

7.1.6 The institution environment and energy initiatives are confirmed through the following

- 1. Green audit**
- 2. Energy audit**
- 3. Environment audit**
- 4. Clean and Green campus recognitions/awards**
- 5. Beyond the Campus environmental promotional activities**



VIKRAMA SIMHAPURI UNIVERSITY

[VSU, NELLORE & VSUPG CENTRE, KAVALI]



GREEN, ENERGY AND ENVIRONMENTAL AUDIT (2017-2021)

Prepared by

**HYM INTERNATIONAL CERTIFICATIONS PVT.LTD
Hyderabad**



VIKRAMA SIMHAPURI UNIVERSITY

Green, Energy, & Environmental Audit Report

(2017-2021)

Prepared by

Vikrama Simhapuri University Team (Nellore & Kavali)

- | | |
|------------------------------------|-----------------------------|
| 1. Prof. Suja S Nair: | Principal, VSU, Nellore |
| 2. Prof. Ande Prasad: | IQAC Director |
| 3. Dr.Ch. Venkatrayulu: | Dept. of Marine Biology |
| 4. Dr.M. Ussenaiah: | Dept. of Computer Science |
| 5. Prof.G. Vijayananda Kumar Babu: | Dept. of Biotechnology |
| 6. Dr. A. Uday Sankar: | Dept. of Biotechnology |
| 7. Dr. SB. Sainath: | Dept. of Biotechnology |
| 8. Dr.T. Veera Reddy: | Dept. of Chemistry |
| 9. Dr.P. Gopi Krishna: | Dept. of Zoology |
| 10. Mr. D. Venkateswara Rao: | Civil Engineer (Consultant) |

ACKNOWLEDGEMENT

We thank Vikrama Simhapuri University for allowing us to conduct **Green, Energy, & Environmental Audit Report** of the VSU, Nellore and VSUPG Centre, Kavali. Our special thanks to the following officials of the University for supporting us in preparing this report:

| | |
|--------------------------------------|--|
| Chancellor | His Excellency Sri Biswabhusan Harichandan, Governor of Andhra Pradesh |
| Vice-Chancellor | Prof. G.M. Sundaravalli Honourable Vice-Chancellor |
| Registrar | Dr. L.V. Krishna Reddy |
| Principal & NAAC Director | Prof. Suja S Nair |
| NAAC Co-Director | Dr. T. Veera Reddy |
| Director, IQAC | Prof. Ande Prasad |
| Asst. Director, IQAC | Dr. Ch. Venkarayulu |
| Asst. Director, IQAC | Dr. M. Ussenaiah |
| Member, IQAC | Prof. Ch. Ramu |
| Member, IQAC | Prof. N.R.V. Ramana Reddy |
| Member, IQAC | Prof. Ch. Srinivasa Rao |
| Member, IQAC | Prof. G. Vijayananda Kumar Babu |



Certificate

HYM International Certifications Pvt. Ltd.

Certified that the Energy Management System of

VIKRAMA SIMHAPURI UNIVERSITY

Nellore, Andhra Pradesh - 524 320, India

has been assessed and found to be in accordance with the requirements of the Energy standards

ISO 50001 : 2018

for the following scope of certification

IMPLEMENTATION OF ENERGY SAVING PRACTICES

Further information about the scope of this certificate and applicability of ISO 50001 : 2018 requirements may be obtained by consulting the organization.

Issue Date : 29/10/2021

1st Surveillance 28/10/2022

Renewal Date : 28/10/2024

2nd Surveillance 28/10/2023



Authorised Signature

Certificate No : **En9186414083**

HYM International Certifications Pvt. Ltd

NOTE: This Certificate is Valid From 29/10/2021 to 28/10/2022

This is an accredited certificate authorized for issue by Accreditation Service for Certifying Bodies [Europe] Limited who have assessed M/s.HYM International Certifications Pvt. Ltd. against defined criteria and in cognisance of ISO 17021:2015 "Conformity Assessment - Requirements for bodies providing audit and Certification of management Systems".

www.hymcertifications.com on for checking the validation of the Certification

Regd. Office : Plot No. 265/C, Addagutta Society, Opp. JNTU, Kukatpally, Hyderabad - 500 072, Telangana State, India.
E-mail: siva@hymcertifications.com, Website: www.hymcertifications.com



Certificate

HYM International Certifications Pvt. Ltd.

Certified that the Environmental Management System of

VIKRAMA SIMHAPURI UNIVERSITY

Nellore, Andhra Pradesh - 524 320, India

has been assessed and found to be in accordance with the requirements of the environmental standards

ISO 14001 : 2015

for the following scope of certification

IMPLEMENTATION OF GREENERY AND ENVIRONMENTAL PROMOTION ACTIVITIES

Further information about the scope of this certificate and applicability of ISO 14001 : 2015 requirements may be obtained by consulting the organization.

Issue Date : 29/10/2020

1st Surveillance 28/10/2021



Renewal Date : 28/10/2023

2nd Surveillance 28/10/2022



Authorised Signature

Certificate No : **E91864141069**

HYM International Certifications Pvt. Ltd

NOTE: This Certificate is Valid From 28/10/2021 to 28/10/2022

This is an accredited certificate authorized for issue by Accreditation Service for Certifying Bodies [Europe] Limited who have assessed M/s.HYM International Certifications Pvt. Ltd. against defined criteria and in cognisance of ISO 17021:2015 "Conformity Assessment - Requirements for bodies providing audit and Certification of management Systems".

www.hymcertifications.com on for checking the validation of the Certification

Regd. Office : Plot No. 265/C, Addagutta Society, Opp. JNTU, Kukatpally, Hyderabad - 500 072, Telangana State, India.
E-mail: siva@hymcertifications.com, Website: www.hymcertifications.com

CONTENTS

| S.No | | Page Number |
|------|--|-------------|
| 1 | About The University | 5 |
| | OBJECTIVES OF THE GREEN, ENERGY AND ENVIRONMENTAL AUDIT | 6 |
| 2 | ABOUT GREEN, ENERGY AND ENVIRONMENTAL AUDIT | 7 |
| 3 | GREEN AUDIT FINDINGS | 9 |
| 4 | Design of buildings with proper Daylight and Ventilation | 10 |
| 5 | Water Efficiency & Management | 11 |
| 6 | Wastewater Management | 21 |
| 7 | Indoor Air Quality | 15 |
| 8 | Energy Management and efficiency | 17 |
| 9 | Solid Waste Management | 18 |
| 10 | Transportation | 23 |
| 11 | Green Belt | 25 |
| 12 | List of Medicinal Plants | 27 |
| 13 | LIST OF FLORAL SPECIES | 32 |
| 12 | Green Programs (Green initiatives) | 50 |
| 14 | OBSERVATIONS | 52 |
| 15 | Recommendations | 54 |

ABOUT THE UNIVERSITY

Vikrama Simhapuri University, Nellore, came into being, fulfilling the long-cherished dream of the people of Nellore district, re-christened Sri Potti Sri Ramulu Nellore district since 2008, by Act No. 29 of 2008 enacted by the Legislature of the State of Andhra Pradesh and published in the Andhra Pradesh Gazette on 24th September 2008. Erstwhile Chief Minister of Andhra Pradesh Dr. Rajesekhar Reddy has laid stone for construction of university buildings at 83.33 acres allotted site on the National Highway No 5. The University is located just 10 KMS from the main town of Nellore. Meanwhile the University Grants Commission conferred recognition on the degrees awarded by Vikrama Simhapuri University under Section 22 of the UGC Act vide its communication No.F.9.2/2010 (CPP-I/PU) dt.20 January 2010. Subsequently, the university is also sanctioned 2(f) and 12 (b) Status by University Grants Commission. The University has 02 Constituent colleges – Vikrama Simhapuri University College, Nellore and Vikrama Simhapuri University College, Kavali. Vikrama Simhapuri University is thus situated in an ambience of great cultural awakening, fascinating journeys of the mind, and rapid economic development.

Biodiversity, the variety of life on Earth, is quite possibly the most amazing thing on the planet. It is the key to sustaining health, wealth, food, fuel and all of the vital services we depend on. Vikrama Simhapuri University has initiated ‘Green, energy and Environmental Audit’ of their institution campuses. In present survey, focus has been given on assessment of present status of diversity in the form of plants, insects and birds from the University main campus, Nellore & PG Centre, Kavali and efforts made by the University authorities for nature conservation. The review is the first stage in the development of a Green Action Plan for the university will contribute towards the implementation of “The strategy for the conservation and enhancement of biodiversity and Green initiatives”. We thank University Officials for giving us the opportunity of preparing Green, Energy & Environmental Audit. We also thank Internal Quality Assurance Cell Team for supporting us. Our special thanks to Dr. A. Madhusudhana Reddy, Associate Professor, Department of Botany, Yogi Vemana University, Kadapa for supporting us for survey and identification of plant species in VSU campus. The team of “Green Energy and Environmental Audit” has been instrumental in the entire process of developing such a huge green space with high biodiversity and helping us with the data required for this report.

EXECUTIVE SUMMARY

There is a major concern towards the environmental degradation due to the rapid industrialization, anthropogenic activities at local, regional and global levels. This leads to a global environmental deterioration. Therefore, for sustainable future and to support natural resources, steps towards the stabilization of human population, adoption of environmentally sound and sustainable technologies, reforestation and ecological restoration are believed to be of paramount importance. To accomplish this task, academic institutions must initiate and support mobilization of internal and external resources and knowledge to meet the needs of environmental challenges. As an academic institution, Vikrama Simhapuri University (VSU) initiated some green initiatives to address fundamental problems associated with the environment deterioration. Further, we believe that as humans it is of profound responsibility to protect the earth's resources in perpetuity. Being one of the premier institutions of Higher Educational Institutes, VSU is aware of its responsibilities towards environmental issues and sustain environmental campaign through extension of activities in terms of education, research, policy formation and information.

This report is based on the approaches and interventions done on part of the University to address the green, energy and environmental concerns of the VSU campus. The current green, energy and environmental audit reflect our sustainable efforts on the campus. The audit was conducted by a team of faculty and students with support from various stake holders of VSU. Further, the VSU Clean and Green Committee and the VSU-NSS teams indeed the reflection of VSU endeavour to exercise leadership in promoting environmental sustainability and inculcate the habit of green initiatives among all students and each of us. This commitment of VSU has lead to actions whose reflection is visible remarkably on ground.

This initiative i.e. green, energy and environmental audit is significant for the institution, and also pave a way for other institutions to emulate and adopt as an audit model and thus, occupy a strategic position in the endeavours of sustainable environment for all.

GREEN, ENERGY AND ENVIRONMENTAL AUDIT

Green, Energy and Environmental Audit are a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of college. This 'Green, Energy and Environmental Audit' aims to analyze the green initiatives at VSU, Nellore and VSUPG Centre, Kavali, which will have an impact on the environment. Several, Green, Energy and Environmental Audit focuses on the utilization of renewable and non-renewable sources, rain water harvesting, Green Campus, Solid waste management, Water Management, & Energy Management etc. being implemented by the University Management.

Green, Energy and Environmental Audit are a valuable means for a University to determine the key element such as utilization of energy, water and plantation aspects. Further, the audit of energy and green or environment represents health consciousness and promotes environmental awareness, values and ethics. It is also one of the means to understand the Green impact on campus. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Hence, it is imperative that the University evaluate its own contributions towards a sustainable future.

