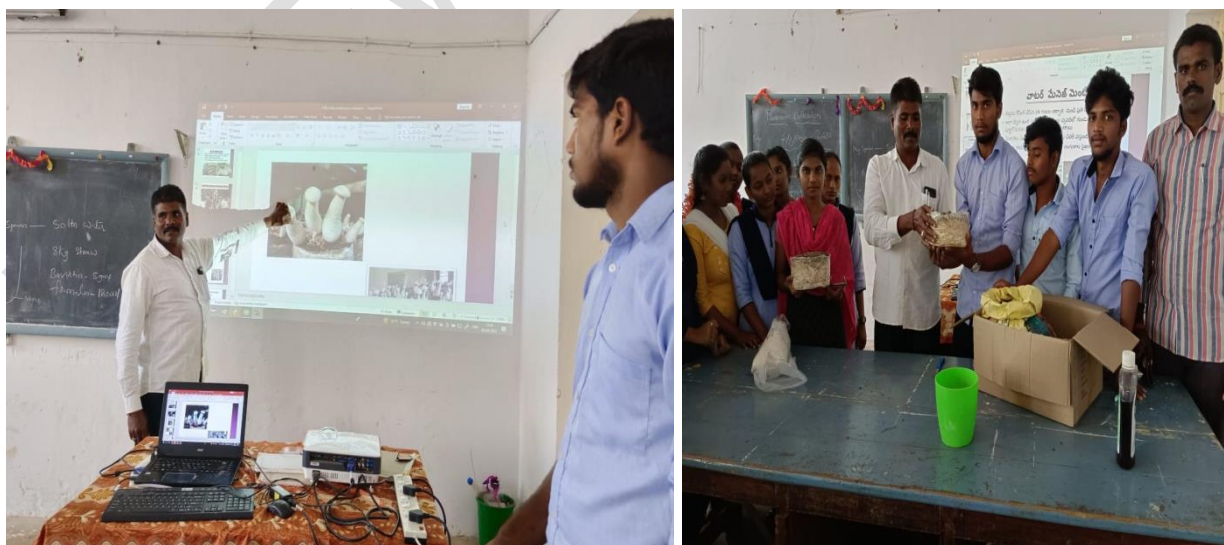


Plate 1: Mr.P.Madhava Rao garu expert in Mushroom cultivation delivering talk on cultivation



2.2.2 Aquatic Pond

The Aquatic pond is constructed in the Botanical Garden 2 of college to increase the biodiversity of the college premises. The Department of Botany and zoology took responsibility for constructing and maintaining the aquatic pond.

The biodiversity can be increased by introducing free-floating hydrophytes like Lemna, Wolffia, and Pistia along with hydrophytes with floating leaves like Nymphaea Nelumbo. In addition to this aquatic flora aquatic fauna like freshwater fishes (Catla catla, Labeo) are grown in this pond.

The aquatic pond will attract thousands of insects and other species thus increasing the biodiversity of the college. The aquatic pond measure 18feet x 9feet x 5.4 feet in length breadth and depth respectively.





2.2.3 Spirulina culture

- Started in this academic year 2022- 2023
- Two cement rings of 5 ft diameter and 1.5 ft depth are established in kitchen garden beside the Azolla pond for spirulina culture.
- Requirements for spirulina culture
- Baking soda - 16g/L
- Potassium nitrate – 2g/L
- Sea salt – 1g/L
- Potassium phosphate – 0.1 g /L
- Ferrous sulphate – 0.0378 g /L
- Regular stirring of the constituents will supply enough oxygen to the system
- Baking soda used in spirulina culture will release enough carbondioxide for photosynthesis. This alga will grow as greenish mass on the surface of water
- Colour of the water is the indicator of density of spirulina
- Deep green colour indicates luxurious growth of spirulina
- Spirulina is filtered by using the cotton cloth, then crushed to remove the water. Later dried and powdered to prepare the finished spirulina capsules.
- The Second BZC students are involved in the practice of Spirulina culture
- Future plan: The finished product will be sent to the lab for analysis of protein and vitamin content. If the results are satisfactory without toxicity then mass production of spirulina will be taken up in the college.

