

**ENERGY AND ENVIRONMENT AUDIT  
(GREEN AUDIT)**

**REPORT (2021-22)**

**WMO ARTS AND SCIENCE COLLEGE  
MUTTIL, WAYANAD**



**OISCA - International**

ORGANISATION FOR INDUSTRIAL SPIRITUAL AND  
CULTURAL ADVANCEMENT - INTERNATIONAL



**SOUTH INDIA CHAPTER**

H. O. of all Chapters in South India

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NGO In Consultative Status with UN & Winner of Indira Priyadarshini Vriksha Mithra Award (IPVM) Award

## GREEN AUDIT CERTIFICATE

This is to certify that the Green Audit Team of OISCA International South India Chapter has conducted the Environment Audit of WMO College Muttill, Wayanad for the period 2021- 2022.

This certificate is based on the original data collected during the period of study. Further it is certified that the baseline data was prepared by the Internal Audit Team of WMO College. Muttill and submitted to us on the basis of the questionnaire provided by us. The content of the baseline data has been physically verified, analyzed and studied in detail by the Functional Area Experts of the audit team.

The audit included sectoral audits in water, energy, waste management, biodiversity, infrastructure and outdoor environment. It is certified that the data used in the study are original and found to be true on physical verification of the audit team. The photographs used in the report are either taken by the audit team directly or given by the internal audit team.

Kozhikode  
March 11, 2022.



M. Aravindababu  
Director and Secretary General



Principal  
W.M.O. Arts & Science College  
Muttill P.O., Wayanad 673122

# OISCA - International

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1. Dr. K.M.Khaleel Chowa  
Course Director (Retd), Dept. of Environmental Studies  
Kannur University.

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Professor in Chemistry (Retd),  
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## WMO ARTS AND SCIENCE COLLEGE, MUTTIL, A BRIEF HISTORY

WMO Arts and Science College, established in 1995 by Wayanad Muslim Orphanage, is an institute run by the Muslim minority community. The majority of the population in the district consists of Scheduled Caste, Scheduled Tribe, and Other Backward Communities. Wayanad is one of the backward districts of India, with a significant shortage of facilities for acquiring higher education. As a result, the society, which consists mainly of Scheduled Caste, Scheduled Tribe and Other Backward Communities in the premise of the college, had a deprivation in obtaining higher education. In this scenario, the orphanage committee had planned to establish the college to uplift the youth, especially the orphans and economically backward students by educating them irrespective of caste, religion, or creed. Since then, the college has been playing a vital role in igniting thousands of students in and around the district of Wayanad, equipping them with essential standards in all sectors of life. The college's original mission to educate the disadvantaged regardless of caste, religion, or creed significantly influenced the elevation of society, which changed public perceptions about higher education.

### *Vision*

Establish academic and peaceful atmosphere conducive to intellectual inquiry and personality development with a holistic perspective

### *Mission*

Strive for academic excellence, creativity and social commitment to the citizens especially the backward minorities, Orphans and destitute, upholding the ethical and moral values

### **About OISCA International**

OISCA International, an NGO with UN's General Category status, was established in 1961 with its headquarters in Tokyo, Japan. The South India office of OISCA functions in Calicut, since 1985. The prime emphasis of the activities of OISCA is to impart knowledge and to create awareness in the key areas of



environmental education, soil, water, biodiversity conservation and youth empowerment activities for students of both schools and colleges. As a part of this program we have Love Green Clubs in 1700 schools and Save Green clubs in 124 colleges. As recognition to these activities, Govt. of India conferred the "INDIRA PRIYADARSHINI VRIKSHA MITHRA AWARD-"to OISCA in the year 1998. At present we have 109 chapters in South India with more than 5000 members. Children's Forest Program (CFP) the most prestigious project of OISCA is effectively functioning in 1700 schools in South India. . Few other projects implemented by OISCA are Sacred Grove Conservation Project, Herbal Garden Development Project, Tree planting projects in educational institutions, Mangrove Forestation and River Protection Project, In addition we are the implementing agency of the Governemnt projects like Jalanidhi, Sujithwa Mission etc. Our vision is sustainable environment and our mission is to promote Earth ethics.



## GREEN AUDIT REPORT

*Prepared by OISCA International SIC*

### 1. Introduction

The Green Campus concept assists in promoting sustainability by improving human and environmental health. However, to address the key issues leading to environmental and resource degradation on the campus, is vital to generate comprehensive baseline data regarding the existing system. In this context we carried out a Green Audit on the campus. Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It is a management system instrument that is used methodologically to protect and conserve the environment. It is also utilized to keep the environment in good shape. For environmental protection, the audit suggests many standard metrics, methodologies, and initiatives. The green audit is beneficial for detecting and monitoring sources of pollution in the environment, and it focuses on waste management of all types, energy consumption monitoring, water quality and quantity monitoring, risks monitoring, stakeholder safety, and even disaster management. The objectives in the present report involved evaluation of biodiversity, energy management practices, water usage, green chemistry initiatives and the best practices followed in the campus. The findings from this audit are expected to have an impact on student/faculty health, productivity, operational costs, and the ecological systems in the campus.



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## 2. Objectives

1. To study the biodiversity of college campus
2. To make report on electric power management
3. To make a report on the water management
4. To analyze the best practices and green chemistry initiatives of the college

## 3. Study area

The WMO College is situated at Muttill, Wayanad located in the Geo co-ordinate  $11^{\circ}64' N$  and  $76^{\circ}11' E$ . Total campus area is 6.07 hectares



Figure.1. Satellite image of study area





## 4. BIODIVERSITY

### 4.1 Floral diversity

The floral diversity of the campus is classified into trees, shrubs, herbs, and climbers belonging to different families. There are 230 species identified and recorded. The campus consists of angiosperms, gymnosperms, pteridophytes and bryophytes. However, in this report, we focused on angiosperms, gymnosperms and pteridophytes. Fabaceae with 27 species is the dominant family, followed by other families. Angiosperms are predominant of both major groups – dicotyledons and monocotyledons. A total of 230 species belonging to 61 families are recorded from the study area. In comparison, monocotyledons are accounted with 37 species belonging to 17 families. Poaceae is the dominant monocotyledon family (13 species), and Fabaceae is the dominant dicotyledon family (16 species). Gymnosperm flora of the campus includes *Cycas revoluta* (Cycadaceae) and *Araucaria columnaris* (Araucariaceae). These two species of gymnosperm are cultivated as ornamental plants. Pteridophytes includes four terrestrial ferns.

Trees, shrubs, herbs, climbers and creepers of the campus are classified into native, exotic and invasive alien species (Table.1). Native species under trees, herbs and climbers are more diverse in number than exotic and invasive alien ones. *Mimosa pudica* is the only creeper identified as an exotic species from the campus. The list of trees, shrubs, herbs, climbers and creepers identified inside the campus is presented in Table.2, Table.3, Table.4, Table.5 and Table.6 respectively.



**Table 1: Classification of trees, shrubs, herbs, climbers and creepers into native exotic and invasive alien species.**

<b>Category</b>	<b>Native (N)</b>	<b>Exotic (E)</b>	<b>Invasive alien Species (IAS)</b>
<i>Trees</i>	68	14	7
<i>Shrubs</i>	23	22	5
<i>Herbs</i>	42	24	4
<i>Climbers</i>	12	7	2



Table.2. List of trees identified in the campus.