ABOUT GREEN, ENERGY AND ENVIRONMENTAL AUDIT

Assessment of environmental performance is a measure of Green auditing (Welford, 2002). Green space and well-being are positively correlated. It can be accomplished through the systematic way by considering the points like documentation, periodic assessment, and objective review by regulated entities of facility operations and practices to meet the standards of environmental requirements (EPA, 2003). The university campuses offer an integral environment for learning. Through improved air, water quality, buffering of noise pollution and mitigation of impacts from extreme events, green spaces can reduce environmental health risks associated with lifestyle. In general, it is the systematic examination of the interactions between any operation and its surroundings. Many aspects need to be considered to assess the green audit such as all emissions to air, land and water; legal constraints; the effects on the neighbouring community; landscape and ecology and the public's perception of the operating company in the local area. Further, the environmental components decide what kind of plants and animals are to be sustaining in the specific area. The V.S. University, Nellore & V.S.U. PG

Centre, Kavali has clay loamy soil. During summer season, water scarcity in the region is an adverse factor. But still the efforts of university for the plantation and development of green spaces at both the Nellore and Kavali campuses are commendable. The main green spaces in the campus are medicinal plants garden, social forestry and other lawns which are properly grown conserving biodiversity. Even the construction of the buildings is well planned with plants in the middle of the building allowing enough air and light flow. Overall the distribution of species principally depends on the climatic conditions and presence of specific ecological parameters along with typical land-form and land-type. In the distribution of flora, the topography, rainfall, soil type etc. play crucial role for their distribution.

OBJECTIVES OF THE GREEN, ENERGY AND ENVIRONMENTAL AUDIT

- 1) To assess the green, energy and environmental audit in a systematic way
- 2) To evaluate the evidences for green energy and environmental audit by the auditor
- 3) To evaluate the auditor concerns assertions about economic actions and events
- 4) To ascertain the degree of correspondence between auditor assertions and established criteria.
- 5) To provide the results ascertained by the auditor to interested users

PROCEDURE FOLLOWED

Vikrama Simhapuri University, Nellore and VSU PG centre Kavali were constructed with least distortion to the original topography of the site. The buildings are two storied with enough ventilation and sunlight. The area details of the university main campus and VSU PG Centre are as follows.

| Area | VSU Main Campus, Nellore | VSUPG Centre, Kavali |
|---|---------------------------------|------------------------------|
| Area of Land | 83.3 | 79.8 |
| Area of Permanent Buildings | 7270 m² | 3755.8 m² |
| Area of Administration Block | 4331 m² | 1217.4 m² |
| Area of Academic Blocks along with Labs | 9856.78 m² | |
| Area of Library | 1426.43 m² | 367.9 m² |
| Area of Hostel Buildings | 3656.91 m² | 2044.38 m² |

GREEN AUDIT FINDINGS

For Green Audit following major areas (including their sub-sections) were covered and compliance/ initiatives under these areas were verified/ validated.

- a) Design of buildings with proper Daylight and Ventilation:
- b) Water Efficiency & management
- c) Wastewater Management
- d) Indoor Air Quality
- e) Energy Management and efficiency
- f) Solid Waste Management
- g) Transportation
- h) Green Belt
- i) Green Programs (Green initiatives)

a. Design of buildings with proper Daylight and Ventilation :

1. All Classrooms, Laboratories, Administrative offices, library, Seminar halls etc. have high ceiling, wide doors and large windows with proper ventilation.
2. Buildings are designed in such a way that corridors and classrooms receive ample sunlight. Curtains are provided for laboratory windows to avoid glare. Natural light in the classrooms was about 70-85 lux.
3. Ventilation in classrooms and laboratories is facilitated by windows and exhaust fans.
4. Cross ventilation is facilitated due to large windows on both sides of all classrooms, labs and administrative sections. Air conditioners are used in offices, seminar halls, research and computer laboratories and computer server rooms etc.
5. Exhaust fans are provided in washrooms, kitchens and sciences department laboratories.

b) Water Efficiency & Management

1. Major water source for university main campus is two big irrigation wells along with bore wells, university post graduate centre have 3 bore wells, also has one bore-well in the campus which is currently not used for water withdrawal.
2. The university main campus is situated very near to the Kakatur village tank with the water spread area of 120 acres. Tank water is used for filling the water in the aquaculture pond facility connected with the university campus area.
3. The daily water consumption for the entire campus when in full operation is 51 KL, which includes 25 KL consumption in academic area and 26 KL for gardening and administrative areas. Water collected in rainwater harvesting pits is used for gardening.
4. As per IS 1172 standards for non-residential institutions, water consumption should be maximum 45 L/person/day. Water consumption of the College works out to be 6.3 L/person/day, which is well under limit.
5. Water is stored in the underground storage tank of capacity 40 KL, and then transferred to 12 overhead tanks of total capacity 21 KL using 5 HP pump and then distributed to washrooms, basins, kitchens, laboratories and water purifiers/coolers installed in the College building.
6. Rain Water Harvesting (RWH) system, comprised of rooftop and surface runoff, is provided in the campus. Through RWH, rain water collected is used for recharging ground water through 2 recharge bores. Rain water collected is also stored in recharge pits which are used for gardening. Installation of rooftop RWH system is also planned for under-construction building which will comprise of an underground tank with a desilting chamber of 60 KL storage capacity.
7. 4 water coolers fitted with RO purifiers are provided in College building as a source of safe drinking water. Third party contractor is appointed by the university for their maintenance and cleaning of the entire campuses of both main campus and PG centre.
8. Hostels, Restrooms, Laboratories of Chemistry, Marine biology, Zoology, Biotechnology and canteen are water intensive areas. Water conservation faucets (nonconcussive taps, aerator taps) are fitted in some washrooms. Dual flushing systems are not provided in the washrooms.
9. Dry and wet mopping is practised for floor cleaning. Floors are mopped once a day. University has appointed third-party contractor, Sulab Enterprises for cleaning activities in both the campuses.
10. As informed by university electrical & water management team, tap water leakage is immediately attended to by the maintenance department for reducing the water wastage.

11. Sprinkler system and drip water irrigation is provided in all gardens which leads to water conservation.
12. Signage boards on water conservation were displayed in washrooms, hostels, canteen, laboratories and near water purifiers.

Water quality of source water in the both campus areas is tested and results are given below table

| S. No | Parameter | University Main Campus | University PG Centre |
|----------------------------|------------------|------------------------|----------------------|
| Physical Parameters | | | |
| 1 | Turbidity | 1.5 NTU | 1.2 NTU |
| 2 | TDS | 196 ppm | 210 ppm |
| Chemical Parameters | | | |
| 3 | pH | 7.3 | 7.1 |
| 4 | Total Hardness | 132 mg/L | 210 mg/L |
| 5 | Calcium (Ca) | 55 mg/L | 49 mg/L |
| 6 | Magnesium (Mg) | 38 mg/L | 29 mg/L |
| 7 | Total Alkalinity | 86.5 mg/L | 97.2 mg/L |
| 6 | Chloride | 62.5 mg/L | 59.8 mg/L |
| 7 | Nitrate | 0.7 mg/L | 0.9 mg/L |
| 10 | Sulphate | 46.5 mg/L | 55.7 mg/L |
| Elemental Analysis | | | |
| 11 | Iron (Fe) | <0.05 mg/L | <0.05 mg/L |
| 12 | Arsenic (As) | <0.01 mg/L | <0.01 mg/L |
| 13 | Lead (Pb) | <0.01 mg/L | <0.01 mg/L |
| 14 | Zinc (Zn) | <0.05 mg/L | <0.05 mg/L |
| 15 | Chromium (Cr) | <0.05 mg/L | <0.05 mg/L |



Open well in the university campus



Kakatur Village tank near to University Main campus, Nellore



RO System in the University campus

d) Indoor Air Quality

Indoor Air Quality (IAQ) refers to the air quality within & around buildings and structures, it relates to the health and comfort of building occupants. Common indoor pollutants are listed as below:

1. Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels.
2. Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
3. Carbon dioxide – Due to human respiration, burning of dry waste materials etc.
4. Particulate matter – Due to construction and maintenance activities, vehicular pollution.
5. Nitrogen Oxides- Due to vehicular pollution.
 - Science laboratories and kitchens in hostels and canteen use liquefied petroleum gas (LPG), a clean fuel.
 - In classrooms and laboratories, the mode of ventilation is natural draft (through windows) and is enhanced by fans. Large windows and cross-ventilation are observed in corridors. Air conditioners are used in some offices and computer laboratories. ACs are serviced regularly to ensure indoor air quality.
 - Wash rooms and science laboratories are provided with exhaust fans so that the fumes are safely discharged outside the building.
 - Green belts have been set up in the both the main campus of university & PG Centre Kavali campus area.

Details of CO₂ and CO emitters: Based on our calculation, the different sources of Carbon dioxide (CO₂) and Carbon monoxide (CO) emitters in our college are:

| S.No | Item | VSU main Campus | VSUPGC, Kavali |
|------|--------------------------------------|-----------------|----------------|
| 1 | Vehicles(Two/Four Wheelers & heavy) | 65 | 38 |
| 2 | Refrigerators & Deep freezes | 21 | 10 |

| | | | |
|---|----------------------------|----|----|
| 3 | Air conditions | 29 | 18 |
| 4 | Burning Pits | 2 | 01 |
| 5 | Water Coolers & RO Systems | 10 | 02 |
| 6 | Ice makers | 02 | - |

On the days of data collection, there were 15 cars, 27 bikes and 20 scooters in the university main campus and 8 cars, 21 bikes and 9, in addition to the vehicles for pick up and drop of visitors and to deliver commodities to the canteen, which in turn proves that these vehicles may contribute moderate to high carbon emission. There are 21 refrigerators along with deep freezers, 29 air conditioners and 10 working water coolers in main campus. The students, teaching and non-teaching staff and the visitors also contribute to carbon dioxide emission. There is a burning pit near the canteen where all the wastes collected from the class rooms and labs which were not suitable for recycling are burnt. Plastic wastes with food particles from the canteen are also burned as it cannot be decomposed.

e. Energy Management and Efficiency:

i. Electricity:

1. Common electricity meter is provided for the entire campus. Electricity is provided by Andhra Pradesh State Power Distribution Corporation Limited (APSPDCL). Electricity bills from 2017-22 were available for review (average consumption 15498 units/ month). Latest bills were available for review.

The areas of major consumption of electricity are mentioned below:

| Major Electrical Items used in campus | VS University Main Campus, Nellore | VS University PG Centre, Kavali |
|--|---|--|
| Lights & Tube lights | 92 | 46 |
| LED Bulbs | 147 | 115 |
| Solar Lights | 15 | 10 |
| Fans (ceiling fans & wall fans) | 247 | 98 |
| Refrigerators & Deep Freezers | 21 | 10 |
| Air Conditioners | 29 | 18 |
| Computers (desktops & laptops) | 275 | 130 |
| Printers & Scanners & Xerox Machines | 47 | 20 |
| Projectors | 10 | 06 |
| Smart Boards | 10 | 02 |
| Motor Pumps | 09 | 02 |
| Water Coolers | 08 | 03 |
| Water purifiers (RO Systems) | 02 | 01 |
| Major Laboratory Equipments | 58 | 22 |

2. Conventional tube lights, LEDs & fans are installed in classrooms, laboratories, seminar halls and library. For efficient energy consumption and saving on electric bill, university has initiated the process of replacing incandescent bulbs and tube lights with LEDs.
3. University main campus and PG Centre have 31 air conditioners with two/three/five -star ratings (6 five Star, 11 three star and 14 two star) [Standards set by Bureau of Energy Efficiency (BEE)].