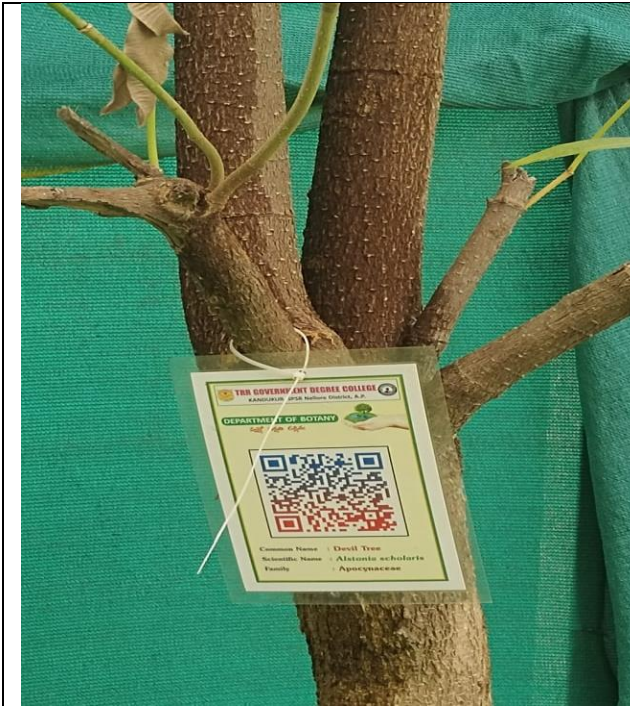


Plate 2: Microscopic Photograph taken by Dr. N. Tirupathi Swamy, Botany Lecturer, by using the bifocal microscope in Botany lab.

2.2.4 QR Coding of all the Plants

QR codes/ barcodes that can be read by mobile phone cameras, have been assigned for all trees in the campus.







3. Observations

Investigative suggestions

The following suggestions are to be considered as a **first priority to be completed in one year** for implementation. The Institute can execute a plan after discussion with Project Head.

➔ Water tanks in all areas

- Include the information about size, capacity and usage
- Paint the tank in light blue colour
- Add signboards about the usage such as 'Drinking' or 'Secondary'
- Add signboard and map about the process/ system in practice

➔ General aspects (Indoors areas)

- Zoning of the site w.r.t. space wise analysis
- Signboards, signages, information and display boards at relevant locations.

4. Inferences

The following suggestions are to be considered as a ***second priority to be completed in 2 years*** for implementation.

Green practices audit

- ➔ **Tree adoption scheme in the premises** - The Institute can adopt the One Faculty – One tree adoption scheme; this can be practiced on occasions such as toppers meet, guest sapling plantations, specific zoning of the tree adoption area. this can be very beneficial, especially during the summer season.
- ➔ **No vehicle day** - Once in a while, a No vehicle day can be adopted by students and staff to promote the use of eco-friendly vehicles on the premise.
- ➔ **Undertake environment study of local areas** – This aspect is w.r.t. environmental parameters and submits the same to local municipality for further up gradations.

Waste Audit

- ➔ **Plastic management for localities** – The can be frequent cloth/ paper bags distribution in local schools, slums, Institutes, medical, police stations.
- ➔ **Cutlery in the Canteen** – The regular plastic and steel plates, spoons used in Canteen can be replaced with eco-friendly and organic leaves, paper straw, disposable plates, edible spoons and tables made out of sugarcane waste or bamboo. This will be first of its kind initiative to be adopted and practiced thus also inculcating the healthy practices in students.
- ➔ Invite companies such as '**Thaely**' - '**Recharkha**' for skill development workshops.

