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MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

A College with Potential for Excellence

NAAC Accredited & ISO 9001: 2015 Certified

REPORT ON

ENVIRONMENT AND ENERGY AUDIT

2020-21

HYM International Certifications Pvt. Ltd.
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USA
Our Certifications : ISO 9001 | ISO 14001 | ISO 45001 | ISO 22000 | ISO 27001 | ISO 21001 | ISO 10002 | ISO 37001 | ISO 50001 | ISO 13485 | HACCP, GHP

Institution	:	Maris Stella College (Autonomous)
Address	:	59A-1-4, Maris Stella College, NH 16 Service Road, Benz Circle, Vijayawada, PIN: 520008
Nature of Business	:	Educational Institute
Certification Body	:	HYM International Certifications Pvt. Ltd.
Accredited by	:	ASCB (E)
Name of Standards	:	ISO 14001: 2018 (Green Audit) ISO 50001: 2018 (Energy Audit)
Audit Date	:	16.02.2021
No. of man days	:	2 man days
Name of Auditor	:	2. member
Team Lead Auditor	:	Sivaiah Alapati
Team Members	:	Suma Devi. T
Certificate Type	:	Initial Certification
Observations	:	2
Recommendations	:	2
Non-conformities	:	0

Introduction

A Green Campus is a place where environment friendly practices are adopted, promoted and practiced for sustainable growth and development. This green campus idea provides a blueprint for an institution in building and integrating its eco-friendly measures. Greening the campus is about efficient energy generation and management systems, correct manner of handling, recycling and disposing waste, effective water conservation measures and practices, developing and maintaining a clean and green environment, encouraging the purchase of environment friendly supplies, and a total ban on the usage of plastic products. The execution of these require a set of initiatives which need to be implemented and reviewed over a fixed time period. At this juncture environment audit plays a crucial role in examining an institution's policies and practices and also identifies areas of improvisation. Environment audit is a useful tool for an institution to determine how and where they are using most energy or water or resources so that the college may then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. This audit aims at creating health consciousness and promoting environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. The environment audit also tries to coordinate the environment, economic and social dimension among the stakeholders of an institution.

Objectives

- To map geographical location of Maris Stella College
- To document the soil conservation strategies of Maris Stella College
- To document the water conservation strategies of Maris Stella College
- To document the biodiversity conservation with reference to fauna and flora
- To document the ambient environment in the campus with reference to energy conservation

About the College

Maris Stella College is a Catholic Christian Minority institution of higher education for women, under the direction of the Franciscan Sisters of Mary. Maris Stella College was founded on 16th July, 1962 to become the first college set up with the express mission of educating young women to be intellectually, morally, socially and spiritually sound, to be equipped to contribute positively to family, community and nation and to become torch-bearers of an equitable society. Maris Stella College strives to enable students to grow into socially aware and responsible citizens. The college is blessed with a vast campus with abundant green cover and home to a variety of indigenous species of fauna and flora. Maris Stella College has a Green Policy which seeks to conserve resources and preserve the environment by harnessing the sun, catching the rain, providing green cover and managing

and restoring from waste. The institution's guiding principles and practices to achieve resource conservation, waste reduction, and sustainability overall are summarized below:

- Conserve energy and other natural resources
- Encourage employees to use public transport/ environment-friendly modes of travel
- Reduce, reuse, and recycle to reduce waste
- Minimize the production of hazardous waste
- Adopt green procurement practices
- Ensure staff and students complete the environmental awareness training
- Continue to review and minimize the impacts of our activities

About the Auditing Agency

HYM International Certifications Private Limited, Hyderabad was established in the year of 2012 HYM International Certification Hyderabad and is accredited by Accredited Services Certifying Bodies (United Kingdom) London. The vision of HYM is "Right Path for Training and Certification on ISO Standards". The team consisting of Mr. Sivaiah Alapati as Team Lead auditor, and Ms.T. Suma Devi as Team Member visited Maris Stella College, Vijayawada on 16.02.2021 to conduct Environment and Energy Audit.

Team Lead Auditor, Mr. Sivaiah Alapati with Green Audit team members, 16.02.2021

Team Lead Auditor, Mr. Sivaiah Alapati with Green Audit team members, 16.02.2021

Biodiversity

Tree Diversity:

The sixty-year old college campus has more than 50 varieties of trees that have been documented by the Department of Botany.