4. An Uninterruptible Power Supply (UPS) system is provided in computer laboratories for computers and servers rooms. The UPS system is typically used to protect hardware viz. computers, data centres, library, internet and telecommunication equipment or other electrical equipment when an unexpected power disruption could cause serious work disruption or data loss.
5. Reflectors are not provided for lights in the library, seminar halls and auditorium. Reflectors can reduce the number of lights required and hence electricity consumption.
6. All computers have LED screens; computers are shut down by turning off the main switch when not in use.
7. Common switches are provided for some tube-lights & fans. To avoid wastage of energy due to common area illumination, it is recommended to have separate switches.
8. Tube-lights and fans are switched off by students and staff when not in use. Instructions regarding switching off the electrical appliance were seen in laboratory notice boards. However, signages are not provided near electrical switch boards. Signage can encourage & help users to switch off lights and fans to save electricity.

ii. On-Site Energy Generation (Usage of LPG/ Natural Gas & Solar Energy):

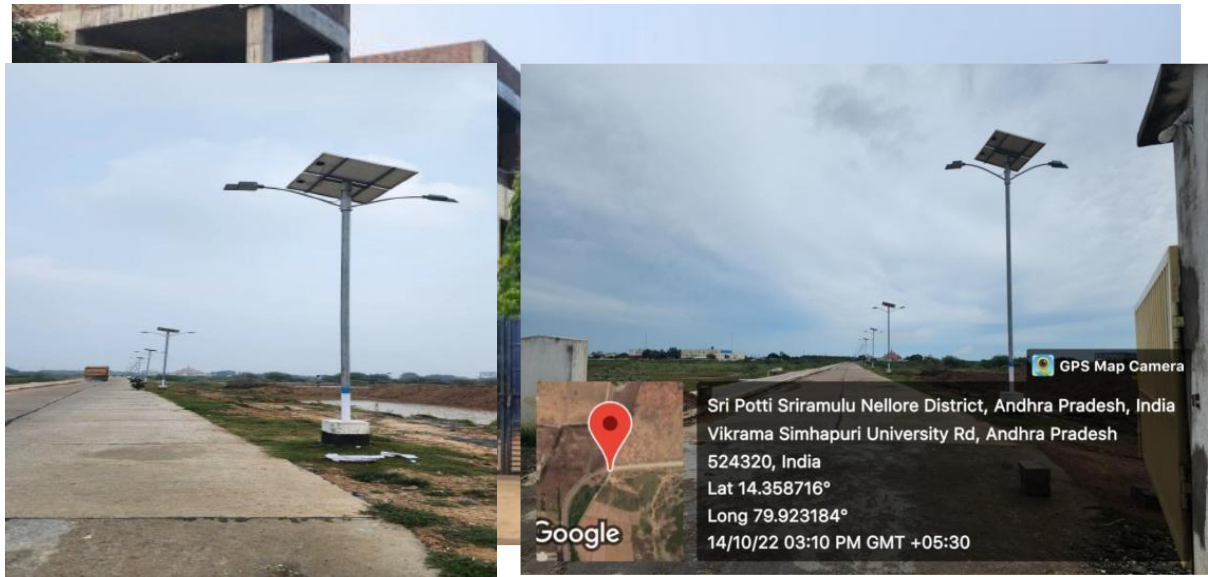
1. LPG cylinders are used mainly in canteen, hostels kitchens for cooking and in chemistry, botany, zoology, microbiology, marine biology and biotechnology laboratories. Inventory of cylinders usage was not available for review. 1 cylinder of 14 kg generates 649.5 MJ (Mega Joules) of energy. An average of 6 cylinders/week at Hostel and an average of six cylinders per two months at departments.
2. Storage facility for LPG cylinder is located on ground floor. All the commercial LPG gas cylinders were in vertical position with access control; however it is necessary to provide extra support system like chain in order to prevent cylinders from falling, movement or physical damage.
3. University main Campus has a diesel generator (DG) of capacity 100 KVA. DG set is used only in case of emergency when there is power cut-off. DG emissions are not monitored.
4. The university main campus approach roads have solar panel LED street lights for saving on electric bill.
5. Steps towards the installation of on grid Rooftop Solar PV System of 100 KWH capacity has been initiated at VSU. Sembcorp is providing Rooftop Solar PV System at University main campus.



HT/LT Transformer



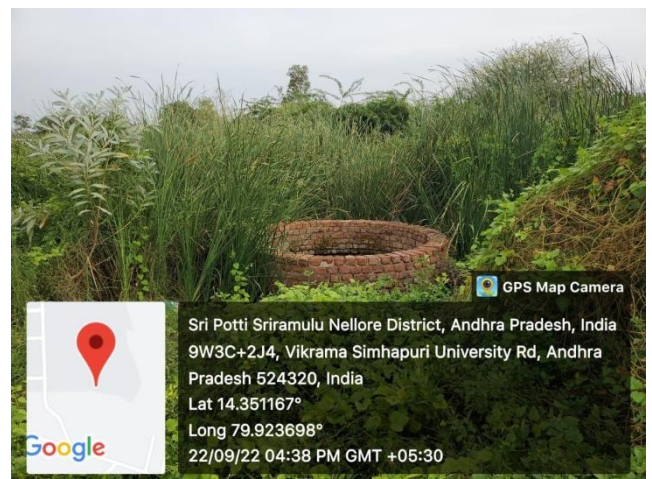
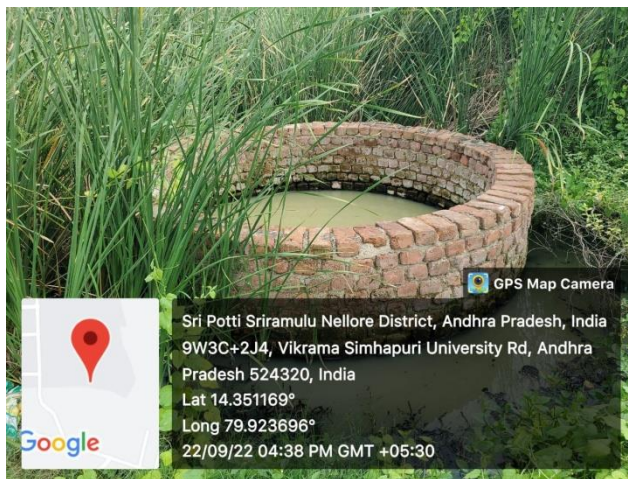
125 KV Generator



Solar panel LED lights in the common areas and roads in the campus

c) Wastewater Management

1. Wastewater is mainly generated from washing, toilet flushing, kitchens in hostels, canteen kitchen and laboratories. Sufficient washrooms are provided in the university main and PG centre campus admin, academic buildings and hostels.
2. Currently, sanitary wastewater generated is sent to municipal sewer line in both the campuses. Sewage treatment plant of 200 KLD capacity is under planning to construction for the treatment of sanitary wastewater generated in the campus. STP will comprise of primary and secondary treatment (biological treatment) followed by filtration.
3. Waste water generated from the RO systems and water coolers in the drinking water areas connected to near garden/plantation area and kitchen garden maintained in the university campus.



Grey water from Pinakini Boys Hostel and girls are directed through a underground drainage system into a large soak pit constructed at a faraway place from the hostel blocks



Underground drainage system for disposing waste water into soak pits



Waste water channelized to connect plantation/gardens maintained in the university campus

f) Solid Waste Management

Solid waste generated from campus includes mainly paper waste, wet (food/ organic) waste and E-waste.

- Blue and Green covered/ pedal-pushed dustbins are placed in the both main campus and PG centre premises. Waste bins are provided on each floor, in staff rooms, class rooms, laboratories, washrooms, kitchen, hostels & canteen and in campus areas.
- Daily around 50-75 kg organic/ bio-degradable waste is generated in the both campuses which includes vegetable, food waste, horticultural waste. Quantity of horticulture waste varies significantly due to seasonal variation, e.g. around 50-60 kg of horticulture waste is generated daily in February- March due to leaf fall.
- Recently, university main campus had vermin composting unit for the treatment for the treatment of horticulture waste generated in the campus. The unit will be operational in 3-4 months.
- Biodegradable wet waste is mostly generated from the hostels, kitchens, canteen. The university has initiated the process of installing a composting unit of 25-30 kg/ day capacity for the treatment of canteen waste and some horticulture waste. Composting unit will be operational once the classes start working.
- In other areas like classrooms and administrative sections, mostly paper waste and plastic wrappers are generated.
- Segregation of wet and dry waste is practised within the campus. However, there is no signage for promoting segregation of wet and dry waste.
- **Paper Waste Management:** Being an academic institution, waste paper is one of the main solid wastes generated in the premises. College has taken steps to minimise and avoid paper usage.
- Prints and photocopies are taken on both sides of the paper to avoid excess paper usage. Rather than photocopy, digitalisation (scanning) is practised.
- All the internal circulars communicating to teaching and non-teaching staff are through SMS, e-mails and whatsapp messages only.
- University Library has an e-book facility having e-journals, and ebooks available online through different portals such as INFLIBNET, National Digital Library. Two computer room are provided in the library to access online services.
- University has a Learning Management System (LMS) where notices are sent, exam results are displayed in the website and attendance is recorded digitally.

- Paper recycled is used for laboratory work. Remaining paper waste is sent to local vendor for recycling. The dissertation reports, journals and answer papers are stored as per the University rules and it is sent to vendor as and when required.
- The college encourages students to use eco-friendly material and recycle old papers/ scrap for decoration purposes during department functions and festivals.
- **E- Waste Management:** E- waste is broadly comprised of discarded computer monitors, motherboards, Key boards, scanners and chargers, compact discs, headphones, Printed Circuit Boards , Xerox machines etc. E- waste is collected & stored in the campus and sent to authorised vendor for recycling/ disposal under buy-back policy.
- **Plastic Waste:** University main campus and PG centre strictly follows the guidelines regarding plastic usage and has prohibited the use of single use plastic e.g. carry-bags, glasses, spoons etc., in the campus environments.
- As per the university guidelines, Canteen Contractor is prohibited to use plastic carry bags, plastic paper, instead paper plates and wooden spoons are used for packing and serving.

g) Transportation:

- The location of university main campus and PG centre is quite enviable with bus service and public transportation facility. Most of the staff pool cars and university buses few staff members travel by private vehicles.
- University has vehicle-free campus. Dedicated area is available for parking has been allotted near the admin and academic blocks; vehicle movement and parking in the main campus is restricted and prohibited.
- University encourages the students and staff to use the university bus facility or public transport system to reduce carbon emissions in the campus areas.

h) Green Belt:

University main campus has an herbal garden. University has 1.83 acre green belt area, having 382 variety of plants including trees shrubs and potted plants. List of few plants present in the campus is given in Annexure 1 & 2. Plantation improves aesthetics and helps as a buffer in reducing noise level, maintaining temperature of the area. Herbal garden has different specific types of plants planted with respect to their medicinal importance.

Green Spaces

Total green space in the campus has increased to and by the end of the year the lawns were also well planned around various buildings. Therefore, out of the total green space the botanical garden area is 21% and other lawn & green spaces are 79% area. While the allocated space for herbal garden is 2.0 acres, the other green space area has increased by 2% by 2018. This is due to increase in plantation in the surrounding of the buildings.

HERBAL GARDEN

Biodiversity Conservation is very crucial and important for a campus because eventually these spaces become lung spaces of that location or district or state. In the year 2017, Vikrama Simhapuri University with the support of university has set up a herbal Garden in 2.0 acres of extent to promote the herbal medicines through research in this area. This garden is to serve as a national repository of living medicinal plant specimens of Eastern Ghats towards ex-situ conservation and propagation of endemic and threatened species. Further to maintain live plant collections for the purpose of research, educational, display and aesthetics. Moreover it would serve as Centre of Excellence for conservation, research and education.

The Vikrama Simhapuri University Herbal garden is At present, species collected from different parts of Andhra Pradesh and elsewhere are being maintained in the herbal garden and in green house. This garden is currently harbouring indigenous and exotic taxa including endemic and threatened herbal species and spread over 2.0 acres. Being part of an academic institution one of the main objectives of the herbal garden is to impart education through first-hand field experience and every plant introduced in the garden is properly labelled, with its scientific name and the family to which it belongs and this is essential for taxonomic knowledge.