Water Audit

NO changes proposed for this section

Health and Hygiene Audit

NO changes proposed for this section

5. Compilation

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- ➔ Uniform Plumbing Code – India, 2008
- ➔ IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- ➔ IGBC Green Landscape Rating system, March 2013
- ➔ BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- ➔ Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation and www.umassd.edu
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| 1. | MoU w.r.t Green Building initiatives of Campus | Undertaken recently |
| 2. | Refill fire extinguishers | Undertaken |
| 3. | There can be provision for drinking water and food facility for birds visiting the College premises | Provided water to Birds by tying environment friendly bottle cups and fill them with water. |
| 4. | Certain pits can be demarcated as 'Nutrition pits' where the organic food from the kitchen and Canteen fruit peels and fruits or vegetables can be degraded for making nutrition-rich soil. | Steps have been initiated to make the soil Nutrition rich. |
| 5. | The NSS and UBA team should undertake a project to have name plates with QR codes on every plant of the premises. | All the plants have been QR Coded. |
| 6. | The landscape redesign and ecological redesign of the entire premises should be done to increase the shade cover. | Steps have been initiated and more saplings have been planted. |

| | | |
|-----|--|--|
| 7. | The roofs of the buildings should be turned into Green roofs (By introducing terrace or vertical gardens). | Steps will be taken |
| 8. | As an appreciation gesture may be the student's toppers/ staff best performers can be awarded a bicycle occasionally. | |
| 9. | The college can go technology-friendly and go paperless in the functioning of the Premise to a certain extent maybe not fully. | The college has initiated steps to send material and information to the staff and students through whatsapp and through website. |
| 10. | Plants should be planted as they will help in Carbon neutralization. | Neem, Peepal and Teak plants have been planted. |

Table 1: Details of the compliance study

2.2 Compliance technical study

Around 120 students and 5 staff members use cycles for commuting to and fro to the campus. This highlights the green practices of the Campus.

College has installed two Fire extinguishers one at Chemistry lab and the other at Library.

3. Observations

Investigative suggestions

The following suggestions are to be considered as a **first priority to be completed in one year** for implementation. The Institute can execute a plan after discussion with Project Head.

➔ Extra care for the rooftop areas

- Introduce the signboards about 'No students are allowed to enter this area'
- Increase the height of parapet walls
- Upgrade the space as cool roof by painting it with cooltop material.
- Undertake feasibility study of before and after temperature reading.
- Take precautions to keep terrace areas free of any kind of storage materials

➔ Messages on the beam area

Include quotes and messages from eminent personalities all over the premises on beam for inspiration and beautification.

➔ General aspects

Introduce zone wise details at relevant locations

➔ Architectural landscape and streetscape features such as:

- Speed limit signage, Speed breakers and Parking mirror
- Bollards with lighting for safety and landscape
- No parking signboards at dedicated locations

4. Inferences

The following suggestions are to be considered as a ***second priority to be completed in 2 years*** for implementation. The Institute can execute a plan after discussion with Project Head.

Site beautification

Child area - There can be one provision where if student's or staff relative who are toddlers or senior citizens can rest and this area could have facilities accordingly.

Heat island reduction

➔ **Cool rooftops** - The Terrace rooftops should be painted with Cooltop – reflective materials to reflect the harsh sun rays and reduce the heat absorption in the top most floor and surrounding areas of the building.