Sl.No	Scientific Name	Common Name/ Local Name	Family
1	<i>Acacia auriculiformis</i>	Acacia	Fabaceae
2	<i>Adenanthera pavonina</i>	Manjadi	Fabaceae
3	<i>Aegle marmelos</i>	Koovalam	Rutaceae
4	<i>Alstonia macrophylla</i>	Match stick tree	Apocynaceae
5	<i>Alstonia scholaris</i>	Ezhilampala	Apocynaceae
6	<i>Annona squamosa</i>	Seethapazham	Annonaceae
7	<i>Annona muricata</i>	Mullatha	Annonaceae
8	<i>Aquilaria sinensis</i>	Ood tree	Thymeleaceae
9	<i>Araucaria auracana</i>	Monkey puzzle tree	Auracariaceae
10	<i>Areca catechu</i>	Kavungu- betelnut	Arecaceae
11	<i>Artocarpus heterophyllus</i>	Plavu/Jack tree	Moraceae
12	<i>Artocarpus hirsutus</i>	Anjili	Moraceae
13	<i>Azadirachta indica</i>	Aryaveppu	Meliaceae
14	<i>Bauhinia variegata</i>	Mandaram	Fabaceae
15	<i>Butea monosperma</i>	Plash	Fabaceae
16	<i>Bombax ceiba</i>	Mullilav	Malvaceae
17	<i>Caesalpinia sappan</i>	Pathimukham	Caesalpinaceae
18	<i>Caryota urens</i>	Aanappana	Arecaceae
19	<i>Cassia fistula</i>	Golden Shower - Kanikkonna	Fabaceae
20	<i>Casuarina equisetifolia</i>	Kattadimaram	Casuarinaceae
21	<i>Chrysophyllum cainito</i>	Star apple	Sapotaceae
22	<i>Cinnamomum zeylanicum</i>	Cinnamon	Lauraceae
23	<i>Citrus limon</i>	Lemon	Rutaceae
24	<i>Cleodendrum trichotomum</i>	Periyila	Lamiaceae
25	<i>Cocos nucifera</i>	Coconut	Arecaceae
26	<i>Cycas revoluta</i>	Sago plant	Cycadaceae
27	<i>Cyrtostachys renda</i>	Red Palm	Arecaceae
28	<i>Dalbergia latifolia</i>	Eetti	Fabaceae
29	<i>Delonix regia</i>	Gulmohar	Fabaceae
30	<i>Pongamia pinnata</i>	Ung tree	Fabaceae
31	<i>Eucalyptus globulus</i>	Eucalyptus	Myrtaceae
32	<i>Erythrina indica</i>	Mullumurikk	Fabaceae
33	<i>Ficus benghalensis</i>	Peral	Moraceae
34	<i>Ficus benjamina</i>	Weeping fig	Moraceae
35	<i>Ficus carica</i>	Athi (N)	Moraceae
36	<i>Ficus exasperate</i>	Parakam	Moraceae





37	<i>Ficus racemose</i>	Cluster Fig	Moraceae
38	<i>Garcinia nervosa</i>	Pear mangosteen	Clusiaceae
39	<i>Garcinia gummi-gutta</i>	Kudampuli	Clusiaceae
40	<i>Gliricidia sepium</i>	Sheemakonna	Fabaceae
41	<i>Gravillea robusta</i>	Silver Oak	Proteaceae
42	<i>Hydnocarpus kurzii</i>	Marotty	Flacourtiaceae
43	<i>Lannea coromandelica</i>	As tree / udi	Anacardiaceae
44	<i>Lagerstroemia speciosa</i>	Manimaruthu	Lythraceae
45	<i>Litchi sinensis</i>	Litchi	Sapindaceae
46	<i>Moringa oleifera</i>	Drumstick tree	Moringaceae
47	<i>Magnolia champaca</i>	Champakam	Magnoliaceae
48	<i>Mallotus philippensis</i>	Kurumkutti	Rutaceae
49	<i>Mangifera indica</i>	Mavu	Anacardiaceae
50	<i>Manilkara zapota</i>	Sapota	Sapotaceae
51	<i>Macaranga peltate</i>	Vatta	Euphorbiaceae
52	<i>Melia dubia</i>	Neem	Meliaceae
53	<i>Millettia pinnata</i>	Ungu	Fabaceae
54	<i>Mimusops elengi</i>	Elengi	Sapotaceae
55	<i>Morus alba</i>	Mulberry	Moraceae
56	<i>Muntingia calabura</i>	Birds cherry	Muntingiaceae
57	<i>Polyalthia longifolia</i>	Aranna maram	Annonaceae
58	<i>Nephelium lappaceum</i>	Rambuttan	Sapindaceae
59	<i>Nerium oleander</i>	Arali	Apocynaceae
60	<i>Peltophorum pterocarpum</i>	Chara konna	Fabaceae
61	<i>Persea americana</i>	Avacado	Lauraceae
62	<i>Phyllanthus emblica</i>	Nelli	Phyllanthaceae
63	<i>Pinus</i>	Pine	Pinaceae
64	<i>Psidium guajava</i>	Guava	Myrtaceae
65	<i>Pterocarpus marsupium</i>	Venga	Fabaceae
66	<i>Punica granatum</i>	Pomegranate	Punicaceae
67	<i>Robinia pseudoacacia</i>	White locust tree	Fabaceae
68	<i>Samanea saman</i>	Mazhamaram	Fabaceae
69	<i>Saraca asoca</i>	Ashokam	Fabaceae
70	<i>Shorea macrophylla</i>	Meranti	Dipterocarpaceae
71	<i>Simarouba glauca</i>	Lakshmitaru	Simaroubaceae
72	<i>Spathodea campanulata</i>	Africantulip tree	Bignoniaceae
73	<i>Spondias pinnata</i>	Ambazham	Anacardiaceae
74	<i>Sterculia guttata</i>	Kavalam	Malvaceae
75	<i>Strychnos nux-vomica</i>	Kanjiram	Loganiaceae
76	<i>Swietenia mahogany</i>	Mahagony	Meliaceae
77	<i>Symplocos tinctoria</i>	Sweet leaf	Symplocaceae
78	<i>Syzygium cumini</i>	Njaval	Myrtaceae



79	<i>Syzygium samarangense</i>	Java apple	Myrtaceae
80	<i>Syzygium jambos</i>	Pancer champa	Myrtaceae
81	<i>Tamarindus indica</i>	Puli	Fabaceae
82	<i>Tectona grandis</i>	Teak	Lamiaceae
83	<i>Terminalia catappa</i>	Indian Badam	Combretaceae
84	<i>Terminalia elliptica</i>	Matti	Combretaceae
85	<i>Trema orientalis</i>	Trematree/Indian Charcoal tree	Cannabaceae
86	<i>Vateria indica</i>	White pine	Dipterocarpaceae
87	<i>Vitex negundo</i>	Karinochi	Lamiaceae
88	<i>Zanthoxylum rhetsa</i>	Mullila	Rutaceae

Table.3. List of shrubs identified in the campus.

Sl.No	Scientific Name	Common Name/ Local Name	Family
1	<i>Abutilon sp.</i>	Oorakam	Malvaceae
2	<i>Allamanda cathartica</i>	Kolambichedi/Allamanda	Apocynaceae
3	<i>Allamanda schottii</i>	Allamanda	Apocynaceae
4	<i>Bambusa vulgaris</i>	Bamboo/ mula	Poaceae
5	<i>Bougainvillea spectabilis.</i>	Bougainvillea	Nyctaginaceae
6	<i>Breynia sp.</i>	Breynia	Phyllanthaceae
7	<i>Caesalpinia pulcherrima</i>	Rajamalli	Fabaceae
8	<i>Cajanuscaian</i>	Pigeon-peaorthuvara(N)	Fabaceae/Leguminosae
9	<i>Calotropis gigantea</i>	Erikku	Apocynaceae
10	<i>Canna sp.</i>	Chakkarachembu	Cannaceae
11	<i>Chlorophytum comosum</i>	Spider plant	Asparagaceae
12	<i>Chromolaena odorata</i>	Communist paccha	Asteraceae
13	<i>Cirnumasiatum</i>	Spiderlilly	Amaryllidaceae
14	<i>Clerodendrum infortunatum</i>	Perikilam	Lamiaceae
15	<i>Coffea arabica</i>	Coffee	Rubiaceae
16	<i>Croton sp.</i>	Croton	Euphorbiaceae
17	<i>Duranta erecta</i>	Golden dew drops	Verbenaceae
18	<i>Gardenia jasminoides</i>	Sugandhraj	Rubiaceae
19	<i>Glycosmis pentaphylla</i>	Panal	Rutaceae
20	<i>Gomphrena globosa</i>	Vadamalli	Amaranthaceae
21	<i>Hibiscusrosa-sinsensis</i>	Hibiscus	Malvaceae