Taxonomy is important for all other allied/natural sciences. Therefore, the University herbal garden strives to impart the taxonomic knowledge through its various display sections and educational programmes. The garden presently represents most of the families that occur in the Eastern Ghats. The important families represented are mentioned in the taxonomic layout.

The existing infrastructural facilities in the herbal garden are net houses (5000 sq ft), Glass house (3000 sq ft), store room, water sump (45000 liters capacity), and power supply facility and 3.5 km long internal roads. The whole garden area has a barbed wire fence. Drip irrigation facility is spread over an area of about 3 acres in the garden. The irrigation facility is provided with underground pipeline system accessible throughout garden. Lilly and lotus ponds are developed for water plants.

All the plants in the herbal garden are properly labelled with botanical names, local name, family to which the particular plant belongs and known uses.

The garden is home for good number of birds and butterflies and many other insects. Snakes is found in the garden which is also a natural habitat for viper, cobra and other reptiles. Some animals such as wild boar, black buck and deer's are regular visitors.

The herbal garden is not only to protect and nurture plants but also to provide inspiration for protecting plant diversity in the world of growing environmental challenges. The garden is now attracting people from all walks of life. The efforts of the garden management are towards development of a range of projects covering science, sustainability, propagation of indigenous fruit crops, seed bank and herbarium. The education programmes are aimed at building awareness for the urgent need to protect our biodiversity from threats of land use changes, climate change, invasive species, over exploitation and pollution. The plant collections serve the purpose of display, education, research, conservation and enjoyment. With the committed efforts of the university administration, members of faculty of department of botany in the PG centre Kavali and department of Biotechnology, VS University main campus, research scholars and students, the dream of developing an excellent botanical garden and herbal gardens for the purpose of research and education has been fulfilled.

Annexure- 1

MEDICINAL PLANTS

It is observed that wide variety of medicinal plant species are gathered and planted in the campus. Few of them are ex-situ species planted in botanic garden. Total medicinal plants contribute 10% of the total plants. The following are the details of species grown here:

| SNo | Species Names | Telugu Name |
|-----|--------------------------------------|------------------|
| 1. | Aegle marmelos (L.) Corr. | Maredu, Bilva |
| 2. | Aloe vera (L.) Burm.f. | Manchi Kalabanda |
| 3. | Aristolochia india L. | Nalla eswari |
| 4. | Arundo donax L. | Kaliveduru |
| 5. | Balanites aegyptiaca (L.) Del. | Gala Chettu |
| 6. | Boswellia ovalifoliolata Bal. & Henr | Konda Sambrani |
| 7. | Callistemon citrinus (Curtis) Skeels | Bottle Brush |
| 8. | Centella asiatica (L.) Urban. | Swarasvathiaku |
| 9. | Cochlospermum religiosum (L.) Alston | Konda Pathi |
| 10. | Commiphora caudata (Wt. & Arn.) Eng. | Konda Mamidi |
| 11. | Costus speciosus (Koen.) Smith | Vanavasa |
| 12. | Cymbopogon citratus (DC.) Stapf. | Nimma Gaddi |
| 13. | Curceligo orchiodes Gaertn. | Nelathati |
| 14. | Decalepis hamiltonii Wt. & Arn. | Nannari Gaddalu |
| 15. | Dioscorea pentaphylla | Yerra teega |
| 16. | Dioscorea oppositifolia L. | Eseru gaddalu |
| 17. | Diospyros melonoxylon Roxb. | Tumki |
| 18. | Euphorbia milli Der. | Kuchu Chettu |
| 19. | Euphorbia nivulia Buch. Ham. | Errakalli |
| 20. | Ficus tirucalli L. | Machikalli |
| 21. | Ficus benghalensis L. | Marri |
| 22. | Ficus hispida L.f. | Kakimedi |
| 23. | Ficus racemosa L. | Madi |
| 24. | Ficus religiosa L. | Raavi |

| | | |
|-----|---|----------------|
| 25. | <i>Gardenia gummifera</i> L.f. | Bikki |
| 26. | <i>Gardenia resinifera</i> Roth. | Pedda Bikki |
| 27. | <i>Givotia moluccana</i> (L.) Sreem. | Tella Polika |
| 28. | <i>Gloriosa superba</i> L. | Nabhi |
| 29. | <i>Gymnema sylvestre</i> (Retz.) Schult. | Podapatri |
| 30. | <i>Gyrocarpus americanus</i> Jacq. | Polika |
| 31. | <i>Hemidesmus indicus</i> (L.) R.br | Sugandipala |
| 32. | <i>Holoptelea integrifolia</i> (Roxb.) Planch | Tapase |
| 33. | <i>Hymenodictyon orixense</i> (Roxb.) Mabb. | Dudippa |
| 34. | <i>Justicia adhatoda</i> L. | Addasramu |
| 35. | <i>Leptadenia reticulata</i> Sehult. | Palateega |
| 36. | <i>Limonia acidissima</i> L. | Pilli adugu |
| 37. | <i>Maerua apetala</i> (Roth.) Jacobs | Danthi |
| 38. | <i>Maytenus emarginata</i> (Welld.) Ding. | Battagadapa |
| 39. | <i>Mitragyna parviflora</i> (Roxb.) Nil. | Maddi |
| 40. | <i>Morinda pubescens</i> J.E. Smith | Kukkavelaga |
| 41. | <i>Naringi crenulata</i> (Roxb.) Nil. | Kukkatulsi |
| 42. | <i>Pandanus fascicularis</i> Lam. | Mogali |
| 43. | <i>Pavetta tomentosa</i> Roxb. | Tellapapidi |
| 44. | <i>Pterocarpus santalinus</i> L.f. | Yerrachandanam |
| 45. | <i>Pterocarpus marsupium</i> Roxb. | Yogisa |
| 46. | <i>Pterospermum xylocarpum</i> (Gaertn.) S.W. | Garika musti |
| 47. | <i>Sansevieria roxburghiana</i> Schult. | Marrimamidi |
| 48. | <i>Schefflera stellata</i> (Gaertn.) Harms. | Somidi |
| 49. | <i>Soymida febrifuga</i> (Roxb.) A.Juss. | Mushti |
| 50. | <i>Strychnos nux-vomica</i> L. | Adavibadam |
| 51. | <i>Sterculia foetida</i> L. | Errapolika |
| 52. | <i>Sterculia urens</i> Roxb. | Badham Chettu |
| 53. | <i>Treminalia catappa</i> L. | Nallakaraka |

| | | |
|-----|---|---------------|
| 54. | <i>Treminalia chebula</i> Retz. | Tellamaddi |
| 55. | <i>Terminalia arjuna</i> Roxb. Ex.DC. | Thandra |
| 56. | <i>Terminalia bellirica</i> (Gaertn.) Roxb. | Nallamaddi |
| 57. | <i>Terminalia alata</i> Roth. | Tellakaraka |
| 58. | <i>Terminalia pallida</i> brandis | Kukkapala |
| 59. | <i>Tylophora indica</i> (Burm.f.) Merr. | Nemaliadugu |
| 60. | <i>Vitex altissima</i> L.f. | Vavili |
| 61. | <i>Vitex negundo</i> L. | Aswagandha |
| 62. | <i>Withania somnifera</i> (L.) Dunal. | Palvareni |
| 63. | <i>Ximenia americana</i> L. | Konda nakkeru |

FLORAL BIODIVERSITY

Wide range of varieties are found in the campus. It observed that high number of Trees i.e., 30% and herbs i.e., 27% are found here. 11% shrubs, 9% grasses & cycads and 7% of medicinal Plants are seen. Though other species are in less number, this counts to high biodiversity of the campus.

| Plant type | No. of varieties | No. of species found |
|------------------|------------------|----------------------|
| Aquatic Plants | 3 | 400 |
| Creepers | 4 | 1010 |
| Climbers | 24 | 4950 |
| Medicinal Plants | 29 | 9350 |
| Flowering Plants | 9 | 8950 |
| Fruiting Plants | 9 | 6500 |
| Grasses & Cycads | 38 | 18750 |
| Herbs | 115 | 52990 |
| Palms | 10 | 6400 |
| Shrubs | 45 | 19450 |
| Trees | 127 | 164290 |
| Vines | 2 | 150 |
| Weeds | 9 | 3700 |
| | 424 | 296890 |

PLANT HEIGHT:

Based on height the highest number of plants with 50 to 100 cms are 50.2% and more than 12 meters are 30%. Further very less height plants are 8 to 12 meters 0.7%. The following are the details:

| Height | No. of species |
|---------------------|-----------------------|
| Less than 50 cms | 30 |
| 50 to 100 cms | 213 |
| Climbers | 24 |
| 2 to 4 meters | 5 |
| 4 to 6 meters | 7 |
| 6 to 8 meters | 5 |
| 8 to 12 meters | 3 |
| More than 12 meters | 137 |
| | 424 |

Water Tolerance

It is observed that the water scarcity considered during the plantation. 58% are normal water intake plants and 42% plants can tolerate less water also.

| Water Tolerance | No. of species |
|-------------------------|-----------------------|
| Can tolerate less water | 176 |
| Normal | 248 |

Estimated lifespan

Most of the plants i.e., 40% are very long life span plants, 1% plants lifespan is 1 to 2 years and 33% plants lifespan is 6 to 12 months. Hence the plants are also well planned as per the lifespan.

| Lifespan | No. of species |
|--------------------|-----------------------|
| Less than 6 months | 91 |
| 6 – 12 months | 138 |
| 1 – 2 years | 21 |
| More than 2 years | 5 |
| Very long life | 169 |

FAUNAL BIODIVERSITY

Due to the high plantation wide variety of faunal species are found within the campus. Especially high number i.e., 43% varieties of butterflies are found. Similarly 17% varieties of insects are found here. The following are the details:

| SNo | Species | No. of varieties |
|-----|--------------|------------------|
| 1 | Amphibians | 6 |
| 2 | Arthropods | 9 |
| 3 | Aves (Birds) | 12 |
| 4 | Insects | 15 |
| 5 | Butterflies | 17 |
| 6 | Reptiles | 14 |
| 7 | Mammals | 8 |

LIST OF FLORAL SPECIES:

As per the findings of internal green audit conducted by the university, large trees include in the Annexure-2