More than 50 Polyalthialongifolia (Ashoka), 20 (Mimusopselengi) Pogada, 10 Albizialebbeck (dirisina), 20 *Peltophorum* pterocarpum (pachha), 15, (Delonixregia), 10 Azardirachtaindica (Neem), 5 Pongamiapinnata (Ganugu), 40 Ficus species, 20 Casuarina trees 2 and 2 Tectonagrandis (Teak) trees are there on the campus. Among them 80% trees are wood yielding and the rest are ornamental.

A total of 50 families and 100 varieties of species are recognized in the campus. These plants absorb maximum CO_2 and produce maximum O_2. Commercial crops like rice (black rice), fruit yielding plants like banana, mango, sapota, guava, papaya, emblica, orange, and vegetable crops such as brinjal, ladies finger, chillies, cassava etc. and leafy vegetables such as amaranthus, mint, curry leaves, coriander, red sorrel etc. are cultivated on the campus.

The campus has five endemic (rare) species: Rauwolfia tetraphylla, Adathoda vascica, Andrographis paniculata, Cycas revoluta & Asparagus racemosus.

The college is committed to following sustainable development, habitat creation and erosion control like natural forests to fulfil the needs of local biodiversity and for the benefit of future generations.

The trees in the college campus are listed in Table-1 and the medicinal plants in Table 2.

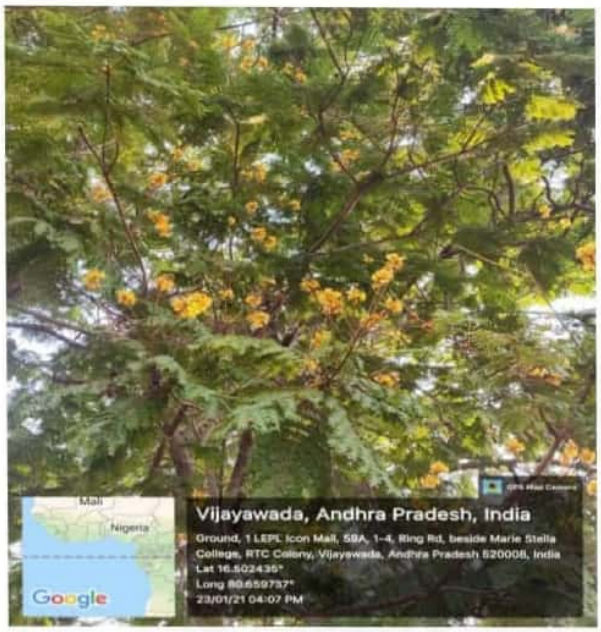
Table 1: List of Tree Species on Maris Stella College Campus

S.No.	Name of the Tree Species	Number	Common Name	Family
1	*Polyalthia longifolia*	50	Ashoka	Annonaceae
2	*Azadiracta indica*	10	Neem	Meliaceae
3	*Cassia fistula*	2	Golden shower	Fabaceae
4	*Pongamia pinnata*	8	Kanuga	Fabaceae
5	*Senna auriculata*	12	Tangedu	Fabaceae
6	*Albezzia lebek*	20	Albezzia	Fabaceae
7	*Eukalyptus*	2	Jamail	Myrtaceae
8	*Palms*	10	Areca Palm	Arecaceae
9	*Syzygium cumini*	20	Malabar Palm	Myrtaceae
10	*Musa paradisica*	100	Arati	Musaceae
11	*Moringa oleraceae*	20	Drumstick tree	Moringaceae
12	*Murraya koenigii*	20	Curry leaves	Rutaceae
13	*Ficus religiosa*	10	Raavi	Moraceae
14	*Annona reticulate (ramaphalam)*	50	Ashoka	Annonaceae
15	*Psidium guajava*	6	Jaama	Myrtaceae
16	*Punica granatum*	2	Pomegranate	Lythraceaea
17	*Terminalia arjuna*	2	Tella maddi	Combretaceae
18	*Emblica phyllanthus*	8	Amla	Phyllanthaceae
19	*Mangifera indica*	30	Mango	Anacardiaceae
20	*Nerium oleander*	20	Nerium	Apocynaceae
21	*Courouptia guinensis*	1	Cannon ball tree	Lecythidaceae
22	*Butea monosperma*	2	Fire of the forest	Fabaceae
23	*Manilkara zapota*	20	Sapota	Sapotaceae
24	*Annona squmosa*	4	Seethaphalam	Annonaceae
25	*Annona reticulata*	1	Ramaphalam	Annonaceae