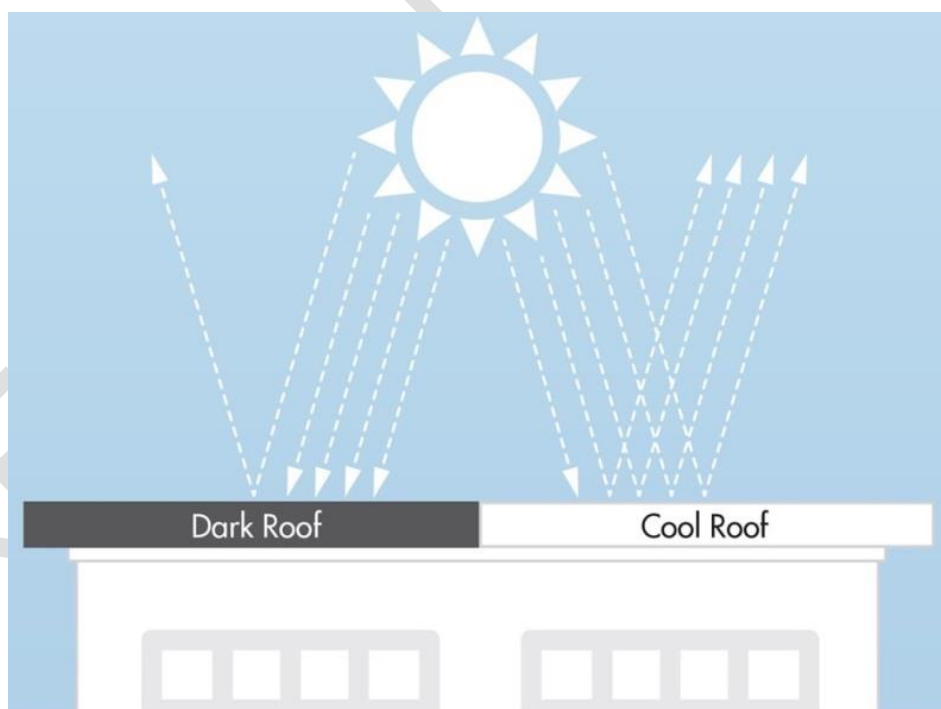


Plate 1: Cool roof comparative analysis (For reference purpose only)

Source: Image by <https://www.qaf.com/en-us/blog/six-truths-about-cool-roofs-281474980105387>

- ➔ **Structures for shaded walkways** – There should be provisions for shaded walkways and also resting/ breakout zones. A sample of the same is as follows:



Plate 2: Shade structures concept for the Institute (For reference purpose only)

Source: Image by <https://earthbound.report/2021/07/14/5-ways-to-reduce-the-urban-heat-island-effect/>

- ➔ **Green rooftops** - The Terrace rooftops can be developed as a 'Green roof' as demostarted below, but this is subject to structural ability and site constraints such as water availability, maintenance aspects.