Annexure- 2

| S. NO | NAME OF THE SPECIES | HABIT |
|----------------------|--|-------|
| ACANTHACEAE | | |
| 1. | <i>Asystasia gangetica</i> (L.) T. Anderson | Herb |
| 2. | <i>Andrographis paniculata</i> (Burm.f.) Wall. | Herb |
| 3. | <i>Blepharis repens</i> (Vahl) Roth. | Herb |
| 4. | <i>Indoneesiella echioides</i> (L.) Sreemadh. | Herb |
| 5. | <i>Lepidagathis cristata</i> Willd. | Herb |
| 6. | <i>Rostellularia prostrata</i> R.B. Majumdar | Herb |
| 7. | <i>Ruellia tuberosa</i> L. | Herb |
| AIZOACEAE | | |
| 8. | <i>Trianthema portulacastrum</i> L. | Herb |
| AMARANTHACEAE | | |

| | | |
|-----------------------|--|----------------|
| 9. | <i>Achyranthes aspera</i> L. | Herb |
| 10. | <i>Allmania nodiflora</i> (L.) R. Br. | Herb |
| 11. | <i>Alternanthera sessilis</i> (L.) DC. | Herb |
| 12. | <i>Amaranthus spinosus</i> L. | Herb |
| 13. | <i>Amaranthus tricolor</i> L. | Herb |
| 14. | <i>Amaranthus viridis</i> L. | Herb |
| 15. | <i>Celosia argentea</i> L. | Herb |
| 16. | <i>Digera muricata</i> (L.) Mart. | Herb |
| 17. | <i>Gomphrena globosa</i> L. | Herb |
| 18. | <i>Gomphrena serrata</i> L. | Herb |
| 19. | <i>Pupalia lappacea</i> (L.) Juss. | Herb |
| 20. | <i>Trichurus monsoniae</i> (L.f.) C. Towns | Herb |
| AMARYLLIDACEAE | | |
| 21. | <i>Crinum asiaticum</i> L. | Herb |
| 22. | <i>Zephyranthes rosea</i> Lindl. | Herb |
| ANACARDIACEAE | | |
| 23. | <i>Mangifera indica</i> L. | Tree |
| 24. | <i>Semecarpus anacardium</i> L.f. | Tree |
| ANNONACEAE | | |
| 25. | <i>Annona squamosa</i> L. | Tree |
| 26. | <i>Polyalthia longifolia</i> (Sonner) Thw. | Tree |
| APIACEAE | | |
| 27. | <i>Centella asiatica</i> (L.) Urb. | Creeping herb |
| APOCYNACEAE | | |
| 28. | <i>Adenium obesum</i> (Forssk) Roem. & Schult. | Shrub |
| 29. | <i>Allamanda blanchetii</i> A. DC. | Shrub |
| 30. | <i>Boucerosia lasiantha</i> Wight | Succulent herb |
| 31. | <i>Boucerosia procumbens</i> (Gravely & Mayur.) Plowes | Succulent herb |
| 32. | <i>Boucerosia umbellata</i> (Haw.) Wight & Arn. | Succulent herb |

| | | |
|------------------------|---|----------------|
| 33. | <i>Calotropis gigantea</i> (L.) R. Br. | Shrub |
| 34. | <i>Caralluma adscendens</i> var. <i>attenuata</i> (Wight) Grav. & Mayur. | Succulent herb |
| 35. | <i>Caralluma adscendens</i> var. <i>fimbriata</i> (Wall.) Gravelly & Mayur. | Succulent herb |
| 36. | <i>Caralluma bhupinderiana</i> Sarkaria | Succulent herb |
| 37. | <i>Caralluma stalagmifera</i> C.E.C. Fisch. | Succulent herb |
| 38. | <i>Carissa spinarum</i> L. | Shrub |
| 39. | <i>Cascabela thevetia</i> (L.) Lippold | Shrub |
| 40. | <i>Catharanthus pusillus</i> (Murr.) G. Don | Herb |
| 41. | <i>Catharanthus roseus</i> (L.) G. Don | Herb |
| 42. | <i>Hemidesmus indicus</i> (L.) R. Br. | Twiner |
| 43. | <i>Nerium indicum</i> Mill. | Shrub |
| 44. | <i>Oxystelma esculentum</i> (L.f.) Sm. | Twiner |
| 45. | <i>Pentatropis capensis</i> (L.f.) Bull | Twiner |
| 46. | <i>Pergularia daemia</i> (Forssk.) Chiov. | Twiner |
| 47. | <i>Plumeria rubra</i> L. | Tree |
| 48. | <i>Plumeria alba</i> L. | Tree |
| 49. | <i>Plumeria pudica</i> Jacq. | Shrub |
| 50. | <i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz. | Herb |
| 51. | <i>Vincetoxicum indicum</i> (Burm.f.) Mabb. | Twiner |
| 52. | <i>Wattakaka volubilis</i> (L. f.) Stapf | Twiner |
| APONOGETONACEAE | | |
| 53. | <i>Aponogeton natans</i> (L.) Engl. & K. Krause | Herb |
| ARACEAE | | |
| 54. | <i>Alocasia macrorrhizos</i> (L.) G. Don | Herb |
| 55. | <i>Colocasia esculenta</i> (L.) Schott | Shrub |
| 56. | <i>Caladium bicolor</i> (Aiton) Vent. | Herb |
| 57. | <i>Rhaphidophora pertusa</i> (Roxb.) Schott | Shrub |
| ARAUCARIACEAE | | |
| 58. | <i>Araucaria araucana</i> (Molina) K. Koch | Tree |

| ARECACEAE | | |
|----------------------|--|-------|
| 59. | <i>Borassus flabellifer</i> L. | Tree |
| 60. | <i>Caryota urens</i> L. | Tree |
| 61. | <i>Cocos nucifera</i> L. | Tree |
| 62. | <i>Dyopsis lutescens</i> (H. Wendl.) Beentje & J. Dransf | Tree |
| 63. | <i>Phoenix sylvestris</i> (L.) Roxb. | Tree |
| 64. | <i>Phoenix dactylifera</i> L. | Tree |
| 65. | <i>Roystonea regia</i> (Kunth) O.F. Cook | Tree |
| 66. | <i>Rhapis excelsa</i> (Thunb.) A. Henry | Shrub |
| 67. | <i>Wodyetia bifurcata</i> A.K. Irvine | Tree |
| ASPARAGACEAE | | |
| 68. | <i>Asparagus racemosus</i> Willd. | Shrub |
| 69. | <i>Chlorophytum laxum</i> R. Br. | Herb |
| 70. | <i>Dracaena marginata</i> Aiton | Herb |
| 71. | <i>Dracaena reflexa</i> Lam. | Herb |
| 72. | <i>Drimia indica</i> (Roxb.) Jessop. | Herb |
| 73. | <i>Sansevieria roxburghiana</i> Schult. & Schult.f. | Herb |
| 74. | <i>Scilla hyacinthina</i> (Roth) J.F. Macbr. | Herb |
| ASPHODELACEAE | | |
| 75. | <i>Aloe vera</i> (L.) Burm.f. | Herb |
| ASTERACEAE | | |
| 76. | <i>Ageratum conyzoides</i> L. | Herb |
| 77. | <i>Blumea mollis</i> Merr. | Herb |
| 78. | <i>Chromolaena odorata</i> (L.) R.M. King & H. Rob. | Shrub |
| 79. | <i>Eclipta alba</i> (L.) Hassk. | Herb |
| 80. | <i>Emilia sonchifolia</i> (L.) DC. | Herb |
| 81. | <i>Glossocardia bosvallea</i> (L.f.) DC. | Herb |
| 82. | <i>Gymnanthemum extensum</i> (DC.) Steetz. | Shrub |
| 83. | <i>Parthenium hysterophorus</i> L. | Herb |
| 84. | <i>Pentanema indicum</i> (L.) Y. Ling | Herb |
| 85. | <i>Pulicaria wightiana</i> (DC.) Clarke. | Herb |
| 86. | <i>Tridax procumbens</i> L. | Herb |
| 87. | <i>Vernonia albicans</i> DC. | Herb |

| | | |
|-----------------------|---|--------------------|
| 88. | <i>Vernonia cinerea</i> (L.) Less. | Herb |
| BIGNONIACEAE | | |
| 89. | <i>Dolichandrone falcata</i> Seem. | Tree |
| 90. | <i>Millingtonia hortensis</i> L. | Tree |
| 91. | <i>Tecoma stans</i> (L.) Kunth. | Tree |
| 92. | <i>Tabebuia chrysantha</i> (Jacq.) G. Nicholson | Tree |
| 93. | <i>Tabebuia rosea</i> (Bertol.) Bertero ex A. DC. | Tree |
| 94. | <i>Spathodea campanulata</i> P. Beauv. | Tree |
| BORAGINACEAE | | |
| 95. | <i>Coldenia procumbens</i> L. | Herb |
| 96. | <i>Cynoglossum zeylanicum</i> Thunb. ex Brand | Herb |
| 97. | <i>Heliotropium bracteatum</i> R. Br. | Herb |
| 98. | <i>Heliotropium strigosum</i> Willd. | Herb |
| 99. | <i>Trichodesma indicum</i> (L.) R.Br. | Herb |
| CACTACEAE | | |
| 100. | <i>Cereus pterogonus</i> Lem. | Succulent shrub |
| 101. | <i>Opuntia stricta</i> (Haw.) Haw. | Succulent shrub |
| 102. | <i>Opuntia dillenii</i> (Ker Gawl.) Haw. | Succulent shrub |
| 103. | <i>Opuntia stricta</i> (Haw.) Haw. | Succulent shrub |
| CANNACEAE | | |
| 104. | <i>Canna indica</i> L. | Shrub |
| CASUARINACEAE | | |
| 105. | <i>Casuarina equisetifolia</i> L. | Tree |
| CLEOMACEAE | | |
| 106. | <i>Cleome viscosa</i> L. | Herb |
| CONVOLVULACEAE | | |
| 107. | <i>Evolvulus alsinoides</i> (L.) L. | Herb |
| 108. | <i>Evolvulus nummularius</i> (L.) L. | Herb |

| | | |
|----------------------|--|---------|
| 109. | <i>Ipomoea aquatica</i> Forssk. | Twiner |
| 110. | <i>Ipomoea cairica</i> (L.) Sweet Hort. | Twiner |
| 111. | <i>Ipomoea coptica</i> (L.) Roem. & Schult. | Twiner |
| 112. | <i>Ipomoea marginata</i> (Desr.) Verdc. | Twiner |
| 113. | <i>Ipomoea obscura</i> (L.) Ker.-Gawl. | Twiner |
| 114. | <i>Ipomoea pes-caprae</i> (L.) R. Br. | Twiner |
| 115. | <i>Merremia aegyptica</i> (L.) Urban | Twiner |
| 116. | <i>Merremia tridentata</i> (L.) Hallier f. | Twiner |
| 117. | <i>Rivea hypocrateriformis</i> (Desr.) Choisy | Twiner |
| COMBRETACEAE | | |
| 118. | <i>Conocarpus erectus</i> L. | Tree |
| 119. | <i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. | Tree |
| 120. | <i>Terminalia catappa</i> L. | Tree |
| 121. | <i>Terminalia mantaly</i> H. Perrier | Tree |
| COMMELINACEAE | | |
| 122. | <i>Commelina benghalensis</i> L. | Herb |
| 123. | <i>Commelina erecta</i> L. | Herb |
| 124. | <i>Commelina ensifolia</i> R. Br. | Herb |
| 125. | <i>Commelina diffusa</i> Burm.f. | Herb |
| 126. | <i>Cyanotis fasciculata</i> (Roth) Schult. & Schult.f. | Herb |
| 127. | <i>Murdannia spirata</i> (L.) G. Brückn. | Herb |
| 128. | <i>Tonningia axillaris</i> (L.) Kuntze | Herb |
| 129. | <i>Tradescantia pallida</i> (Rose) D.R. Hunt | Herb |
| COSTACEAE | | |
| 130. | <i>Costus speciosus</i> (J. Koenig) Sm. | Shrub |
| CRASSULACEAE | | |
| 131. | <i>Kalanchoe blossfeldiana</i> Poelln. | Herb |
| CUCURBITACEAE | | |
| 132. | <i>Coccinia grandis</i> (L.) Voigt. | Climber |
| 133. | <i>Citrullus colocynthis</i> (L.) Schrad. | Climber |
| CUPRESSACEAE | | |
| 134. | <i>Thuja occidentalis</i> L. | Tree |
| 135. | <i>Cupressus sempervirens</i> L. | Tree |
| CUSCUTACEAE | | |