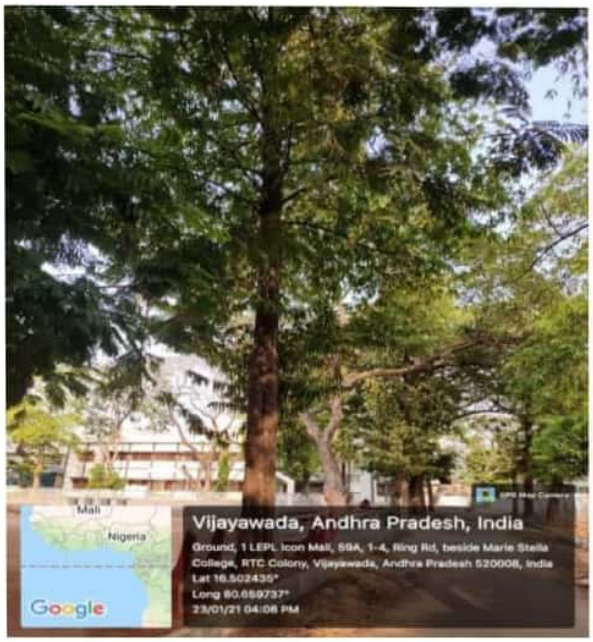
Table 2: List of Medicinal Plant Species in Maris Stella Campus

S. No	Name of the Tree Species	Family Name	Common Name
1	*Azadirachtaindica*	Meliaceae	Vepa
2	*Abutilon indicum*	Malvaceae	Tutturubenda
3	*Acalyphaindica*	Euphorbiaceae	Muripinda
4	*Achyranthusaspera*	Amaranthaceae	Uthareni
5	*Aloe vera*	Liliaceae	Kalabandha
6	*Alternantherasessilis*	Amaranthacee	Ponnagantikura
7	*Araca catechu*	Arecaceae	Poka
8	*Artocarpusintegrefolia*	Moraceae	Panasa
9	*Boerhaeviadiffusa*	Nyctaginaceae	Atakamamidi
10	*Calotropisgigantia*	Asclapiadaceae	Gelladu
11	*Carica papaya*	Caricaceae	Boppai
12	*Cassia auriculata*	Cesalpianaceae	Boppai
13	*Cassia fistula*	Caesalpinaceae	Tangedu
14	*Catheranthus roseus*	Apocynaceae	Billaganneru
15	*Cathranthus alba*	Apocynaceae	Billaganneru
16	*Ceibapentandra*	Bombacaceae	Buruga
17	*Ciccaacida*	Euphorbiaceae	Vusirikia
18	*Citrus aurantium*	Rutaceae	Naringa
19	*Citrus lemon*	Rtuaceae	lemon
20	*Cleome viscosa*	Capparadaceae	Vomitlu
21	*Cymbopogonspp*	Poaceae	Bodagaddi
22	*Datura metal*	Solanaceae	Vumetha
23	*Eclipta alba*	Asteraceae	Guntagalalagara
24	*Eucalyptus globosa*	Myrtaceae	Zamoil
25	*Euphorbia hirta*	Euphotbiaceae	Pachabotlu
26	*Euphoribstirucalli*	Euphoribiaceae	kadajemudu