22	<i>Ixora coccinea</i>	Thechi	Rubiaceae
23	<i>Justicia adhatoda</i>	Adalodakkam	Acanthaceae
24	<i>Lantana camara</i>	Arippooovu	Verbenaceae
25	<i>Manihotes culenta</i>	Kappa/Cassava	Euphorbiaceae
26	<i>Morus sp</i>	Mulberry	Moraceae
27	<i>Murrayya koengii</i>	Curryveppu	Rutaceae
28	<i>Musa paradisiaca</i>	Vazha/Banana	Musaceae
29	<i>Mussaenda erythrophylla</i>	Mosanda	Rubiacea
30	<i>Memecylon randerianum</i>	Kayambo	Melastomataceae
31	<i>Nyctanthes arbortristis</i>	Pavizhamalli	Oleaceae
32	<i>Pedilanthus tithymaloides</i>	Pedilanthus	Euphorbiaceae
33	<i>Plumeria obtusa</i>	Whitefrangipani	Apocynaceae
34	<i>Plumeria pudica</i>	Plumeria/Ezhachempakam	Apocynaceae
35	<i>Rauwolfia serpentina</i>	Sarpagandhi	Apocynaceae
36	<i>Ricinus communis</i>	Avannakku	Euphorbiaceae
37	<i>Ruellia humilis</i>	Wildpetunia	Acanthaceae
38	<i>Sauropus androgynus</i>	Velicheera	Phyllanthaceae
39	<i>Sida acuta</i>	Malamkurunthotti	Malvaceae
40	<i>Sida cordifolia</i>	Kurunthotti	Malvaceae
41	<i>Solanum paniculattum</i>	Solanum	Solanaceae
42	<i>Solanum torvum</i>	Aanachunda	Solanaceae
43	<i>Syngonium sp.</i>	Syngonium	Araceae
44	<i>Tabernaemontana heyneana</i>	Kundalappala	Apocyanaceae
45	<i>Tabernamontana divaritica</i>	Nandyarvattam	Apocynaceae
46	<i>Tecoma stans</i>	YellowElder	Bignoniaceae
47	<i>Trema micranthus</i>	Trema	Cannabaceae
48	<i>Urena lobatta</i>	Caesarweed	Malvaceae
49	<i>Yucca gloriosa</i>	Yucca/Adam'sNeedle	Asparagaceae
50	<i>Ziziphus oenoplia</i>	Thudali	Rhamnaceae

Table.4. List of herbs identified in the campus.

SLNo	Scientific Name	Common Name/ Local Name	Family
1.	<i>Abelmoschus esculentus</i>	Venda/Lady'sfinger	Malvaceae
2.	<i>Aerva lanata</i>	Cherula	Amaranthaceae



3.	<i>Ageratum conyzoides</i>	Chickweed	Asteraceae
4.	<i>Aloe vera</i>	Kattar Vazha	Asphodelaceae
5.	<i>Alternanthera sessilis</i>	Alternatheria	Amaranthaceae
6.	<i>Alysicarpus vaginalis</i>	Alysicarpus	Fabaceae
7.	<i>Artimissia indica</i>	Artimissia	Asteraceae
8.	<i>Anthurium andraeanum</i>	Anthurium	Araceae
9.	<i>Asparagus racemosus</i>	Shatavari	Asparagaceae
10.	<i>Begonia malabarica</i>	Kayyalapulian	Begoniaceae
11.	<i>Biophytum sensitivum</i>	Mukutti	Oxalidaceae
12.	<i>Callisia repens</i>	Turtlevine	Commelinaceae
13.	<i>Carica papaya</i>	Pappaya	Caricaceae
14.	<i>Capsicum frutescens</i>	Kandari mulakku	Solanaceae
15.	<i>Catharanthus pusillus</i>	Perwinkle/Kapavila	Apocynaceae
16.	<i>Catharanthus roseus</i>	Shavamnari	Apocynaceae
17.	<i>Cleome viscosa</i>	Kaatukaduku	Cleomaceae
18.	<i>Commelina caroliniana</i>	Carolinadayflower	Commelinaceae
19.	<i>Crotalaria retusa</i>	KiluKillukki	Fabaceae
20.	<i>Curcuma aeruginosa</i>	Karimanjal	Zingiberaceae
21.	<i>Curculigo orchoides</i>	Nilappana	Hypoxidaceae
22.	<i>Cyanthillium cinereum</i>	Poovamkurunila	Asteraceae
23.	<i>Demodium trifolium</i>	Nilamparanda	Fabaceae
24.	<i>Dendrophthoe falcata</i>	Ithikanni	Loranthaceae



25.	<i>Desmodium gangeticum</i>	Orila	Fabaceae
26.	<i>Emilia sanchifolia</i>	Muyalcheviyan	Asteraceae
27.	<i>Euphorbia hirta</i>	Asthma plant	Euphorbiaceae
28.	<i>Euphorbia nutans</i>	Nodding spurge	Euphorbiaceae
29.	<i>Evolvulus alsinoides</i>	Vishnu kranthi	Convolvulaceae
30.	<i>Hedychium coronarium</i>	Hedychium	Zingiberaceae
31.	<i>Heliconia rostrata</i>	Hangingloster	Heliconiaceae
32.	<i>Hemigraphis colorata</i>	Redflameivyor Murikootti	Acanthaceae
33.	<i>Hyptis suaveolens</i>	Naattapoochedi	Lamiaceae
34.	<i>Ipomoea triloba</i>	Ipomoea	Convolvulaceae
35.	<i>Leuca saspara</i>	Thumba	Lamiaceae
36.	<i>Lilium sp.</i>	Lily	Liliaceae
37.	<i>Lindernia sp</i>	Lindernia	Scrophulariaceae
38.	<i>Mirabilis jalapa</i>	Naalumaniplant	Nyctaginaceae
39.	<i>Naregamia alata</i>	Nilanarakam	Meliaceae
40.	<i>Nephrolepis sp</i>	Pannal	Pteridaceae
41.	<i>Ocimum gratissimum</i>	Ramatulasi	Lamiaceae
42.	<i>Ocimum tenuiflorum</i>	Krishnatulasi	Lamiaceae
43.	<i>Phyllanthus niruri</i>	Keezhanelli	Phyllanthaceae
44.	<i>Piper longum</i>	Thippali	Piperaceae
45.	<i>Plectranthus barbatus</i>	Panikoorka	Lamiaceae
46.	<i>Portulaca grandiflora</i>	Pathumaniplant	Portulacaceae
47.	<i>Pteris sp.</i>	Pannal	Pteridaceae
48.	<i>Rosa indica</i>	Rosa	Rosaceae





49.	<i>Scadoxus multiflorus</i>	Ball lily	Amaryllidaceae
50.	<i>Scorparia dulcis</i>	Kallurukki	Plantaginaceae
51.	<i>Sesamum radiatum</i>	Kattellu	Pedaliaceae
52.	<i>Solanum melongena</i>	Vazhuthana	Solanaceae
53.	<i>Solanum anguivi</i>	Putharichunda	Solanaceae
54.	<i>Stachytarpheta cayennensis</i>	Stachytarpheta	Verbenaceae
55.	<i>Synedrella nodiflora</i>	Synedrella/ Mudiyendrapacha	Asteraceae
56.	<i>Tagetes minuta</i>	Marigold	Asteraceae
57.	<i>Tridax procumbens</i>	Tridax	Asteraceae
58.	<i>Tylophora indica</i>	Vallipala	Apocynaceae
<b>Grasses</b>			
59.	<i>Axonopus compressus</i>	Blanket grass	Poaceae
60.	<i>Cymbopogon citratus</i>	Lemon grass (N)	Poaceae
61.	<i>Cynodon dactylum</i>	Karuka	Poaceae
62.	<i>Digitaria ischemum</i>	Smoothcrab grass	Poacea
63.	<i>Digitaria sangualis</i>	Crab grass	Poacea
64.	<i>Eragrostis curvula</i>	Weeping love grass	Poaceae
65.	<i>Ischaemum rugosum</i>	Ischaemumrugosum	Poaceae
66.	<i>Kyllinga nemoralis</i>	Spikesedge	Poaceae
67.	<i>Panicum virgatum</i>	Switch grass	Poaceae
68.	<i>Pennisetum polystachion</i>	Mission grass	Poaceae