| | | |
|----------------------|--|--------------------|
| 136. | <i>Cuscuta reflexa</i> Roxb. | Parasite |
| CYCADACEAE | | |
| 137. | <i>Cycas revoluta</i> Thunb. | Tree |
| CYPERACEAE | | |
| 138. | <i>Abildgaardia triflora</i> (L.) Abeywick. | Herb |
| 139. | <i>Bulbostylis barbata</i> (Rottb.) C.B. Clarke | Herb |
| 140. | <i>Cyperus arenarius</i> Retz. | Herb |
| 141. | <i>Cyperus articulatus</i> L. | Herb |
| 142. | <i>Cyperus corymbosus</i> Rottb. | Herb |
| 143. | <i>Cyperus compressus</i> L. | Herb |
| 144. | <i>Cyperus exaltatus</i> Retz. | Herb |
| 145. | <i>Cyperus flavidus</i> Retz. | Herb |
| 146. | <i>Cyperus rotundus</i> L. | Herb |
| 147. | <i>Fimbristylis cymosa</i> R. Br. | Herb |
| 148. | <i>Fimbristylis dichotoma</i> (L.) Vahl | Herb |
| 149. | <i>Fimbristylis miliacea</i> (L.) Vahl | Herb |
| 150. | <i>Fimbristylis ovata</i> (Burm.f.) J. Kern | Herb |
| 151. | <i>Fuirena ciliaria</i> (L.) Roxb. | Herb |
| 152. | <i>Kyllinga brevifolia</i> Rottb. | Herb |
| 153. | <i>Kyllinga bulbosa</i> P. Beauv. | Herb |
| 154. | <i>Pycreus polystachyos</i> (Rottb.) P. Beauv. | Herb |
| 155. | <i>Schoenoplectiella articulata</i> (L.) Lye | Herb |
| ELATINACEAE | | |
| 156. | <i>Bergia ammannioides</i> Roxb. | Herb |
| EUPHORBIACEAE | | |
| 157. | <i>Acalypha alnifolia</i> Willd. | Herb |
| 158. | <i>Acalypha indica</i> L. | Herb |
| 159. | <i>Croton bonplandianum</i> Bail. | Herb |
| 160. | <i>Codiaeum variegatum</i> (L.) Rumph. ex A. Juss. | Succulent shrub |
| 161. | <i>Euphorbia heterophylla</i> L. | Herb |
| 162. | <i>Euphorbia milii</i> Des Moul. | Succulent shrub |
| 163. | <i>Euphorbia hirta</i> L. | Herb |

| | | |
|-----------------|--|--------|
| 164. | <i>Euphorbia rosea</i> Retz. | Herb |
| 165. | <i>Jatropha glandulifera</i> Roxb. | Shrub |
| 166. | <i>Jatropha gossypifolia</i> L. | Shrub |
| 167. | <i>Pedilanthus tithymaloides</i> (L.) Poit. | Shrub |
| 168. | <i>Tragia involucrata</i> L. | Shrub |
| 169. | <i>Tragia plukenetii</i> Radcl.-Sm. | Shrub |
| FABACEAE | | |
| 170. | <i>Abrus precatorius</i> L. | Twiner |
| 171. | <i>Acacia aurculiformis</i> A. Cum ex. Benth. | Tree |
| 172. | <i>Acacia leucophloea</i> (Roxb.) Willd. | Tree |
| 173. | <i>Acacia nilotica</i> (L.) Del. | Tree |
| 174. | <i>Aeschynomene aspera</i> L. | Herb |
| 175. | <i>Aeschynomene indica</i> L. | Herb |
| 176. | <i>Albizia lebbek</i> (L.) Willd | Tree |
| 177. | <i>Albizia saman</i> (Jacq.) F. Muell. | Tree |
| 178. | <i>Alysicarpus bupleurifolius</i> (L.) DC. | Herb |
| 179. | <i>Alysicarpus hamosus</i> Edgew. | Herb |
| 180. | <i>Atylosia scarabaeoides</i> (L.) Benth. | Twiner |
| 181. | <i>Bauhinia acuminata</i> Vell. | Tree |
| 182. | <i>Bauhinia purpurea</i> L. | Tree |
| 183. | <i>Bauhinia racemosa</i> Vahl | Tree |
| 184. | <i>Caesalpinia pulcherrima</i> (L.) Sw. | Shrub |
| 185. | <i>Canavalia gladiata</i> (Jacq.) DC. | Twiner |
| 186. | <i>Cassia auriculata</i> L. | Shrub |
| 187. | <i>Cassia fistula</i> L. | Tree |
| 188. | <i>Cassia occidentalis</i> L. | Shrub |
| 189. | <i>Cassia senna</i> L. | Herb |
| 190. | <i>Clitoria ternatea</i> L. | Twiner |
| 191. | <i>Crotalaria angulata</i> Mill. | Herb |
| 192. | <i>Crotalaria hebecarpa</i> (DC.) Rudd. | Herb |
| 193. | <i>Crotalaria medicaginea</i> var. <i>medicaginea</i> Lam. | Herb |
| 194. | <i>Crotalaria ramosissima</i> Roxb. | Herb |

| | | |
|-------------------------|--|---------|
| 195. | <i>Delonix regia</i> (Hook.) Rafin. | Tree |
| 196. | <i>Desmodium triflorum</i> (L.) DC. | Herb |
| 197. | <i>Dichrostachys cinerea</i> (L.) Wight & Arn. | Tree |
| 198. | <i>Indigofera linifolia</i> (L.f.) Retz | Herb |
| 199. | <i>Indigofera linnaei</i> Ali | Herb |
| 200. | <i>Leucaena leucocephala</i> (Lam.) Dewit | Tree |
| 201. | <i>Macroptilium atropurpureum</i> (DC.) Urb. | Herb |
| 202. | <i>Mimosa pudica</i> L. | Herb |
| 203. | <i>Neptunia triquetra</i> (Vahl) Benth. | Herb |
| 204. | <i>Peltophorum pterocarpum</i> (DC.) Heyne | Tree |
| 205. | <i>Pongamia pinnata</i> (L.) Pierre | Tree |
| 206. | <i>Prosopis chilensis</i> (Molina)Stuntz | Tree |
| 207. | <i>Pterocarpus santalinus</i> L.f. | Tree |
| 208. | <i>Rhynchosia capitata</i> DC. | Twiner |
| 209. | <i>Rhynchosia minima</i> (L.) DC. | Twiner |
| 210. | <i>Saraca asoca</i> (Roxb.) J.J.de Wilde | Tree |
| 211. | <i>Senna uniflora</i> (Mill.) H.S. Irwin & Barneby | Herb |
| 212. | <i>Stylosanthes fruticosa</i> (Retz.) Alston | Shrub |
| 213. | <i>Stylosanthes hamata</i> (L.) Taub. | Herb |
| 214. | <i>Tephrosia pumila</i> (Lam.) Pers. | Herb |
| 215. | <i>Tephrosia purpurea</i> (L.) Pers. | Herb |
| 216. | <i>Vigna radiata</i> (L.) Wilczek | Climber |
| 217. | <i>Vigna trilobata</i> (L.) Verdc. | Climber |
| GENTIANACEAE | | |
| 218. | <i>Enicostemma axillare</i> (Lam.) Rayn | Herb |
| HYDROCHARITACEAE | | |
| 219. | <i>Halophila ovalis</i> (R.Br.) Hook.f. | Herb |
| 220. | <i>Hydrilla verticillapa</i> (L.f.) Royle | Herb |
| 221. | <i>Ottelia alismoides</i> (L.) Pers. | Herb |
| 222. | <i>Vallisnaria spiralis</i> Roxb. | Herb |
| HYPOXIDACEAE | | |
| 223. | <i>Curculigo orchiioides</i> Gaertn. | Herb |
| LAMIACEAE | | |

| | | |
|-----------------------|---|----------|
| 224. | <i>Gmelina arborea</i> Roxb. ex Sm. | Tree |
| 225. | <i>Gmelina asiatica</i> L. | Tree |
| 226. | <i>Hyptis suaveolens</i> (L.) Poit. | Shrub |
| 227. | <i>Ocimum americanum</i> L. | Herb |
| 228. | <i>Ocimum basilicum</i> L. | Herb |
| 229. | <i>Ocimum sanctum</i> L. | Herb |
| 230. | <i>Leonotis nepetiifolia</i> (L.) R. Br. | Shrub |
| 231. | <i>Leucas aspera</i> (Willd.) Link | Herb |
| 232. | <i>Leucas cephalotes</i> (Roth.) Spreng. | Herb |
| LAURACEAE | | |
| 233. | <i>Cassytha filiformis</i> L. | Parasite |
| LEMNACEAE | | |
| 234. | <i>Lemna aequinoctialis</i> Welw. | Herb |
| LYTHRACEAE | | |
| 235. | <i>Ammannia baccifera</i> Roth. | Herb |
| 236. | <i>Lawsonia inermis</i> L. | Tree |
| MALVACEAE | | |
| 237. | <i>Abutilon hirtum</i> (Lam.) Sweet. | Shrub |
| 238. | <i>Abutilon indicum</i> (L.) Sweet. | Shrub |
| 239. | <i>Hibiscus rosa-sinensis</i> L. | Shrub |
| 240. | <i>Hibiscus vitifolius</i> L. | Shrub |
| 241. | <i>Malvastrum coromandelianum</i> (L.) Garcke | Shrub |
| 242. | <i>Sida acuta</i> Burm.f. | Herb |
| 243. | <i>Sida cordata</i> (Burm.f) Borssum | Herb |
| 244. | <i>Sida cordifolia</i> L. | Herb |
| 245. | <i>Thespesia populnea</i> (L.) Corr. | Tree |
| 246. | <i>Urena lobata</i> L. | Shrub |
| MELIACEAE | | |
| 247. | <i>Azadirachta indica</i> A. Juss. | Tree |
| 248. | <i>Melia azedarach</i> L. | Tree |
| 249. | <i>Swietenia mahagoni</i> (L.) Jacq. | Tree |
| MENISPERMACEAE | | |
| 250. | <i>Cocculus hirsutus</i> (L.) Diels | Twiner |

| | | |
|----------------------|---|--------------|
| 251. | <i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thoms. | Twiner |
| MENYANTHACEAE | | |
| 252. | <i>Nymphoides hydrophylla</i> (Lour.) Kuntze | Herb |
| MAGNOLIACEAE | | |
| 253. | <i>Magnolia champaca</i> (L.) Baill. ex Pierre | Tree |
| MORACEAE | | |
| 254. | <i>Artocarpus heterophyllus</i> Lam. | Tree |
| 255. | <i>Ficus benghalensis</i> L. | Tree |
| 256. | <i>Ficus benamina</i> L. | Tree |
| 257. | <i>Ficus hispida</i> L.f. | Tree |
| 258. | <i>Ficus racemosa</i> L. | Tree |
| 259. | <i>Ficus religiosa</i> L. | Tree |
| 260. | <i>Ficus variegata</i> Blume | Tree |
| 261. | <i>Morus alba</i> L. | Tree |
| MORINGACEAE | | |
| 262. | <i>Moringa pterigosperma</i> Gaertn. | Tree |
| MOLLUGINACEAE | | |
| 263. | <i>Glinus oppositifolius</i> (L.) A. DC. | Herb |
| 264. | <i>Mollugo nudicaulis</i> Lam. | Herb |
| 265. | <i>Mollugo pentaphylla</i> L. | Herb |
| MUNTINGIACEAE | | |
| 266. | <i>Muntingia calabura</i> L. | Tree |
| MYRTACEAE | | |
| 267. | <i>Psidium guajava</i> L. | Tree |
| 268. | <i>Syzygium cumini</i> (L.) Skeels | Tree |
| NYMPHAEACEAE | | |
| 269. | <i>Nelumbo nucifera</i> Gaertn. | Aquatic herb |
| 270. | <i>Nymphaea nouchali</i> Burm.f. | Aquatic herb |
| 271. | <i>Nymphaea pubescens</i> Willd. | Aquatic herb |
| 272. | <i>Nymphaea rubra</i> Roxb. ex Andrews | Aquatic herb |
| NYCTAGINACEAE | | |