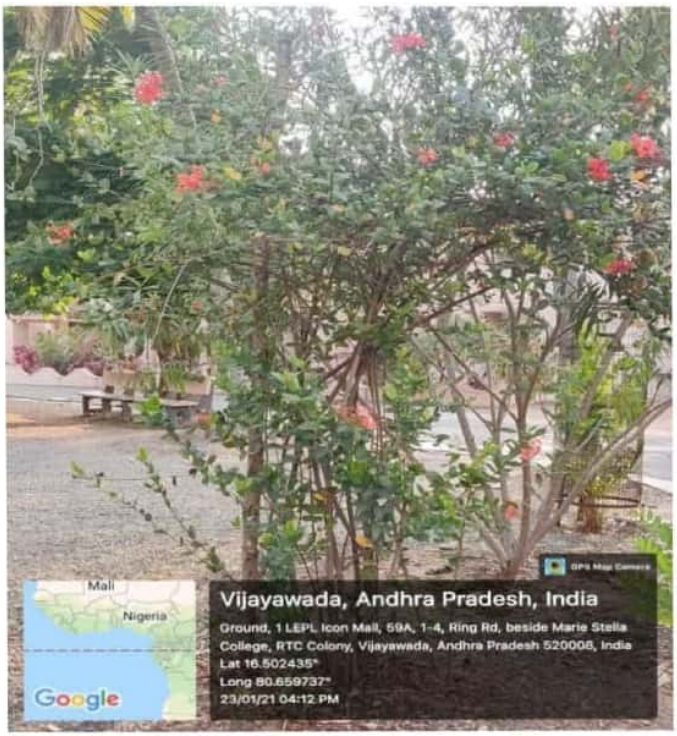
27	*Ficusrecemosa*	Moraceae	Medi
28	*Ficusreligiosa*	Moraceae	Raavi
29	*Ficusbenghalensis*	Moraceae	Marri
30	*Gossypiumarboreum*	Malvaceae	Pathi
31	*Hibiscus rosasinensis*	Malvaceae	Mandara
32	*Jatrophabellodona*	Euphorbiaceae	Nephalun
33	*Lawsoniainermis*	Lythraceae	Gorinta
34	*Mangiferaindica*	Anacaradiaceae	Mamidi
35	*Moringatinctoria*	Moringaceae	Munaga
36	*Murrayatinctoria*	Moringaceae	Mumaga
37	*Ocimum sanctum*	Lamiaceae	Tilasi
38	*OcimumBassilicum*	Lamiaceae	Sabja
39	*Phyllanthusneruri*	Euphoribiaceae	Nelavusire
40	*Phyllanthusemblica*	Euphorbiaceae	Nelavusire
41	*Physalis minima*	Eyphoribiaceae	Vusirika
42	*Pongamiapinnata*	Fabaceae	Kanuga
43	*Pongamialongifolia*	Fabaceae	Kanuga
44	*Psidiumguagava*	Myrtaceae	jama
45	*Punicagranatum*	Punicaceae	Denemma
46	*Ricinuscommunis*	Euphoribiaceae	Aamundam
47	*Sidacordifolia*	Malvaceae	Aribala
48	*Syzygiumcumini*	Myrtaceae	Neredu
49	*Tamarindusindica*	Cesalpinaceae	Chinta
50	*Tephrosiapurpuria*	Fabaceae	Vempalli



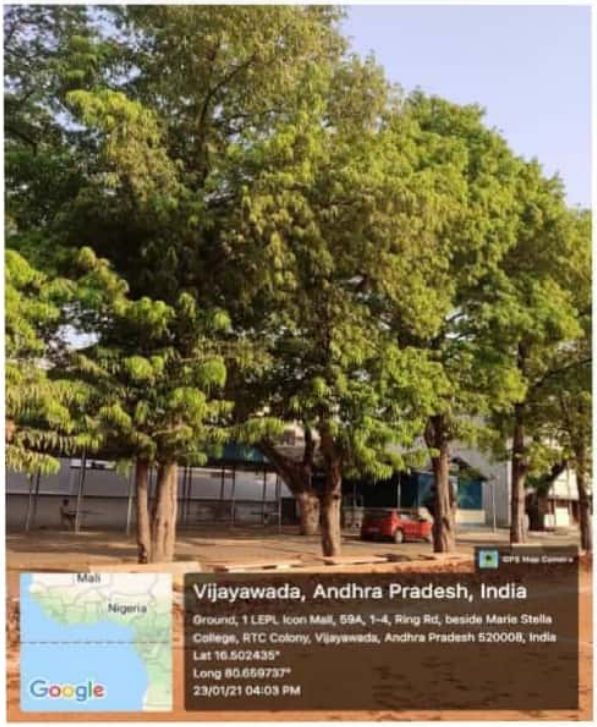
Peltophorum pterocarpum



Azadiracta indica



Ixora Species



Polyalthia longifolia

Faunal Diversity:

India, an acclaimed mega-biodiversity nation, represents about 6.4% of the total global fauna in its share of only 2.4% of the total land surface of the world. Biogeographically, the country is divided into ten different biogeographic zones: Trans Himalaya, Himalaya, Desert, Semi-Arid, Western Ghats, Deccan Peninsula, Gangetic Plains, Northeast, Islands, and Coasts. The Indian Himalaya (IH) with a total area of 3, 95,485 sq. km. comprised of 2 biogeographic zones including 7 biotic provinces:

1. Trans Himalaya (Ladakh Mountains: 1A, Tibetan Plateau: 1B, Sikkim: 1C)
2. Himalaya (North-West: 2A, West: 2B, Central: 2C and East: 2D)

Despite being one of the global biodiversity hotspots of the world, so far no attempt has been made to catalogue the faunal diversity of the extant species reported from Maris Stella College, Vijayawada.