Table.5. List of climbers identified in the campus:

Sl.no	Scientific Name	Common Name/ Local Name	Family
1.	<i>Abrus precatorius</i>	Kunnikuru	Fabaceae
2.	<i>Aganosma cymosa</i>	Paalvalli	Apocynaceae
3.	<i>Antigonon leptopus</i>	Mexican creeper	Polygonaceae
4.	<i>Aristolochia indica</i>	Eswaramooli	Aristolochiaceae
5.	<i>Calycopteris floribunda</i>	Pullani	Combretaceae
6.	<i>Cardiospermum halicacabum</i>	Uzhinja	Sapindaceae
7.	<i>Cleodendrum thomsoniae</i>	Bleeding heart vein	Lamiaceae
8.	<i>Clitoria ternata</i>	Shanku pushpam	Fabaceae
9.	<i>Coccinia cordifolia</i>	Kaattukoval	Cucurbitacea
10.	<i>Cyclea peltata</i>	Padathali	Menispermaceae
11.	<i>Epipremnum aureum</i>	Moneyplant	Araceae
12.	<i>Ipomoea marginata</i>	Thiruthalli	Convolvulaceae
13.	<i>Merremia vitifolia</i>	Manjavayara valli	Convolvulaceae
14.	<i>Mikania micrantha</i>	Bittervine	Asteraceae
15.	<i>Mimosa diplotricha</i>	Aanathottavadi	Fabaceae
16.	<i>Mimosa pudica</i>	Touch me not	Fabaceae
17.	<i>Muehlenbeckia platyclada</i>	Phylloclade	Polygonaceae
18.	<i>Passiflora edulis</i>	Passionfruit	Passifloraceae
19.	<i>Passiflora foetida</i>	Passiflora foetida	Passifloraceae
20.	<i>Smilax zeylanica</i>	Kareelanchi	Smilacaceae
21.	<i>Tiliacora acuminata</i>	Vallikanjiram	Menispermaceae
22.	<i>Tragia involucrata</i>	Choriyanam	Euphorbiaceae





#### 4.2 Endangered, Endemic and threatened species

Few species of red listed flora identified from the campus includes viz. *Rauvolfia serpentina* (endangered), *Hydnocarpus kurzii*, *Vateria indica* (critically endangered), *Aquilaria sinensis* (Vulnerable), *Tabernaemontana heyneana* (near threatened). *Rauvolfia serpentina* and *Tabernaemontana heyneana* are shrubs and *Hydnocarpus kurzii*, *Aquilaria sinensis* (Vulnerable) and *Vateria indica* are trees. All these four IUCN threatened plants are used for medicinal purposes. Out of these four plant *Tabernaemontana heyneana* and *Vateria indica* are endemic to southern Western Ghats. Thus, special conservation should be given to these plants.

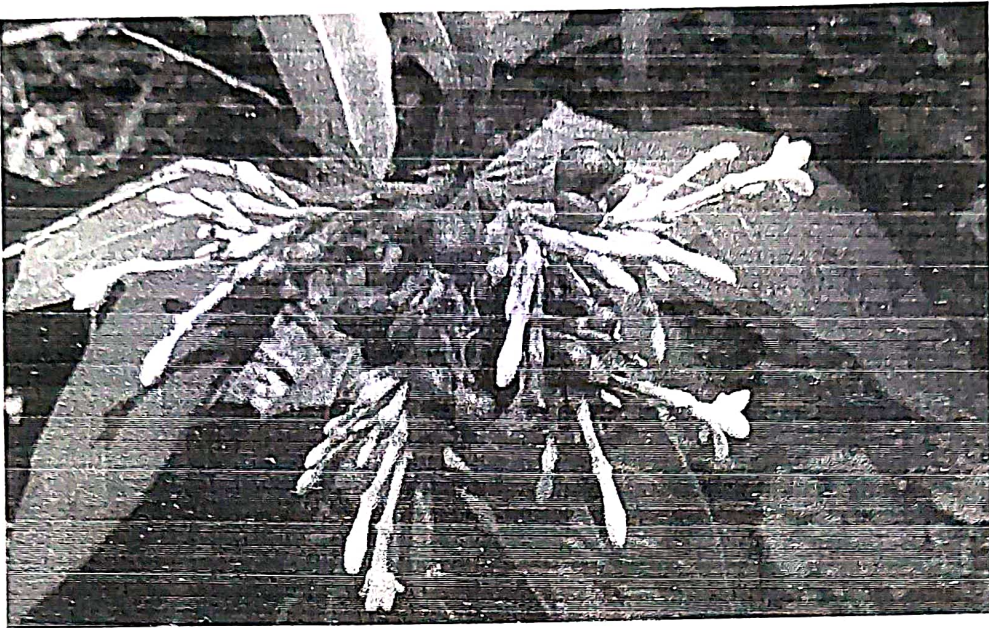
Fig. 1. Red book listed Species



*Aquilaria sinensis*







*Rauvolfia serpentina*



*Vateria indica*







*Tabernaemontana heynean*

#### 4.3 Invasive Alien Species

An alien species is a species, subspecies or lower taxon introduced outside its natural past or present distribution, including gametes, seeds, eggs, or propagules of such species that might survive and subsequently reproduce (CBD, 2002). An invasive alien species refers to an alien species whose introduction and spread threaten the region/habitat (CBD, 2002).

*Acacia auriculiformis*, *Annona muricata*, *Casuarina equisetifolia*, *Cleodendrum trichotomum*, *Eucalyptus globulus*, *Gliricidia sepium*, *Chromolaena odorata*, *Lantana camara*, *Merremia vitifolia*, *Solanum paniculatum*, *Tithonia diversifolia*, *Crotalaria retusa*, *Euphorbia hirta*, *Stachytarpheta cayennensis*, *Tagetes minuta*, *Mikania micrantha*, *Mimosa diplotricha* are identified as the invasive alien species of the campus. Most of the garden plants in campus are found to be invasive. IAS



can be classified into high risk, medium risk, low risk, and insignificant species based on their potential to produce negative impacts. *Wedelia trilobata*/Singapore daisy, *Mikania micrantha*/bittervine, *Lantana camara*, *Chromolaena odorata*, *Mimosa diplotricha*, *Merremia vitifolia* are high risk IAS found in the campus. All these IAS except *Chromolaena odorata* are intentionally introduced plants for various purposes like as sources of animal food, for timber, afforestation, ornamental etc. Pollens of *Acacia* sps. are reported as allergens and causes respiratory diseases like asthma. Allelochemical produced by invasive plants cause growth retardation of native plants. IAS also have rapid and high propagation potential. If not managed effectively we will lose the current diversity of the campus soon.

