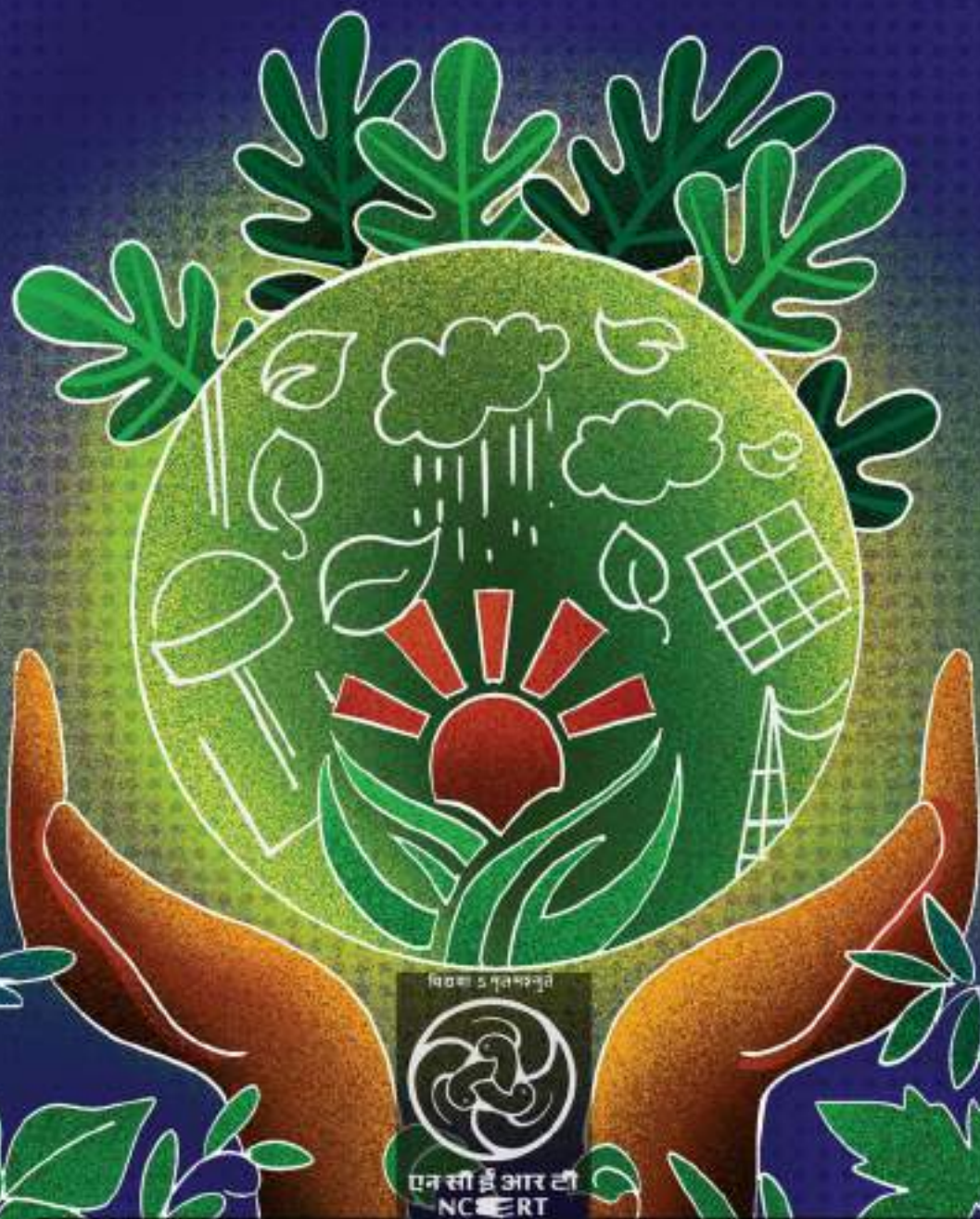


# ENVIRONMENT AUDIT 2022-2023



REGIONAL INSTITUTE OF EDUCATION

NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING

BHUBANESWAR, ODISHA



State plants plantation programme from different states of India in presence of Hon'ble Minister of Education, Shri Dharmendra Pradhan, Director, NCERT, Prof. Dinesh Prasad Saklani and Principal, RIE, BBSR Prof. P.C. Agarwal during Kala Utsav 2022-23



ENVIRONMENT AUDIT WORKSHOP  
REGIONAL INSTITUTE OF EDUCATION, BHUBANESWAR

# ENVIRONMENT AUDIT

2022-23



विद्यया ऽ मृतमश्नुते



एन सी ई आर टी  
NCERT

**Regional Institute of Education**  
(National Council of Educational Research & Training)  
**Bhubaneswar – 751022, Odisha**