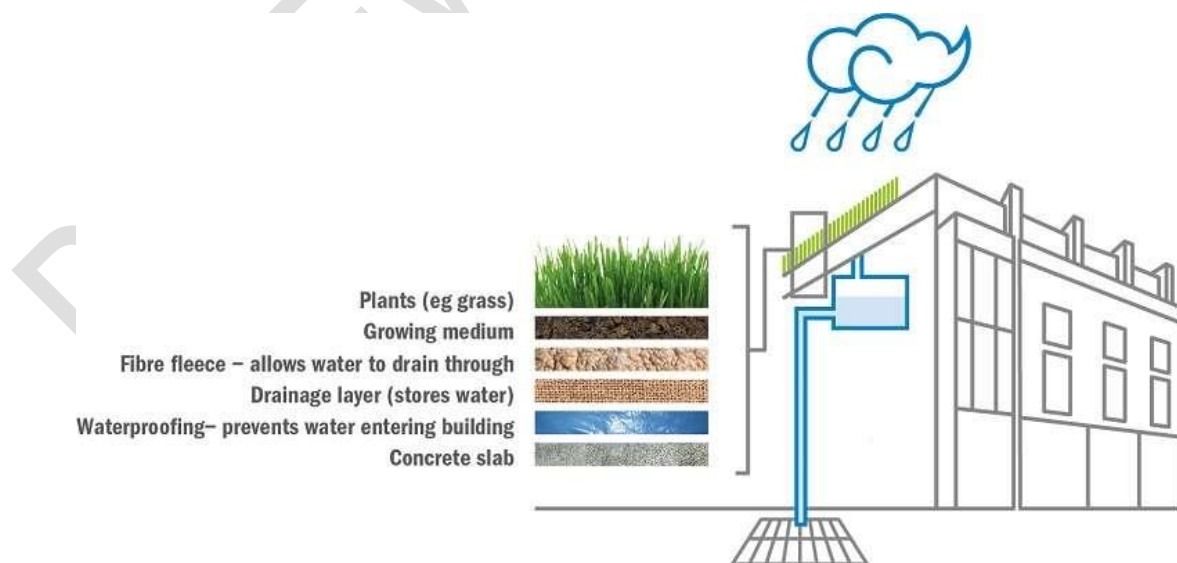


Plate 3: Green roof (For reference purpose only)

Source: Image by <https://www.iop.org/explore-physics/physics-around-you/sustainable-building/blue-green-roof#gref>

Life safety

- ➔ **Fire station** – A dedicated fire station could be established within the premises as part of the Fire and Life safety practices.
- ➔ **Mandate fire extinguisher in spaces** - One fire extinguisher should mandatorily be there in every space which has an air conditioner/ gas cylinder.
- ➔ **Safety for scientific laboratory** – These areas should have sand buckets, ventilators, fire extinguisher as per required grade, fire and life safety notice board.
- ➔ **Combustible equipment** - Every space which has a gas cylinder or combustible equipment should have a provision for the barricade around the gas cylinders, appropriate safety board's mentioning 'danger sign' and 'Do not touch' with an additional small fire extinguisher close by.

Pollution Control

- ➔ **Specific area designated for E-vehicles** – There should be designated area dedicated to E-vehicles parking and charging and this zone should be demarcated as 'Eco-Zone'
- ➔ **Avoid using plastic in premise** - There should be a provision for a ban on the use of plastic bags or products on the Premise.

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Tikkavarapu Rami Reddy
Government Degree College
Kovur Road, Kandukur, Prakasam District,
Andhra Pradesh - 523105, India

Studied in the capacity of
Accredited and Certified
Green Building Professional



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Valid till **31 October 2024**

Disclaimer

The Audit Team has prepared this report for the **Tikkavarapu Rami Reddy Government Degree College** located at Kovur Road, Kandukur, Prakasam District, Andhra Pradesh - 523105, India based on input data submitted by the Institute analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and Institute. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a while and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is an Accredited and Certified Green Building Professional. Green Building consultancy is her forte and she is one of the most sought-after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted incapacity of an Accredited & Certified Green Building Professional with extensive experience.

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Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy Firm
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Acknowledgment

The Audit Assessment Team thanks the **Tikkavarapu Rami Reddy Government Degree College, Andhra Pradesh** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are extended to **Prin. Dr.M.Ravi Kumar**, (Principal).

We are also thankful for **Institute Taskforce** who have collected the data required –

- ➔ **Dr. Yedukondalu Narendra**, Lecturer in Economics
- ➔ **Dr. N. B. Tirupathi Swamy**, Lecturer in Botany
- ➔ **Dr. N. V. Srihari**, Lecturer in Physics
- ➔ **Sri B. Kamal Babu**, Lecturer in Chemistry
- ➔ **Dr. I. Anusha**, Lecturer in Zoology
- ➔ **Dr. Ch. Sankar Rao**, Lecturer in Economics/ NSS In charge

We highly appreciate the assistance of the **entire Teaching, Non-teaching, and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

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RENEWAL REPORT

1. Introduction

1.1 About the functioning of the Institution

Right from the day of its inception in 1966 TRR Government Degree College aims at scattering the seeds of knowledge that only brings light and colour to the lives of rural poor and needy.

1.2 Statements of the Institution

Vision

Their vision is fired with the belief that education should communicate not only the knowledge but power - power to emerge high, power to decide right, power to think noble and at the end power to serve the society. To turn this high goal a reality they provide suitable learning environment.