| | | |
|------------------------|--|---------|
| 273. | <i>Boerhavia diffusa</i> L. | Herb |
| 274. | <i>Boerhavia erecta</i> L. | Herb |
| 275. | <i>Bougainvillea glabra</i> Choisy | Herb |
| 276. | <i>Bougainvillea spectabilis</i> (pink) | Shrub |
| OLEACEAE | | |
| 277. | <i>Jasminum flexile</i> Vahl | Shrub |
| 278. | <i>Nyctanthes arbor-tristis</i> L. | Tree |
| ONAGRACEAE | | |
| 279. | <i>Ludwigia adscendens</i> (L.) H. Hara | Herb |
| 280. | <i>Ludwigia octovalvis</i> (Jacq.) P.H. Raven | Herb |
| 281. | <i>Ludwigia perennis</i> L. | Herb |
| OXALIDACEAE | | |
| 282. | <i>Biophytum sensitivum</i> (L.) DC. | Herb |
| PASSIFLORACEAE | | |
| 283. | <i>Passiflora foetida</i> L. | Climber |
| PEDALIACEAE | | |
| 284. | <i>Martynia annua</i> L. | Herb |
| 285. | <i>Pedaliium murex</i> L. | Herb |
| PHYLLANTHACEAE | | |
| 286. | <i>Flueggea leucopyrus</i> Willd. | Shrub |
| 287. | <i>Phyllanthus amarus</i> Schumach. & Thonn. | Herb |
| 288. | <i>Phyllanthus emblica</i> L. | Tree |
| 289. | <i>Phyllanthus maderaspatensis</i> L. | Herb |
| 290. | <i>Phyllanthus reticulatus</i> Poir. | Herb |
| 291. | <i>Phyllanthus rotundifolius</i> Klein ex Willd. | Herb |
| 292. | <i>Phyllanthus virgatus</i> Forst.f. | Herb |
| 293. | <i>Ricinus communis</i> L. | Shrub |
| 294. | <i>Sauropus bacciformis</i> (L.) Airy Shaw | Herb |
| PLUMBAGINACEAE | | |
| 295. | <i>Plumbago zeylanica</i> L. | Herb |
| PLANTAGINACEAE | | |
| 296. | <i>Bacopa monnieri</i> (L.) Wettst. | Herb |
| PONTEDERIAACEAE | | |

| | | |
|----------------------|--|---------|
| 297. | <i>Eichhornia crassipes</i> (Mart.) Solms | Herb |
| 298. | <i>Monochoria vaginalis</i> (Burm.f.) C. Presl | Herb |
| PORTULACACEAE | | |
| 299. | <i>Portulaca oleracea</i> L. | Herb |
| 300. | <i>Portulaca quadrifida</i> L. | Herb |
| POLYGALACEAE | | |
| 301. | <i>Polygala arvensis</i> Willd. | Herb |
| POLYGONACEAE | | |
| 302. | <i>Antigonon leptopus</i> Hook. & Arn. | Crepper |
| POACEAE | | |
| 303. | <i>Alloteropsis cimicina</i> (L.) Stapf | Herb |
| 304. | <i>Andropogon pumilus</i> Roxb. | Herb |
| 305. | <i>Apluda mutica</i> L. | Herb |
| 306. | <i>Aristida adscensionis</i> L. | Herb |
| 307. | <i>Aristida hystrix</i> L.f. | Herb |
| 308. | <i>Aristida funiculata</i> Trin & Rupr. | Herb |
| 309. | <i>Aristida setacea</i> Retz. | Herb |
| 310. | <i>Brachiaria distachya</i> (L.) Stapf | Herb |
| 311. | <i>Brachiaria ramosa</i> (L.) Stapf | Herb |
| 312. | <i>Brachiaria remota</i> (Retz.) Haines | Herb |
| 313. | <i>Cenchrus biflorus</i> Roxb. | Herb |
| 314. | <i>Cenchrus ciliaris</i> L. | Herb |
| 315. | <i>Chloris barbata</i> Sw. | Herb |
| 316. | <i>Chloris quinquesetica</i> Bhide | Herb |
| 317. | <i>Chrysopogon fulvus</i> (Spr.) Chiov. | Herb |
| 318. | <i>Chrysopogon zizanioides</i> (L.) Roberty | |
| 319. | <i>Coelachyropsis lagopoides</i> Bor | Herb |
| 320. | <i>Cynodon barberi</i> Rang. & Tadul. | Herb |
| 321. | <i>Cynodon dactylon</i> (L.) Pers. | Herb |
| 322. | <i>Cymbopogon coloratus</i> (Hook.f.) Stapf | Herb |
| 323. | <i>Dactyloctenium aegyptium</i> (L.) Beauv. | Herb |
| 324. | <i>Dichanthium annulatum</i> (Forssk.) Stapf | Herb |

| | | |
|-------------------|---|------|
| 325. | <i>Dichanthium caricosum</i> (L.) A. Camus | Herb |
| 326. | <i>Digitaria bicornis</i> (Lam.) Roem & Schult. | Herb |
| 327. | <i>Digitaria ciliaris</i> (Retz.) Koeler | Herb |
| 328. | <i>Echinochloa colona</i> (L.) Link | Herb |
| 329. | <i>Echinochloa crusgalli</i> (L.) Beauv. | Herb |
| 330. | <i>Enteropogon monostachyos</i> (Vahl) Schum. ex Engl. | Herb |
| 331. | <i>Eragrostiella bifaria</i> (Vahl) Bor | Herb |
| 332. | <i>Eragrostis nutans</i> (Retz.) Steud | Herb |
| 333. | <i>Eragrostis pilosa</i> (L.) Beauv. | Herb |
| 334. | <i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. & Schult. | Herb |
| 335. | <i>Eragrostis unioloides</i> (Retz.) Nees ex Steud. | Herb |
| 336. | <i>Eragrostis viscosa</i> (Retz.) Trin. | Herb |
| 337. | <i>Heteropogon contortus</i> (L.) Beauv. | Herb |
| 338. | <i>Imperata cylindrica</i> (L.) P. Beauv. | Herb |
| 339. | <i>Iseilema anthephoroides</i> Hack. | Herb |
| 340. | <i>Iseilema prostratum</i> (L.) Andersson | Herb |
| 341. | <i>Melanocenchris jacquemontii</i> Jaub. & Spach | Herb |
| 342. | <i>Melanocenchris monoica</i> (Rottl.) Fischer | Herb |
| 343. | <i>Oropetium thomaeum</i> (L.f.) Trin. | Herb |
| 344. | <i>Panicum notatum</i> Retz. | Herb |
| 345. | <i>Panicum repens</i> L. | Herb |
| 346. | <i>Panicum trypheron</i> Schult. | Herb |
| 347. | <i>Perotis indica</i> (L.) O. Ktze. | Herb |
| 348. | <i>Saccharum spontaneum</i> L. | Herb |
| 349. | <i>Setaria pumila</i> (Poir.) Roem. & Schult. | Herb |
| 350. | <i>Setaria verticillata</i> (L.) Beauv. | Herb |
| 351. | <i>Sporobolus coromandelianus</i> (Retz.) Kunth | Herb |
| 352. | <i>Trachys muricata</i> (L.) Pers. ex Trin. | Herb |
| 353. | <i>Vetiveria zizanioides</i> (L.) Nash | Herb |
| RHAMNACEAE | | |
| 354. | <i>Ziziphus mauritiana</i> Lam. | Tree |
| 355. | <i>Ziziphus oenopolia</i> (L.) Mill. | Tree |

| RUBIACEAE | | |
|-------------------------|---|--------|
| 356. | <i>Catunaregum spinosa</i> (Thumb.) Tirv. | Shrub |
| 357. | <i>Canthium parviflorum</i> Lam. | Shrub |
| 358. | <i>Dentella repens</i> (L.) J.R. Forst. & G. Forst. | Herb |
| 359. | <i>Hedyotis aspera</i> Roth. | Herb |
| 360. | <i>Hedyotis corymbosa</i> (L.) Lam. | Herb |
| 361. | <i>Hedyotis puberula</i> (G. Don.) Arn. | Herb |
| 362. | <i>Ixora arborea</i> G. Lodd. | Shrub |
| 363. | <i>Ixora chinensis</i> Lam. | Shrub |
| 364. | <i>Ixora coccinea</i> L. | Shrub |
| 365. | <i>Spermacoce hispida</i> L. | Herb |
| 366. | <i>Spermacoce pusilla</i> Wall. | Herb |
| SAPINDACEAE | | |
| 367. | <i>Cardiospermum halicacabum</i> L. | Twiner |
| 368. | <i>Dodonaea viscosa</i> Jacq | Shrub |
| SAPOTACEAE | | |
| 369. | <i>Mimusops elengi</i> L. | Tree |
| SCROPHULARIACEAE | | |
| 370. | <i>Sopubia delphinifolia</i> (L.) G. Don. | Herb |
| 371. | <i>Striga angustifolia</i> (D. Don) C.J. Saldanha | Herb |
| 372. | <i>Striga asiatica</i> (L.) O. Ktze. | Herb |
| 373. | <i>Striga densiflora</i> (Benth.) Benth. | Herb |
| 374. | <i>Limnophila indica</i> (L.) Druce | Herb |
| 375. | <i>Lindernia antipoda</i> (L.) Alston | Herb |
| 376. | <i>Scoparia dulcis</i> L. | Herb |
| SOLANACEAE | | |
| 377. | <i>Physalis minima</i> L. | Herb |
| STERCULIACEAE | | |
| 378. | <i>Waltheria indica</i> L. | Herb |
| TILIACEAE | | |
| 379. | <i>Corchorus capsularis</i> L. | Herb |
| 380. | <i>Corchorus olitorius</i> L. | Herb |

| | | |
|--------------------|---|---------|
| 381. | <i>Corchorus trilocularis</i> L. | Herb |
| 382. | <i>Triumfetta pentandra</i> A. Rich | Herb |
| 383. | <i>Triumfetta rhomboidea</i> Jacq. | Herb |
| TURNERACEAE | | |
| 384. | <i>Turnera ulmifolia</i> L. | Herb |
| TYPHACEAE | | |
| 385. | <i>Typha angustata</i> Bory & Chaub. | Shrub |
| VERBENACEAE | | |
| 386. | <i>Duranta erecta</i> L. | Herb |
| 387. | <i>Lantana camara</i> L. | Shrub |
| 388. | <i>Phyla nodiflora</i> (L.) Greene | Herb |
| 389. | <i>Stachytarpheta jamaicensis</i> (L.) Vahl. | Herb |
| 390. | <i>Tectona grandis</i> L.f. | Tree |
| VITACEAE | | |
| 391. | <i>Cissus quadrangularis</i> L. | Climber |
| VIOLACEAE | | |
| 392. | <i>Hybanthus enneaspermus</i> (L.) F.V. Muell | Herb |