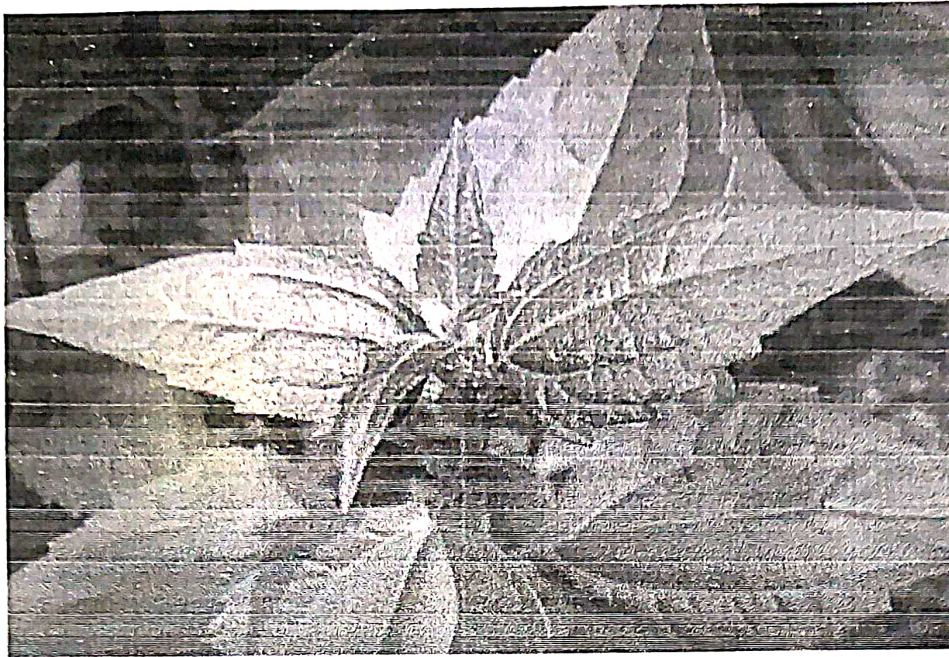
**Figure.2.** Invasive alien species in the campus



*Lantana camara*







*Eupatorium odoratum*



*Crotalaria retusa*





#### 4.4 Lichen diversity in the college campus

Lichens are one of the most fascinating symbiotic organisms found worldwide. The lichens species are ubiquitous and common inhabitants of the bark of the tree, rock surface, soil etc. They are a lower group of plants coming under non-flowering plants that live in a variety of substrates under a wide range of environmental conditions with or without causing harm to the hosts. Ecologically, lichen plays important roles in soil formation; re-establishes life on earth; fixes atmospheric nitrogen; plant's health, ecology distribution, and in the formation of organic matter of habitat which in turn benefitting mosses in nutrient availability. A unique synergetic association between a fungal and an algal species results in lichens and occupied in plant kingdom. In this relationship both the organisms are mutually benefited. The major forms of lichens are;-

- a) Foliose lichens exhibit a flat leaf like thallus.
- b) Fruticose lichens exhibit erect, pendulous and bushy thallus.
- c) Squamulose lichens exhibit thallus with minute, scale like squamules.
- d) Crustose lichens exhibit flat crust shaped thallus. Lichen diversity recorded in the WMO College campus showed a total of three different lichens.

#### Lichen diversity Family Growth forms

1	<i>Buelliapullata</i>	Caliciaceae	Crustose
2	<i>Lecanoraperplexa</i>	Lecanoraceae	Foliose
3	<i>Graphis glauconigra</i>	Graphidaceaea	Furticose

#### 4.5 Faunal diversity

About 103 species of fauna are identified from the campus. Out of which, 43 are birds, 36 are butterflies, 5 are a moth, 6 are reptiles, 13 are mammals and 1 amphibian. The campus is also home to 23 other invertebrate organisms belonging to 16 orders. Birds visiting the campus is not bad since 42 species of birds are



identified from the campus. House crow, rock pigeon and common myna are the dominant birds found on the campus. The presence of an appreciable diversity of butterflies on the campus is due to the abundance of butterfly host plants which include *Albizia sp*, *Pterocarpus marsupium*, *Manihot carthaginensis* and *Smilax zeylanica*. Nectar providing plants like *Lantana camera*, *Ixora coccinia*, *Saraca asoka*, *Tridax sp*, *Clerodentron sp*, *Cassia sp*. etc., retains the butterfly diversity of the campus. *Felis catus*, *Canis lupus*, *Bos taurus*, *Bubalus bubbalis* and *Capra aegagrus hircus* are the common mammals of the campus. The great diversity of herbivores insects is thought to be linked to their interactions with host plants. CUSAT reservoir and pond support good fish fauna. Concrete ponds in various departments are home to many insects like damselflies and dragonflies because their life cycle have an aquatic larval stage. Amphibians also depend on this water system.

Table.6. List of birds identified from the campus

SLNo	Common Name	Scientific Name
1	House sparrow	<i>Passer domesticus</i>
2	Indian cuckoo	<i>Cuculus micropterus</i>
3	Barn owl	<i>Tyto alba</i>
4	Lesser whistling duck	<i>Dendrocygna javanica</i>
5	Red-vented bulbul	<i>Pycnonotus cafer</i>
6	House crow	<i>Corvus splendens</i>
7	Rock pigeon	<i>Columba livia</i>
8	Common myna	<i>Acridotheres tristis</i>
9	Asian koel	<i>Eudynamys scolopacea</i>
10	Greater coucal	<i>Centropus sinensis</i>
11	Black-rumped flame back	<i>Dinopium benghalense</i>



12	Indian pond heron	<i>Ardeola grayii</i>
13	Median egret	<i>Mesophoyx intermedia</i>
14	Rose ringed parakeet	<i>Psittacula krameri</i>
15	Indian tree pie	<i>Dendrocitta vagabunda</i>
16	Purple-rumped sunbird	<i>Leptocoma zeylanica</i>
17	Scaly breasted munia	<i>Lonchura punctualata</i>
18	Blue-tailed bee eater	<i>Merops philippinus</i>
19	Red-whiskered bulbul	<i>Pycnonotus jocosus</i>
20	Magpie robbin	<i>Copsychus saularis</i>
21	Black drongo	<i>Dicrurus macrocercus</i>
22	Great racket tailed drongo	<i>Dicrurus paradiseus</i>
23	White throated kingfisher	<i>Halcyon smyrnensis</i>
24.	White headed babbler	<i>Turdoides affinis</i>
25	White cheeked barbet	<i>Meglaima viridis</i>
26	Golden oriole	<i>Oriolus oriolus</i>
27	Black naped oriole	<i>Oriolus chinensis</i>
28	Common kingfisher	<i>Alcedo atthis</i>
29	Brahminy kite	<i>Haliastur indus</i>
30	Black kite	<i>Milvus migrans</i>
31	Shikra	<i>Accipiter badius</i>
32.	Rosy starlings	<i>Pastor roseus</i>
33.	Spider hunter	<i>Arachnothera</i>
34.	Indian robin	<i>Saxicoloides fulicatus</i>
35.	Indian roller	<i>Coracias benghalensis</i>
36.	Indian jungle crow	<i>Corvus culminatus</i>





37.	Cormorant	<i>Phalacrocoracidae</i>
38.	Jungle babbler	<i>Turdoides striata</i>
39.	Ceylon grey tit	<i>Parus major</i>
40.	Emerald dove	<i>Chalcophaps indica</i>
41.	Common swift	<i>Apodidae</i>
42.	Common quail	<i>Coturnix coturnix</i>
43	Wood shrike	<i>Tephrodornis pondicerianus</i>

Table.7. List of butterflies identified from the campus

Sl.No	Common Name	Scientific Name
1	Common jezebel	<i>Delias eucharis</i>
2	Common evening brown	<i>Melanitis leda</i>
3	Pioneer butterfly	<i>Belenois aurota</i>
4	Common angled castor	<i>Ariadne ariadne</i>
5	Tawny castor	<i>Acraea terpsicore</i>
6	Common rose butterfly	<i>Pachliopta aristolochiae</i>
7	Common mormon	<i>Papilio polytes</i>
8	Chocolate pansy	<i>Junonia iphita</i>
9	Tailed jay	<i>Graphium agamemnon</i>
10	Lime butterfly	<i>Papilio demoleus</i>
11	Painted sawtooth	<i>Prioneris sita</i>
12	Common crow	<i>Euploea core</i>
13	Common wanderer butterfly	<i>Pareronia valeria</i>
14	Grey pansy	<i>Junonia atlites</i>