Mission

- To develop this rural area into a Hub for Higher Education and cater the needs of all sections of the society.
- To impart State of the Art skills to the poor students along with knowledge and empower them to stand high and overcome all the impediments in life.
- To inculcate skills that will enable our students to withstand the competition in the job market and enable them to reach good positions.
- To design teaching learning resources that help in the all round development of the students and enable them to evolve into individuals with broad and critical thinking and human approach
- To create an atmosphere where women are respected and Girl students are treated on par.
- To provide opportunities to faculty to update and enhance their knowledge so as to inculcate the spirit of inquiry among the students.
- Also guided the Core Values of Team Work, Integrity, Transparency, Institutional Social Responsibility.

1.3 Populace analysis for Academic year 2022-2023

1.3.1 Students data

The student data shows the premises had **385 male and 182 female students**.

1.3.2 Staff data

The staff data shows the premises had 20 male and 07 female staff members.

1.3.3 Non-teaching staff data

The staff data shows the premises had 15 male and 07 female Non-teaching staff members.

1.4 Site and building spread area

The **site area is 50 acres** and the **Built-up area of the Institute is 87,040 sq. ft.**

1.5 Timeline of activities for research

As the Institute had undergone a renewal for Academic year 2022-2023, process was:

- Allotment and Initiation by the Institute
- Process discussion with team
- Data submitted by Institute
- Submission of the files

1.6 Assessment of the Institute

The Institute has received Accreditations with the following academic councils for providing various courses:

- **NAAC Accredited with B++ Grade with CGPA of 2.84 on 19-5-2023** - College has made an appeal against the grading in August 2023. The NAAC has considered their appeal and ordered for Re-DVV and Re-Visit of NAAC Peer Team. Shortly the college is expecting the NAAC Peer Team Re-visit.
- **ISO 9001 : 2015 Certified Institution**

2. Compliance

The compliance study was carried out through investigative ways. This was done to understand the **extent of suggestions and their implementations based on previous report of Academic years 2021-2022.**

2.1 Compliance status

The details of compliance are analysed on previous year Report (Academic year 2021-2022)

| S. No. | Recommendation Title | Compliance Status |
|--------|--|--|
| 1. | Desktop computers to Laptops | All the members of the staff have shifted to Laptops |
| 2. | Renewable energy | Not suggested but Institute has received excellent results as per study by Internal team |
| 3. | MoU w.r.t Green Building initiatives of Campus | Undertaken recently |

Table 1: Details of the compliance study

The Institute has undertaken initiative of installing rooftop solar panels wherein the energy produced extensively is utilized in the premises and excess units are exported back to the grid.

The Institute has exported 7,734 excess units to Andhra Pradesh Central Power Distribution Company Ltd.

Hereby generating an income of Rs. 28,933/- received against the same

In this way they have set a benchmark for other Educational Facilities to undertake similar initiatives

2.2 Compliance comparative study

The information for the existing nos. of electrical appliances and their power consumption is documented below.

➔ Lights – Source of electrical usage

- The current data shows there are **20 Non-LED lights contributing to 2,187 kWh of energy.**
- Since the total numbers are extensive bulk replacement is not recommended. Whenever the appliances are not, in working conditions, they are suggested to be replaced and this has been in practice as well.

➔ Fans – Source of electrical usage

- The current data shows there are **40 nos. of Ceiling fans contributing to 3,803 kWh of energy.**
- Since the total numbers are extensive bulk replacement is not recommended. Whenever the appliances are not in working conditions they are suggested to be replaced and this has been in practice as well.

➔ Air conditioners – Source of electrical usage

- The current data shows there are **6 nos. of air conditioners contributing to 11,188 kWh of energy.**
- Since the total numbers are extensive bulk replacement is not recommended. Whenever the appliances are not in working conditions they are suggested to be replaced and this has been in practice as well.