LIST OF FAUNAL SPECIES

| SNO | Species Type | Common Name | Scientific Name |
|-----|--------------|------------------------|---------------------------------|
| 1 | Amphibian | Indian Bull Frog | <i>Rana tigrina</i> |
| 2 | Amphibian | Indian pond frog | <i>Euphlyctis hexadactylus</i> |
| 3 | Amphibian | Common Indian Toad | <i>Bufo melanostictus</i> |
| 4 | Amphibian | Common Tree Frog | <i>Polypedates maculates</i> |
| 5 | Amphibian | Indian Bull frog | <i>Hoplobatrachus tigerinus</i> |
| 6 | Amphibian | Jerdons Bull Frog | <i>Hoplobatrachus crassus</i> |
| 7 | Arthropoda | Honey Bee | <i>Apis mellifera</i> |
| 8 | Arthropoda | Centipede | <i>Scolopendra Hardwickei</i> |
| 9 | Arthropoda | Crimson Rose Butterfly | <i>Pachliopta hector</i> |
| 10 | Arthropoda | Painted Grasshopper | <i>Poecilocus pictus</i> |
| 11 | Arthropoda | Lychee Shield Bug | <i>Chrysocoris stollii</i> |

| | | | |
|----|--------------|----------------------|-------------------------------------|
| 12 | Arthropoda | Cockroach | <i>Periplaneta americana</i> |
| 13 | Arthropoda | Ant | <i>Oecophyllas maragdina</i> |
| 14 | Arthropoda | House fly | <i>Musca domestica</i> |
| 15 | Arthropoda | Mosquito | <i>Anopheles</i> |
| 16 | Arthropoda | Mosquito | <i>Culex</i> |
| 17 | Arthropoda | Scorpion | <i>Centruroides vittatus</i> |
| 18 | Annelida | Earth worm | <i>Lumbricus terrestris</i> |
| 19 | Aves (Birds) | Kaki | <i>Corvus splendens</i> |
| 20 | Aves (Birds) | Palapitta | <i>Coracias benghalensis</i> |
| 21 | Aves (Birds) | Ramachiluka | <i>Psittacula krameri</i> |
| 22 | Aves (Birds) | Gudla Guba | <i>Athene brama</i> |
| 23 | Aves (Birds) | Vadrangagipitta | <i>Micropternusbrachyurus</i> |
| 24 | Aves (Birds) | Pichuka | <i>Passer domesticus</i> |
| 25 | Aves (Birds) | Gorinka | <i>Acridotheres tristis</i> |
| 26 | Aves (Birds) | Rose ringed Parakeet | <i>Psittaculakramerimanillensis</i> |
| 27 | Aves (Birds) | Common Myna | <i>Acridotheres tristis</i> |
| 28 | Aves (Birds) | Common Jungle Crow | <i>Corvus macrorhynchus</i> |
| 29 | Aves (Birds) | Great Erget | <i>Ardea alba</i> |
| 30 | Aves (Birds) | Common tailor bird | <i>Orthotomus sutorius</i> |
| 31 | Aves (Birds) | Pigeon | <i>Columba livia</i> |
| | | | |
| 32 | Insect | Common Nawab | <i>Polyura athamas</i> |
| 33 | Insect | Common Emigrant | <i>Catopsilia pomona</i> |
| 34 | Insect | Common Brush brown | <i>Mycalesis perseus</i> |
| 35 | Insect | Common Mormon | <i>Papiliopolytes</i> |
| 36 | Insect | Common tiger | <i>Danaus genutia</i> |
| 37 | Insect | Ant | <i>Solenopsis</i> |
| 38 | Insect | Striped Tiger | <i>Danaus genutia</i> |
| 39 | Insect | Fruit fly | <i>Drosophila melanogaster</i> |
| 40 | Insect | Blue tiger | <i>Tirumala limniace</i> |
| 41 | Insect | Crimson Tip | <i>Colotisdanae</i> |
| 42 | Insect | Great Eggfly | <i>Hypolimnasbolina</i> |
| 43 | Insect | Common Leopard | <i>Phalantaphalantha</i> |

| | | | |
|----|--------------------|-------------------------|---------------------------------|
| 44 | Insect | Midatha | <i>Caelifera.L</i> |
| 45 | Insect | Black Garden ant | <i>Lasiusniger</i> |
| 46 | Insect | Danaid Eggfly | <i>Hypolimnasmisippus</i> |
| 47 | Insect | Lesser Grass Blue | <i>Zizinaotis</i> |
| 48 | Insect | Common Pierrot | <i>Castaliusrosimon</i> |
| 49 | Insect | Boddinka | <i>Periplaneta americana</i> |
| 50 | Insect | Bee fly | <i>Bombyliidae</i> |
| 51 | Insect (Butterfly) | Common jay | <i>G. doson</i> |
| 52 | Insect (Butterfly) | Common rose | <i>Pachlioptaa ristolochiae</i> |
| 53 | Insect (Butterfly) | Common merun | <i>P. memnon</i> |
| 54 | Insect (Butterfly) | The black tail | <i>P. liomedon</i> |
| 55 | Insect (Butterfly) | Common albatross | <i>Appias albino</i> |
| 56 | Insect (Butterfly) | Common emigrant | <i>Catopsilia crocale</i> |
| 57 | Insect (Butterfly) | Common gull | <i>Cepora nerissa</i> |
| 58 | Insect (Butterfly) | Common jezebel | <i>Delias eucharis</i> |
| 59 | Insect (Butterfly) | Common grass yellow | <i>Eurema hecabe</i> |
| 60 | Insect (Butterfly) | Small grass yellow | <i>Eurema brigitta</i> |
| 61 | Insect (Butterfly) | Three spot grass yellow | <i>Euremablanda</i> |
| 62 | Insect (Butterfly) | Common wanderer | <i>Valeria valeriaanis</i> |
| 63 | Insect (Butterfly) | Plain tiger | <i>Danaus chrysippus</i> |
| 64 | Insect (Butterfly) | Blue tiger | <i>Tirumala limniace</i> |
| 65 | Insect (Butterfly) | Rustic | <i>Cuphaerymanthis</i> |
| 66 | Mammal | Monkey | <i>Macaca fascicularis</i> |
| 67 | Mammal | Eluka | <i>Mus musculus</i> |
| 68 | Mammal | kundelu | <i>Lepus nigricollis</i> |
| 69 | Mammal | Gabbilam | <i>Microchiropeta L.</i> |
| 70 | Mammal | Adavi Pandi | <i>Wild Boar Herpestes.L</i> |
| 71 | Mammal | Pandi Kokku | <i>Field Bandicoot</i> |
| 72 | Mammal | Chunchu | <i>Common Shrew</i> |
| 73 | Mammal | Squirrel | <i>Funambulus palmarum</i> |
| 74 | Mammal | Dog | <i>Canis familiaris</i> |
| 75 | Mammal | Deer (Krihna jinka) | <i>Axis axis</i> |

| | | | |
|----|----------|-----------------------|----------------------------------|
| 76 | Reptiles | Wall lizard | <i>Hemidactylus flaviviridis</i> |
| 77 | Reptiles | Chameleon | <i>Chameleo zeylanicus</i> |
| 78 | Reptiles | House Lizard | <i>Hemidactylus frenatus</i> |
| 79 | Reptiles | Garden lizard | <i>Calotes versicolor</i> |
| 80 | Reptiles | Termite Gecko | <i>Hemidactylus triedrus</i> |
| 81 | Reptiles | Common Garden Lizard | <i>Calotes versicolor</i> |
| 82 | Reptiles | Common Skink | <i>Mabuyacarinata</i> |
| 83 | Snake | Common Indian Krait | <i>Bungarus caeruleus</i> |
| 84 | Snake | Russell's Kukri Snake | <i>Oligodontae niolatus</i> |
| 85 | Snake | India Rat Snake | <i>Ptyasmucosus</i> |
| 86 | Snake | Indian Cobra | <i>Naja naja</i> |

i) Green Programs (Green initiatives)

Due to minimum consideration for environment & sustainability, the world is facing problems of ozone depletion, climate change, water scarcity and sustainable resource management. The university organizes massive plantation programmes, awareness programmes, guest lectures on environmental conservation, biodiversity etc. every year.

List of Programmes:

Green Steps taken by the University:

University campuses were audited with respect to Green Audit Checklist developed by Hym International certifications Pvt. Ltd, Hyderabad Based on the data available for review, it is understood that since 5 years (2017-2021) university is actively taking initiatives in environment related activities. University has taken green initiatives by installing a renewable energy system, rainwater harvesting system, vermi composting, Kitchen gardening, establishing Green Club, recycling process, promoting eco-friendly activities etc.

1. Buildings are specifically designed with wide windows and wide passages to utilise sunlight, and for ventilation.
2. University has more number of trees, shrubs and potted plants present in the campus.
3. University has initiated a rooftop solar PV system of 100 KWH capacity in the main campus.

4. University has e-book facility in the library.
5. Understanding the importance of efficient energy use, university has initiated the process of replacing all incandescent lights with LEDs.
6. Solar panel lights are arranged in the common areas and roads in the campus.
7. For e-waste management, university has tied-up with E-waste recycler/ disposer.
8. University established an 'Green Clubs' and 'Extension activities Committees' in which students and staff arrange different environmental activities such as guest lecture programmes, green awareness camps, conferences, cleanliness drives in association with NSS etc.

OBSERVATIONS

1. Biodiversity: The university campus at Nellore and Kavali comprises of around 424 species of plants and 115 faunal species.
2. Green spaces: From 2017 to 2021, due to huge plantation at the VSU, Nellore and VSUPG Centre, Kavali the area of green space is increased tremendously.
3. Organic manure/fertilizers: One of the best initiatives to improve plantation is through organic farming. Farmers from Buranpur, Nellore district voluntarily supply organic manure to sustain plantation programmes organized by University via Clean and Green initiatives in association with NSS cell of the University.
4. Transportation: The fuel used for transportation of various plantation requirements is 2712 Litres per year. It is observed that the lawn maintenance is properly done and lawn mowing is high in October and November months. The fuel consumption is less than previous year.
5. Wide range of varieties are found in the campus. It observed that high number of Trees i.e., 30% and herbs i.e., 27% are found here. 11% shrubs, 9% grasses & cycads and 7% of medicinal Plants are seen. Though other species are in less number, this counts to high biodiversity of the campus.
6. Based on height the highest number of plants with 50 to 100 cms are 50.2% and more than 12 meters are 30%. Further very less height plants are 8 to 12 meters 0.7%.
7. It is observed that the water scarcity considered during the plantation. 58% are normal water intake plants and 42% plants can tolerate less water also.
8. Most of the plants i.e., 40% are very long life span plants, 1% plants lifespan is 1 to 2 years and 33% plants lifespan is 6 to 12 months. Hence the plants are also well planned as per the lifespan.
9. Biodiversity of fauna: Increase in the plantation from 2017 to 2021 lead to the increase in the biodiversity of fauna. It is observed that a wide variety of butterflies followed by insects have been increased during the assessment year.
10. Water sources: The University at both the campuses has rainwater harvesting systems to avoid scarcity during summer season.
11. Medicinal plants: The University allocated a green space at VSU, Nellore to promote plantation of medicinal plants. So far, 70 species of medicinal plants have been planted at herbal garden and to promote green initiative, the plants are distributed to the local

communitys as a part of environmental sustanability.

12. Involvement of students: Students of Clean and Green Committee in assoication with VSU NSS Cell are regularly involved in the plantation programmes conducted by the unversity.

RECOMMENDATIONS

1. **Plantation:** Increase the plantation at VSU, Nellore and VSUPG Centre, Kavali. Further, improve the herbal garden at VSU, Nellore and Botanical Garden at VSU, Kavali. Plan for the more aquatic plants in botanic garden.
2. **Water utilization:** Utilize the water facility available in front of the University premises for plantation to avoid water scarcity during summer season. Further, use drip irrigation and sprinklers for watering plants.
3. **Water Management:** Construct more farm ponds for better water management.
4. **Transportation:** Reduce the fuel consumption for plantation and its maintenance.
5. **Organic farming:** Reduce the use of fertilizers and improve organic farming through vermicomposting
6. **Rainwater harvesting units:** Increase number of rainwater harvesting structures near building areas for better conservation of water.
7. **Records:** Campus has to conduct audit every year to track the flora and fauna species
8. **Students activity:** Initiate clean and green activities by involving students. This enables them to understand plant species and their conservation.