15	Mottled emigrant	<i>Catopsilia pyrantha</i>
16	Common grass yellow	<i>Eurema hecabe</i>
17	Crimson rose butterfly	<i>Pachliopta hector</i>
18	Blue tiger	<i>Tirumala limniace</i>
19	Dark blue tiger	<i>Tirumala septentrionis</i>
20	Plain tiger	<i>Danaus chrysippus</i>
21	Common palm fly	<i>Elymnias hypermnestra</i>
22	Banana skipper	<i>Erionta thrax</i>
23	Red pierrot	<i>Talicauda nyseus</i>
24	Psyche	<i>Leptosia nina</i>
25	Common egg fly	<i>Hypolimnas bolina</i>
26	Striped tiger	<i>Danaus genutia</i>
27	Plain cupid	<i>Chilades pandava</i>
28	Common cerulian	<i>Jamides celeno</i>
29	Common quaker	<i>Orthosia cerasi</i>
30	Common baron	<i>Euthalia aconthea</i>
31	Common four ring	<i>Ypthima huebneri</i>
32	Common bush brown	<i>Mycalesis perseus</i>
33	Common rustic	<i>Mesapamea secalis</i>
34	Common sailor	<i>Neptis hylas</i>
35	Chestnut bob	<i>Iambrix salsala</i>



Table.8. List of moths identified from the campus.

Sl.No	Common Name	Scientific Name
1	Blue tiger moth	<i>Dysphania percota</i>
2	Crotalaria moth	<i>Utetheisa lotrix</i>
3.	Hawk-moth	<i>Daphnis nerii</i>
4.	Tiger moth	<i>Asota caricae</i>
5.	Ailanthus web worm moth	<i>Atteva fabriciella</i>
6	Atlas silk moth	<i>Attacus atlas</i>

Table.9. List of mammals identified from the campus.

Sl.No	Common Name	Scientific Name
1	Jungle cat	<i>Felis chaus</i>
2	Domestic cat	<i>Felis catus</i>
3	Dog	<i>Canis lupus</i>
4	Indian grey mongoose/Keeri	<i>Herpestes edwardsii</i>
5	Three-striped palm squirrel	<i>Funambulus palmarum</i>
6	Indian flying fox	<i>Pteropus giganteus</i>
7	House rat	<i>Rattus rattus</i>
8	Brown rat/Panni eli	<i>Rattus norvegicus</i>
9	Jackal/Kurukkan	<i>Canis aureus</i>
10	Toddy cat/marapatti	<i>Paradoxurus jerdoni</i>
11	Indian mole-rat	<i>Bandicota bengalensis</i>
12	Black-naped hare	<i>Lepus nigricollis</i>





**Table.10.** List of reptiles identified from the campus.

Sl.No	Common Name	Scientific Name
1	Rat snake	<i>Pytas mucosa</i>
2	Cobra	<i>Naja naja</i>
3.	Garden lizard	<i>Calotes versicolor</i>
4.	House gecko	<i>Hemidactylus sp.</i>
5.	Common skink	<i>Mabuya carinata</i>
6.	Monitor lizard	<i>Varanus bengalensis</i>

**Table.11.** List of amphibians identified from the campus.

Sl.No	Common Name	Scientific Name
1.	Asian common toad	<i>Duttaphrynus melanostictus</i>
2.	Indian bull frog	<i>Hoplobatrachus tigerinus</i>
3.	Malabar tree toad	<i>Pedostibes tuberculosus</i>
4.	Small wood frog	<i>Indosylvirana aurantica</i>
5.	Malabar gliding frog	<i>Rhacophorus malabaricus</i>



#### 4.6 Threats to biodiversity

Generally, mass clearance of plants and trees for construction works is the main reason behind the disappearance of many native plants and trees. It also causes habitat destruction and eventually affect the faunal diversity of the campus. The invasive species like *Acacia auriculiformis*, *Mikania micrantha*, *Chromolaena ordata* and *Lantana camara* are found in the campus. These aliens never support indigenous plants. Lab waste, including hardwires and chemicals released directly into the soil, is deteriorating soil quality, and making soil unsuitable for supporting plants. It also affects soil micro and macro fauna. So, care must be taken during new constructions not to disturb the biodiversity of the campus. Similarly, growth of the invasive and alien species should be controlled by selective eradication.

#### 4.7 Recommendations

1. A butterfly garden may be developed by planting following butterfly plants:

*Clerodendrum paniculatum*

*Crotalaria pallida*

*Crotalaria retusa*

*Cuphea hyssopifolia*

*Gloriosa superba*

*Gardenia sp.*

*Heliotropium keralense*

*Lantana camara*

*Ixora coccinea*





*Hibiscus sp.*

*Aristolochia indica*

*Murraya koenigii*

2. Convert the barren area to a forest using the *Miyawaki* method.
3. Medicinal plant garden using RET (Rare, Endangered and Threatened) species may be established
4. A bamboo garden with different species may be grown.
5. An orchard of fruit trees may be developed near to the hostel

### 5 Energy Management

The Functional Area Expert of the Audit team has assessed the energy consumption, energy sources, energy management, lighting devices and other appliances used in the campus. The use of energy is a very important aspect of the sustainability of any community. The audit team assessed the number of electrical appliances and their respective uses in terms of consumption of energy per month in KWh.

**Table 5.1 - List of Electrical – electronic equipments in the college**

Sl.No	Name of Instruments	No of Instruments
1	LED bulbs	400
2	Tube lights	300
3	Fan	102
4	Coolers	3
5	Desk top computers	150
6	Laptops	5
7	Printers	22



8	LCD projector	20
9	Scanner	5
10	Televisions	3
11	Photocopier	5
12	Refrigerators	3
13	Electric motors/water pumps	4
14	Water heater	1
15	Electronic balance	2
16	Electric bunsen burners	5

### 5.1 Findings

Consumer number: 9010753

Tariff: 6F

Use: Pump House

Phase: 3Ø

The present current charge is very high as it is in the construction tariff (6F) which has to be changed to domestic tariff (1A). It may soon be switched over to 11 KV (11000 volt) and will have a lower fixed charge. It is seen that 5 HP and 1.5 HP water pumps are connected to the same capacitor. Separate capacitor should be used for 1.5 HP motor pump.

PF 0.8

Capacitor value 60/440v

So the output result is not satisfactory.





Sl. No	Consumer number	Purpose	Tariff	Phase
1	4009062	Daycare	6A	1Ø
2	9010753	Pump house	6F	3Ø
3	6004470	Principal quarters	1A	1Ø
4	0004471	Ladies toilet	6A	1Ø
5	7004468	Canteen	7A	3Ø
6	4004469	Pump house (o)	6B	1Ø
7	5008036	Mosque	6A	1Ø
8	7008037	Ladies hostel	6B	3Ø
9	3008725	Library	6A	3Ø
10	9007986	Main building	6A	3Ø
11	9010669	Boys hostel	6F	3Ø

Volt (V)

Current (I)

Power factor (PF)

Active power (KW)

Apparent power (KVA)

Reactive power (KVAX)

Energy consumption (KWh)

Frequency (H)

The Energy audit was defined to meet the following objective. The audit team conducted a sample walk in the campus buildings and the functional area expert observed the energy consumption of electrical appliances within the WMO Arts and Science College building.



The audit team reviewed and analyzed the history of the usage of electricity in the various buildings of the college. The college will readily be switched over to the 11 KV baseline supply, which will increase the efficiency of the power supply and will reduce the rate .

Consumer number: 4009062

Tariff: 6A

Use: Day care

Energy auditing of power factor is found to be very low. Tests showed that the capacities in the motor water pump or electrical fan (inductive) were low or bad to increase the power factor.