2.3 Compliance technical study

The internal team has studied, collected, and documented the following data:

| S. No. | Month | Year | Amount (Rs) | (A) Total units consumed | (B) Solar units generated | (C = A-B) Gross units consumed after deduction |
|--------|-----------|------|-------------|--------------------------|---------------------------|--|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1 | June | 2022 | 9889 | 1934 | 671 | 1263 |
| 2 | July | 2022 | 17684 | 2794 | 23 | 2771 |
| 3 | August | 2022 | 24282 | 2545 | 0 | 2545 |
| 4 | September | 2022 | 20148 | 1469 | 352 | 1117 |
| 5 | October | 2022 | 8505 | 1162 | 918 | 244 |
| 6 | November | 2022 | 4876 | 1089 | 1113 | -24 |
| 7 | December | 2022 | 6227 | 845 | 831 | 14 |
| 8 | January | 2023 | 10522 | 863 | 2503 | -1640 |
| 9 | February | 2023 | 5362 | 729 | 1466 | -737 |
| 10 | March | 2023 | 2855 | 812 | 1251 | -439 |
| 11 | April | 2023 | 4459 | 2253 | 1125 | 1128 |
| 12 | May | 2023 | 20199 | 1103 | 1490 | -387 |

Table 2: Soar unit consumption study

Note: The fifth column indicates the import units, which indicates the monthly consumption of electricity in a year.

The sixth column indicates the export units which indicates the number of units of solar energy produced by the roof top solar panels.

The last column indicates the net units, which indicates the supply of excess solar power transferred to the grid

3. Observations

Investigative suggestions

The following suggestions can be implemented ***in next one year***. The Institute can execute a plan after discussion with Project Head.

Certain aspects noted below in red font should be upgraded as per the convenience of the Institute; these are common to the site and can be considered for entire premises wherever there are similar areas.

➔ Earth pit zones

- Add signboard about 'Outdoor Electrical area'
- Code the earthing pits in the courtyard.

➔ DG and Transformer area

- Add safety *signages* such as 'Danger-do not touch' etc.
- Add *signboards* about as 'Transformer areas' and 'Diesel Generator area'
- Every user in this space should compulsorily jacket, helmet, gloves, boots while working and being a part of this space.

➔ General safety aspects

- Rubber flooring in the laboratories to avoid an electric shock.
- Introduce '*PASS*' *information board* about how to use Fire extinguisher and '*FIRE ZONE*' *display board* where safety equipments are kept.

4. Inferences

Entire site recommendations

The following suggestions can be implemented ***in next two years***. The Institute can execute a plan after discussion with Project Head.

4.1 Replacement of non-energy efficient appliance

- Non-LED lights with energy efficient appliances
- Regular ceiling fans with energy efficient appliances
- Reduce nos. of air conditioners

4.2 Alternatives towards Smart premises mechanisms - Gardening

The Institute can undertake a Smart Gardening system using IoT Technology. This will result in saving time by scheduling time for watering; saving money through automated water schedules tracking dampness of soil to know when, how much water garden needs.



Plate 1: Solar farm concept for the Institute (For reference purpose only)

Image source: <https://housing.com/news/smart-gardening/>

Data source: <https://www.happysprout.com/inspiration/what-is-smart-gardening/>

5. Compilation

The study is based on the data collected, analysed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyse and study the data collected.

Specific references for study related to energy

- ➔ <https://www.energy.gov/eere/buildings/zero-energy-buildings>
- ➔ <https://www.dsaarch.com/zero-net-positive-energy>
- ➔ U.S. Energy Information Administration
- ➔ <https://ieeexplore.ieee.org/document/6779316>
- ➔ <https://www.murata.com/en-global/apps/industry/security/entranceandexitsystem>
- ➔ <https://www.energuide.be/en/questions-answers/what-are-the-alternatives-to-air-conditioning/2121/>