India is one of the hotspot for biodiversity owing to its versatile and endemic distribution of flora and fauna. Keeping in view of the immense biodiversity potential, a large network of Indian Biosphere reserves, National parks, Wild life sanctuaries and sacred grooves vested for the conservation and sustainability of valuable biodiversity.

The geographical and ecological ambits under which Maris Stella College categorically falls are Deccan plateau, Coastal Andhra (central). Central Coastal Andhra is blessed with wide variety of fauna. Maris Stella College which is located in the proximity of Krishna River has a prevailing variety of fauna ranging from annelids to insects (under Invertebrates) and amphibians, reptiles, birds to mammals (under Vertebrates). Owing to the climatic, terrestrial and local atmospheric favourability the common fauna in habituating in the Maris Stella College campus was tabulated.

The following table contains the fauna which is commonly in habituating in the region in general, and Maris Stella College in particular. Insects are widely prevailing fauna in the campus in terms of number of species in habituating in the campus.

1	Vertebrates	Fishes
2	Amphibians	*Hoplobatrachus tigerinus, Duttaphrynus melanostictus*
3	Reptiles	*Hemidactylus*
4	Mammals	*Canis lupus familiaris, Bonnet macaque*
5	Birds	*Columba livia, Corvus splendens, Psittaciformes*

Sensitization Programmes for Students

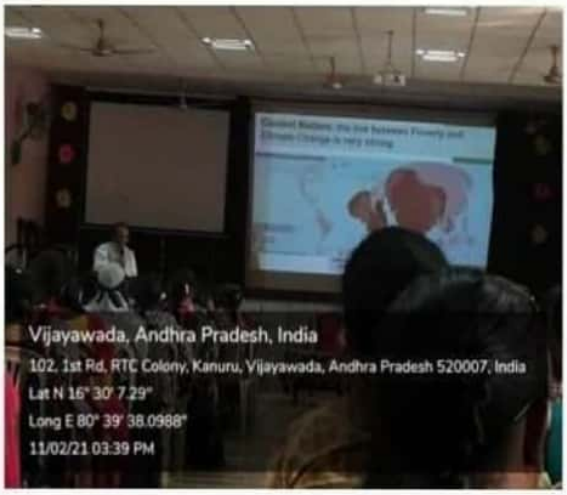
Maris Stella College was formed "Eco Ambassadors Club" in 2021 to sensitize students about ecofriendly practices, to promote environmental awareness, and to nurture green consciousness among them so that they as ambassadors spread the advantages of ecofriendly living. The following activity was organized by the Eco Ambassadors Club

- An orientation session on "Environmental/Climate Changes and We the Youth" on 11-02-2021 for all the second year degree students

Mr. Rayappa, climatologist interacting with students

Dr. Fr. Don Bosco, resource person during the session

Motivating students to be Eco Ambassadors



Explaining about link between poverty and climate change

Soil Management

Soil conservation is a combination of practices used to protect the soil from degradation. First and foremost, soil conservation involves treating the soil as a living ecosystem, and recognizing that all the organisms that make the soil their home, play important roles in producing a fertile healthy environment. Soil conservation is the need of the day as it protects the loss of this natural resource and improves agricultural production.
Maris Stella College has adopted organic vermicomposting practice for soil conservation.

Organic Vermicomposting:
The main objective of vermicomposting is to produce organic manure of exceptional quality for the organically starved soil by using college campus plant refuse agricultural wastes; garden wastes, office paper waste, hostel kitchen waste and canteen waste and animal farms waste which are usually dumped at places resulting in a foul mess. The biological waste obtained in the college campus through plant refuse, garden weed, hostel kitchen waste, office paper waste and canteen waste is recycled to obtain vermicompost. Vermicomposting is a simple way to add rich nutrient to the agriculture crop fields and restores vitality to depleted soil. It's also free, easy to make and good for the environment.