Meter shifting - (due to switching to 11 KV, there will be no need for this)

PF. 6.8, 0.7 (1,0.9,0.8)

Voltage 224-227V

Energy meter is old.

Consumer number: 6004470

Tariff: 1A

Use: Principal quarters

Phase: 1Ø

PF: 0.8

Only the current charges come for usage. If the fan is converted to B.L.D.C, the electricity bills can be further reduced by 30% .

- a) Earth pipe
- b) Energy meter L & T old.

This problem will be solved by switching to 11 KV (11000V) transformer installations.



Consumer number: 0004471

Tariff: 6A

Use: Ladies toilet building

Phase: 1Ø

Some LED bulbs are prone to breaking and need to be replaced with new ones. T. exposed electrical looping should be avoided.

PF: 0.9 - is good

Consumer number: 7004468

Tariff: 7A

Use: Canteen

Phase: 3Ø

Four nos of electrical fan were converted to B.L.D.C. The water purifier is complaint. Water connection (point to motor), on and off switches with motor long distance.

PF 0.7 is poor (0.9 or 0.8)

Fridge working more time due to increase in the cooling position.

Fridge door should be checked due off on low floor level.

Consumer number: 4004469

Tariff: 6A

Use: Pump house

Phase: 1Ø

The motor has to be turned on and off many times a day.

The motor and main on left switch wire is low.

The capacitor value is not matching the motor

PF is very poor 6.9 - (1, 0.9, 0.8)

Consumer number: 5008036

Tariff: 6A





Use: Mosque

Phase: 1Ø

It is on high charge tariff, so current charge is very high.

Control the usage.

There are two are old electrical fan. It is advised the convert to B.L.D.C

Power factor is 0.7, poor (1, 0.9, 0.8 )

Consumer number: 7008037

Tariff: 6A

Use: Ladies hostel

Phase: 3Ø

Neutral W/P wire supported in (energy meter connection wire) is dangerous and should be avoided.

Electricity use is very high.

Convert electrical fans to B.L.D.C

The reason that the fan working with noise increases the current charge.

Consumer number: 3008725

Tariff: 6A

Use: Library

Phase: 3Ø

No need to move the meter board anymore, because of switching to 11KV line with transformer.

PF: 0.8

Voltage : 234V

I. The current rating cannot be measured as the whole load is not functioning.

Consumer number: 9007986

Tariff: 6A

Use: Main building



Phase: 3Ø

II. Since the wiring is spliced together, the wires and gauge/ grade more likely to be different, so the wiring should be checked.

III. Since the load in three phases is unbalancing there is a possibility that one or two phase (R, Y) or (R, B) or (Y, B) cable will get heated. Load and those cables will get heated. As the main building carried a lot of load one or two controls are essential. This makes fault detection easier

Voltage: 189- 234V

PF: 6.4 to 0.7

Consumer number: 9010669

Tariff: 6F

Use: Boys hostel

Phase: 3Ø

Not load balancing noted the in three storied building.

The inspection showed that the second floor was using more load.

If the fan in the hostel is running with loud noise, it is to be converted to B.L.D.C.

Voltage: 228, 223, 227 (R.Y.B)

PF: 0.9

Meter shifting -(R: 1.68 Y: 2.76 B: 2.61 5.05)

Total standing 9.9 A Difference is very high and low

## 5.2 Renewable Source of Energy

The college has established 20 W solar power plant. The beneficiary of the solar energy is college library and the boy's hostel. The college is in the process of promoting the use of non – conventional energy sources , such as solar, wind, and biogas. One biogas plant is established near the canteen and solar street lights are in the process of installation. The garden lights proposed in the campus are solar powered. The college authorities have informed us that they are planning to install wind turbine which is currently in the discussion stage. They have also mentioned that once the college comes out of the financial stringencies imposed by the Covid 19



pandemic, they will take more initiatives towards setting up clean energy sources.

### 5.3 Carbon Foot print Audit

The green house gases are carbon dioxide, methane, oxides of nitrogen, ozone and water vapor. Of these green house gases the major one is carbon di oxide and that is the one usually dumped into the campus atmosphere by the day to day activities related the functioning of the college. The basic knowledge of carbon foot print is useful in controlling the release green house gases in to the atmosphere. Carbon foot print is the total amount of green house gases particularly carbon di oxide and methane that are generated by human activities. The carbon foot print is an indicator to compare the total amount of green house gases emitted from a human activity. By reducing the emission of green house gases to the atmosphere, an environmentally conscious person is contributing towards the sustainability of our environment .We produce green house gas emissions from burning fossil fuels when we drive, burning gas or wood, or by using electricity.

If we control the use of materials that cause greenhouse gas emissions, our carbon foot print can be reduced. Thus by changing an individual's personal choices or habits, the carbon emission to the atmosphere can be controlled. Hence the Carbon foot print audit of each institution can definitely educate the youth make them aware of the carbon foot print and climate change.

### 5.4 Major findings

Total number of students	- 2045
Total number of teachers	- 91
Number of non-teaching staff	- 42
Number of persons using cars	- 40
Number of persons using two wheelers	- 39
Number of persons using public transport	- 2020
LPG usage – number of cylinders per month	- 6
Average fossil fuel usage per day	
Firewood used in the canteen-kg/day	-300





### 5.5 Methods proposed to reduce carbon foot print

1. Teachers from nearby destination may share the vehicles whenever possible
2. Public transport will be promoted to staff and students. At present the college has a bus to for the conveyance of students. Few staff members are also using this public conveyance system. The public conveyance system will be increased in the near future.
3. The use of firewood in the college canteen will be replaced by LPG/biogas
4. Campus will be made more and more green to fix carbon di oxide

### 6 Water Management

Table 6.1

Sl.No	Details	Remarks
3	Water sources in the campus	Wells
5	Number of open well in the campus	2
6	The number of electric motors used for pumping	5
8	The depth of the deepest well in the campus	12 meters
12	Capacity of the overhead tank/s in the campus in litres	2 lakh litres
13	The quantity of water pumped every day	30000 Litres
16	Waste water disposal System	Soak pit
18	The system of management of water used in the Chem. Lab.	Soak pit with filter bead
23	Number of water coolers in the college	4
24	Number of water purifiers in the college	10
25	Number of water taps in the college	168
27	Number of toilets in the college	48
28	Number of bath rooms and toilets in the college hostels	65
30	Amount of water used per day in the bath rooms/ toilets	11200 L/day
31	Number of water taps in the canteen	10
32	Amount of water used in the canteen in liters	4000 L/day



34	Amount of water used in lab	500L/day
35	Rainwater harvesting system in the campus	Two tanks each of two lakh litres capacity
37	Water fountains in the campus	One
39	Amount of water used for irrigation purpose	500 liters/day
41	Water Quality	Good
48	What is the average rain fall in the campus?	2700 mm

### 6.1 Observations

The college has a clear vision on water management. Students are aware on the necessity of water conservation, as observed from their attitude in the use of water. Stickers are placed near water taps to promote the minimal use of water. The open wells in the campus are well maintained. The water quality is analyzed at least once in a year. The quality parameters are within the BIS limits. The overhead tanks are hygienic and cleaned at frequent intervals. The college has rainwater harvesting mechanisms. There are two storage tanks, each of two lakh liters capacity, located near both boy's and girl's hostels. The rain water harvesting system is the best practices on water awareness among students and public. Moreover the rain water in the open area are not allowed to run away, instead by soil conservation practices the water is allowed to filter to the soil and finally to aquifers thus maintaining the water table of the nearby area. Hence the college does not face any water scarcity during summer season. The NSS units of the college organize awareness programs on water conservation frequently to spread the message of water conservation and water quality. It is a regular practice of the college to organize special programs on March 22, the World Water Day. The geography of the campus indicates that the area is water rich with a high level of water



## 6.2 Suggestions

It is better to have a water consumption monitoring system in the college. There is no particular mechanism to find water wastage. Few taps in gent's urinal found to be leaking, because the taps were not properly closed. This has to be overcome with awareness programs and has to be dealt with maximum care. Students must realize that every drop of water is precious.