Benefits:
The students of B.Sc. Agriculture & Rural Development are involved in the preparation of organic vermicompost. So, this practice acts as an awareness tool for students about the eco-friendly method of waste management and as a provider of fertilizers to the college garden. The organic composting addresses many environmental problems by conditioning the soil with compost, creating rich humus for lawn and garden. This process adds nutrients to the plants and helps retain moisture in the soil.
Solid waste management takes place due to vermicomposting as office paper waste, campus green refuse, kitchen and canteen waste are recycled through decomposition mechanism.
The organic composting results in introducing beneficial organisms to the soil. Microscopic organisms like saprophytic microorganisms in compost help aerate the soil, simplify into organic material for plant use.
The segregation of campus waste into plastic waste, wet waste and dry waste and conversion of dry waste and wet waste into compost serves the dual purpose of recycling the waste in the campus and also reducing the pollution in the campus through an eco-friendly approach.

1. The college has constructed two permanent chambers for solid waste management and vermicomposting in the college campus. First unit is of 9 ft. length, 9 ft. width, and 5 ft. deep, which is about 2 ft. above ground level to avoid entry of rainwater into the chambers for solid waste decomposition. The college campus waste like agricultural waste, botanical

garden waste, office paper waste, hostel kitchen waste, canteen waste, and animal farms waste are dumped in this pit for recycling.

2. The second unit is of 12 ft. in length, 4 ft. in width, and 2 ft. in depth, which is about 2 ft. above ground level to avoid entry of rainwater into the chambers. In this pit solid waste decomposed material is dumped. *Eisenia foetida* (Red Worms), *Eudrilus eugeniae* (Night crawler) and the native species *Perionyx excavates* of the earthworms are added to the decomposed material in the second pit for vermicomposting as this species has high conversion ratio.

Vermicomposting is an advantageous technology for solid waste management. Vermicomposting results in earthworms and vermicompost products. The vermicompost can be used as bio-fertilizers whilst the earthworms can be used for further vermicomposting

Earthworms

Releasing Earthworms

Water Conservation

Water is the most important natural resource essential for living. Hence it is necessary to use water economically and preserve it. One of the ways to minimize misuse and wastage of water is to reuse water and this is the core idea of water conservation. Water Conservation is the practice of efficiently preserving, controlling, and managing water resources.

The college practices rainwater harvesting which recharges the bore wells in the campus and also helps in water conservation. The institution collects and stores rain water running down the roof top, logged on the road, and in the college playground. Rain water harvesting assists in recharging ground water and improves the water table. It improves quality and quantity of ground water. Rainwater harvesting measures are essential when the ground water is brackish or has a high Iron or Fluoride content.

There are five rain harvesting pits in the campus and each pit is 5 ft. in length, 5 ft. in width, and 10 ft. in depth. Water collected in the rain harvesting pit adjacent to the Indoor Stadium is used for agricultural purposes and the water stored in the second pit is used for aquaculture.

Traditional soil puddling with harvested rain water

Paddy seedling transplantation with harvested rain water

After transplantation paddy seedling grown well in harvested rainwater

Energy Conservation

The world runs on energy, of course various forms of it. The global society at large which uses energy endlessly needs to think about creating more and using the available energy resources economically. Energy conservation is the need of the hour which has to be adopted and practiced by the society. Energy conservation is the prevention of the wasteful use of energy, especially in order to ensure its continuing availability. Educational institutions play a major role in it as they can sensitize the students in this regard. In this regard Maris Stella College has adopted the following responsibilities towards energy conservation. They are

- Turn off lights when not in use and use natural light when possible.
- Turn off all computers, terminals, speakers and other office equipment at the end of every work day.
- Activate the power down features on the computer and monitor to enter into a low-power or sleep mode when not in use.
- Unplug equipment that drains energy even when not in use (e.g., cell phone chargers, fans, desktop printers).
- Use LED lighting wherever possible.
- Utilize video conferencing and conference calls as an alternative to travel when possible.
- Limit the use of air conditioners.

At this juncture energy audit is essential as it recommends ways to implement renewable energy systems and energy efficiency enhancement technologies thereby reducing the

overall carbon footprint. Energy audit consists of: scout energy consumption in the organization, find scope for saving, identify the most likely areas for attention as well areas of improvement/ savings, and set a reference point.