The waste water from canteen, hostel kitchens, laboratories, toilets, bathrooms can be recycled and used for gardening or irrigation purposes. Suitable action should be prepared for the recycling and use of waste water. More attention should be given for protecting the RWH ferro cement tanks. V should not be allowed to encircle the tanks, instead a small garden should be established and the soil beneath the tank should be protected from erosion during fall.

It is better to close the top of the open well near the women's hostel to prevent the formation of algae and the entry of water polluting objects from outside. A considerable amount of storm water is flowing out from the campus. A portion of this water can be retained within the campus by using leach pits, rain water contour bunds or trenches.

## 7 Best practices followed in the college for Sustainable Environment

### 7.1 Green Chemistry Initiatives.

The green chemistry aims to achieve the highest level of pollution prevention. A deliberate attempt to minimize pollution from the source. The wastes and the water from the laboratories, particularly from the chemistry lab are minimized. Chemical reagents are prepared at a very low level of concentration and semi-analytical approaches are followed with the minimum use of the reagents. The water from the chemistry laboratory is passed through a filter tank packed with gravels, broken country bricks and charcoal. The care and concern of the institution for environmental issues are well illustrated by the green chemistry initiatives.





## 7.2 Eco friendly Approach

The WMO College is maintaining more than 75% of the green cover area after completing the construction works. The management has tried to follow the guidelines of World Green Building Council and Indian Green Building Council to provide an ecofriendly environment to the stakeholders. Deliberate attempts were made to maintain the natural vegetations to the maximum extent and planted trees are mostly of indigenous species.

The campus is established without causing detrimental impact to the ecosystem of 15 acres of the natural vegetation along with the artificially developed topography like small mounts, path ways, and parking areas. The beautiful auditorium of the college is not a concrete building illustrating the ecofriendly approach towards constructions.

## 7.3 Herbal Garden and Butterfly Garden

The WMO College has created a 'Herbal Garden' with more than 50 medicinal plants and a natural butterfly garden. The college takes keen interest in afforestation programs in which selected indigenous seedlings and shrubs species are planted and protected under the title 'Biodiversification' as to increase the number of flora on the campus.

## 7.4 Dense Green Cover

A community forest of about 70 cents with different species is maintained for water conservation and to ensure deep green canopy of the campus. This forest area is very rich in flora and fauna. The Japanese concept of 'Miyawaki forest' is developed at various corners that provide dense, green cover and natural beauty to the campus.

## 7.5 Floral Diversity.

In view of floral biodiversity in the college campus, a sum 230 species are being identified and recorded. These species consists of angiosperms, gymnosperms, pteridophytes and bryophytes. Sixty one families covering trees, herbs, shrubs, climbers, lianas, twiners and lawns are recorded. The institution has prepared a biodiversity register also.



### 7.6. Rain Water harvesting.

The College has established rainwater harvesting models, by collecting rainwater from the building roofs. Two storage tanks, each with two lakh litre capacity have been constructed and the water storage system is well maintained. The water overflowing from the storage tanks are redirected to the open well. Thus the educational institution has given prime importance for water conservation.

### 7.7 Soil and Water Analysis.

The institution ensures the water quality by doing water analysis in recognized water testing laboratories. It is observed that the water analysis is done two times in an academic year. Moreover ample drinking water facilities are provided to the stakeholders. So it is well evident that the institution gives care and concern to health of the student community. Similarly it is observed that soil samples from the campus have been analyzed to understand a clear idea about the quality parameters of the soil. Since soil is the medium for plant growth and also for the medium of hydrological cycle, the soil sustainability should be conserved. WMO College has given good attention in maintaining the quality parameters of soil and water.

**Table 7.1 Soil Test**

Sample code	pH	EC	OC	P	K	Ca	Mg	Zn	S	Fe	Cu	Mn
A	5.30	0.009	0.79	17.5	236	125	24	0.68	5.5	1.20	0.59	0.9
B	5.10	0.013	0.70	16.4	229	125	25	0.66	5.1	0.98	0.60	0.9



Table 7.2 Water test

Sl.No	Parameters	Sample 1	Sample 2	Sample 3	Acceptable limit as per (BIS)
1	Colour	Colourless	Colourless	Colourless	
2	Odour	Odourless	Odourless	Odourless	
3	pH	6.10	6.60	6.00	6.5 -8.5
4	Electrical Conductivity	252	248	209	500
5	Turbidity NTU	1.1	0.7	0.9	1.00
6	TDS	215	231	247	500
7	Iron	0.20	0.15	0.17	0.38

### 7.8 Waste Disposal

This institution has given due importance in solid waste management. Dustbins are placed at many places in the campus and hence litters are not seen anywhere in the campus. It is a clean and green campus even if more than two thousand students are studying in this educational institution.

### 8 Recommendations

- Many class rooms were found in disorder. The bench and desk are not properly placed. It is advisable to keep the seating arrangements in good order.
- Even though dustbins are kept at many parts of the college, few class rooms were unclean with litters. Hence more awareness classes should be given to the students for keeping their class rooms neat and tidy.
- Many water taps were found open in the gent's toilet, thus wasting water. Daily usage of water should be monitored and wasting of the precious water should be avoided.



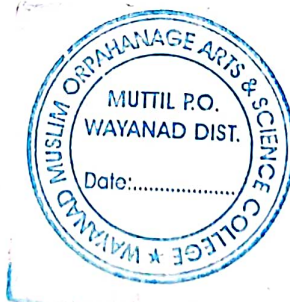


- The campus is green and clean, but the diversity of plant species is not en for a campus area of fifteen years. Hence campus biodiversification should done more effectively.
- Though the classes begin with a prayer song no other illustrations are evid for the “Value Education” of the students.
- The institution is situated in a clean and green environment. So the air qua good. Even then the air quality index can be analyzed at least once in a ye the number of excessively oxygen releasing trees and shrubs should be increased.
- The campus is blessed with abundant flora and fauna, which need to be classified more scientifically and mapped out.
- The management should consider to establish a robust botany and zoology departments to address this situation.
- Various birds, butterflies and other creatures including small wild animal observed in the campus. So it is advised to spare a minimum of fifty ce develop a community forest resembling a natural forest with suitable indig plants, shrubs, herbs an climbers. A small forest in the campus can ha maintain the institutions’ integrity to conserve its valuable flora and fauna
- Labels should be provided, at the very least for all plants near the buildings
- It is proposed to increase the number of medicinal plants in the camp setting up a medicinal plants garden, especially to protect the various listed under the ‘RET Listed Species’ (Rare Endemic and Threatened Govt.of india, though which are abundantly visible in Wayanad district.
- Year wise green audit should be conducted on biodiversity, water, soil and energy by the internal audit team of the college.
- Proper management and month wise mapping of water and energy usage to conducted and be recorded for future references.
- The waste water should be recycled and may be used for gardening.



## 9. Conclusion

WMO College is a well-established private institution of Wayanad which imparts quality education to rural, tribal and urban people of Wayand district. This institution is excellent in terms of curricular and co curricular activities. The academic performance of many departments is very good and their basic knowledge on climate issues is appreciable. The institution has taken enormous efforts to maintain green campus, unpolluted water and tiny forests. The extracurricular activities through NSS, NCC Bhoomitrasena and such clubs benefit the rural and tribal community people of Muttil Grama Panchayath. The audit team is influenced by the sufficient green cover area of the college campus and wish that the greenery shall not be destroyed by the unscientific construction of new building. Of course the institution has to grow in future, so new construction cannot be avoided. But Carbon foot print, Green building concept, Green and clean atmosphere and thereby environmental sustainability should be considered in every human interference on the very basic "Soil" medium, which in fact is the 'SOUL OF INFINITE LIFE'.



### Acknowledgement

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