Given below are the energy consumption details at Maris Stella College:

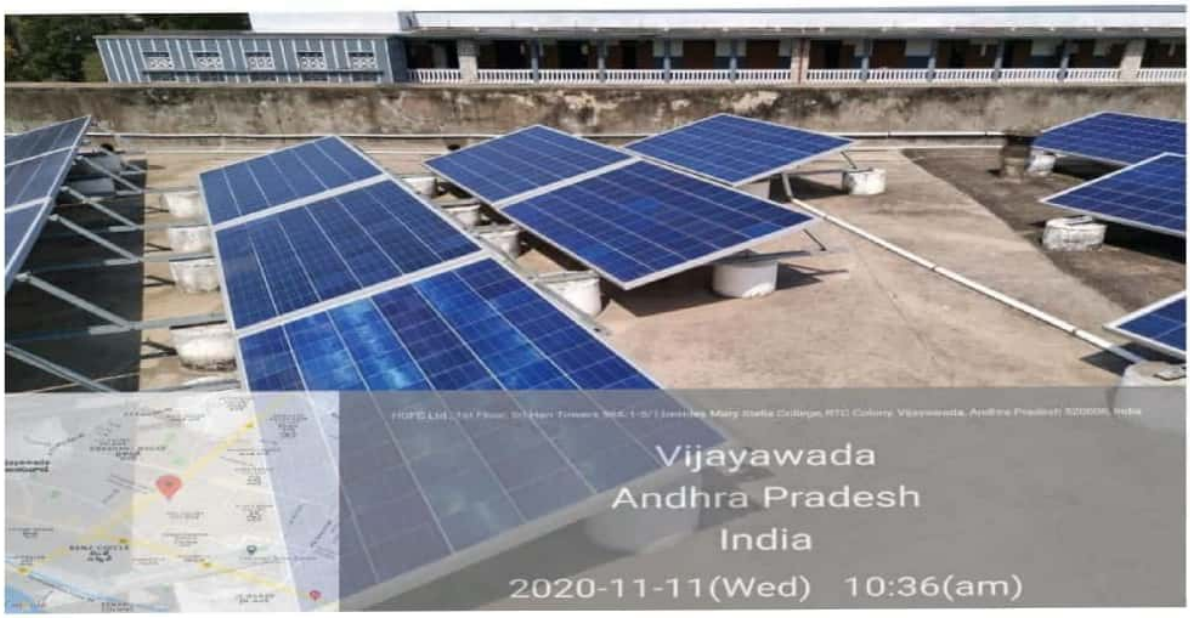
Heavy consumption areas are auditorium, office, examination section, computer labs, and audio-visual room. Medium consumption areas are the classrooms, physics lab, biotechnology lab, food science and technology lab, English language lab, RUSA lab, conference room, canteen, and indoor stadium. Low consumption areas are chemistry lab, electronics lab, zoology lab, botany lab, Bonaventure block, Helen block, Francis block. The number of heavy consumption fixtures are 19, medium consumption fixtures are 16 and low consumption fixtures are 381.

The institution generates solar energy as a part of its idea to switch to renewable form of energy. There are 169 solar panels fixed over the roof top the main block to generate solar energy. The details of the solar panels is given below:

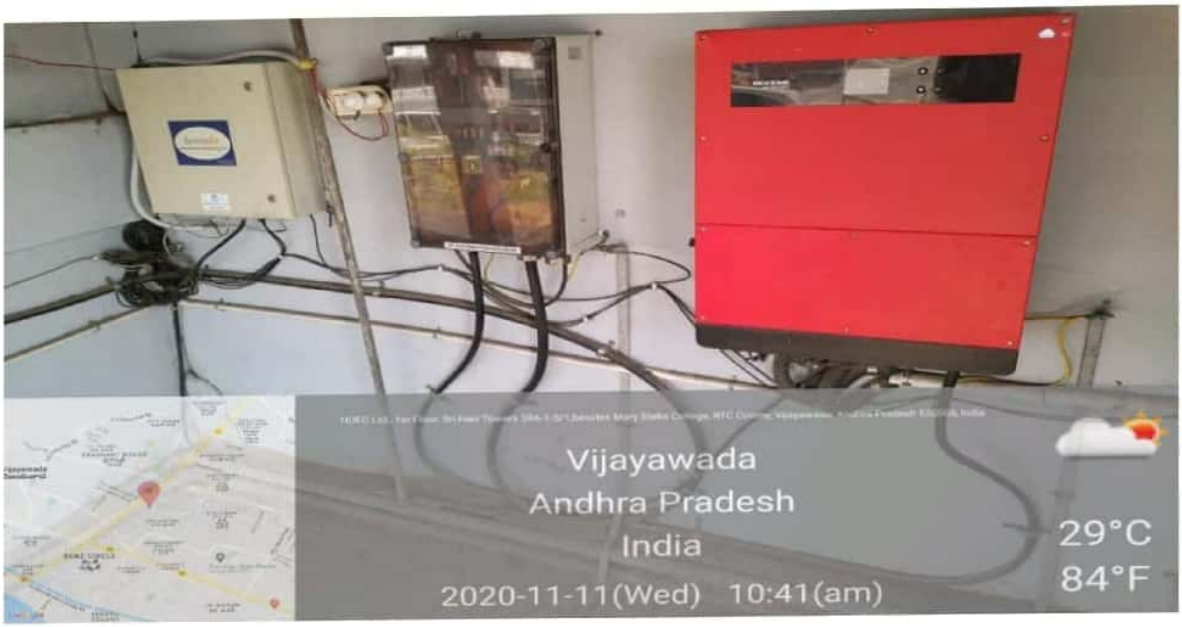
Company Name	:	TATA Power Solar
Inverter Purchased from	:	TATA Power Solar
Inverter Capacity	:	50K
Inverter Model	:	GW50K-MT
Inverter Serial Number	:	9050KMTS187R0015
Inverter Installation date	:	FEBRUARY - 2019
End customer Name	:	Dr. Sr. Jasintha Quadras, Principal
Site Address	:	Maris Stella College, NH-16 Service Road, Benz Circle, Vijayawada – 520 008
Support Required	:	Technical Person to get the data
Contact Name	:	Mr. Prasad, IT Admin

The solar panels are cleaned periodically and maintained in good condition. Due to the second wave of as classes were conducted in online mode the institution was able to contribute power to the grid as less electricity was consumed and also had surplus power through solar energy.

Solar panels on the rooftop of the main block



Solar panels on the rooftop of the main block



Electricity and Solar readings from April 20 to March 21: Meter No 6512305000312

Months	KVAH			Solar			Net Difference
	Present	Previous	Difference	Present	Previous	Difference	
20-Apr	79020	75847	3173	22962	18409	4553	-1380
20-May	80637	79020	1617	28881	22962	5919	-4302
20-Jun	82313	80637	1676	33526	28881	4645	-2969
20-Jul	85624	82313	3311	35854	33526	2328	983
20-Aug	87938	85624	2314	38136	35854	2282	32
20-Sep	90272	87938	2334	40924	38136	2788	-454
20-Oct	92764	90272	2492	43782	40924	2858	-366
20-Nov	96025	92764	3261	46558	43782	2776	485
20-Dec	99016	96025	2991	48859	46558	2301	690
21-Jan	101487	99016	2471	60096	48859	11237	-8766
21-Feb	105028	101487	3541	62394	60096	2298	1243
21-Mar	110572	105028	5544	63415	62394	1021	4523

Observations

The audit team made two observations during their visit to Maris Stella College. The team appreciated the rain harvesting methods adopted by the institution and commended the judicious use of water collected through rain harvesting for agricultural purposes. The team welcomed the efforts of the Green Audit Team with regard to the signages displayed on all trees in the campus. The Maris Stella College campus flora was given QR codes during 2020-21. The department of Botany initiated this programme and around 100 plants on the campus were given QR codes to bring awareness on scientific and vernacular names of the plants and their significance. The audit team commended the efforts of the department of Botany in this regard.

Recommendations

The audit team suggested two improvements towards greening the campus. The team advised the institution to develop Green Zones promoting healthier environment and better green practices. The audit team also recommended Tree Adoption Policy on campus wherein the stakeholders of the institution especially students adopt trees thereby promoting Green Campus.

Conclusion

The audit team appreciated the overall maintenance of the campus from an environmental perspective. The audit team advised the institution to improve students' involvement in implementing green initiatives. The team gave few recommendations to curb the menace of waste management using more eco-friendly and scientific techniques.