## Regional Institute of Education (NCERT), BBSR

### Internal Environment Audit Committee 2022-23

*Prof. Prakash Chandra Agarwal*  
*Chairman and Principal, RIE, Bhubaneswar*

*Prof. Manasi Goswami, Convenor*  
*Professor, Physics Section*  
*DESM, RIE, Bhubaneswar*

*Prof. Ritajali Dash,*  
*Coordinator, IQAC*  
*Head, DEE, RIE, Bhubaneswar*

#### *Members*

*Dr. Abhisa Bal, Assistant Professor,*  
*Zoology Section, DESM, RIE, Bhubaneswar*  
*Dr. Sanjeeb Kumar Dash, Laboratory Assistant,*  
*Botany Section, DESM, RIE, Bhubaneswar*  
*Mr. Dharanidhar Khandai, Laboratory Assistant*  
*Chemistry Section, DESM, RIE, Bhubaneswar*

#### *Student Members*

<i>Mr. Ranjit Singh, Student</i>	<i>B.Sc. B.Ed., CBZ, DESM, RIE, BBSR</i>
<i>Ms. Swati Kumari, Student</i>	<i>B.Sc. B.Ed., CBZ, DESM, RIE, BBSR</i>
<i>Mr. Aman Mittal, Student</i>	<i>B.Sc. B.Ed., PCM, DESM, RIE, BBSR</i>
<i>Ms. Vaishnavi Sahu, Student</i>	<i>B.Sc. B.Ed., CBZ, DESM, RIE, BBSR</i>

#### *External Environment Audit Committee*

*1. Prof. Rama Chandra Mohanty,*  
*Emeritus Professor in Botany*  
*Former Professor & Head of the*  
*Department of Botany*  
*Utkal University, Vaní Vihar*  
*Bhubaneswar, Odisha*

*2. Dr. Nihar Ranjan Sahoo*  
*Chief Environmental Engineer*  
*State Pollution Control Board*  
*Bhubaneswar, Odisha*

## क्षेत्रीय शिक्षा संस्थान

(राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद)  
सचवालय मार्ग , भुवनेश्वर-751022-  
FAX : 0674-2543782, 2540531  
E-mail: [riebbs@nic.in](mailto:riebbs@nic.in)  
websites: [www.riebbs.ac.in](http://www.riebbs.ac.in)



REGIONAL INSTITUTE OF EDUCATION  
(National Council of Educational Research and Training)  
SACHIVALAYA MARG,  
BHUBANESWAR-751022

Phones :Principal :2541409, 2540534(O), 2543609(R)  
Administrative Officer : 2542924(O), 2543351(R)

**Prof. P. C. Agarwal**  
Principal



## MESSAGE

It gives me immense pleasure to bring out the report of Environment Audit of the Institute conducted in accordance with NAAC guidelines. Regional Institute of Education, Bhubaneswar, a constituent unit of NCERT, New Delhi stands for its reputation as a premier teacher training Institute of the country. The Institute consistently carries out its responsibility to ensure a clean and healthy environment for effective teaching learning programmes. The Institute preserves the environment within the Campus, as per the feedback taken regularly and taking indigenous as well as technology blended initiatives to solve its environmental issues.

Environment Audit Report of the Institute has been prepared by an internal audit team of the Institute, comprising of faculty members, staff members and students. The purpose of the environment audit is to ensure that the practices followed in the Campus for environmental protection, environmental awareness etc. are in the right direction for sustainable development of the Institute. The suggestions and recommendations of external experts on the audit report have been incorporated in the Report. Hope it will inspire new initiatives for further improvement of campus environment.

I believe this Environment Audit report would bring renewed vigour in the Institute activities and turn as an indispensable document for undertaking environment decision of the Institute in future.

(P.C. Agarwal)

## क्षेत्रीय शिक्षा संस्थान

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सचिवालय मार्ग , भुवनेश्वर-751022-  
FAX : 0674-2543782, 2540531  
E-mail: [riebbs@nic.in](mailto:riebbs@nic.in)  
websites: [www.riebbs.ac.in](http://www.riebbs.ac.in)



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Administrative Officer : 2542924(O), 2543351(R)

**Prof. Ritanjali Dash**  
Coordinator, IQAC



## MESSAGE

The Environment Audit report is a documented proof of the measures undertaken by any organization to evaluate its initiatives to make the campus environment friendly. The Environment Audit Team of the Institute made out all efforts to bring out this report after making a meticulous survey of every aspect of the environment in the campus. The external audit team after a thorough evaluation has also proposed many recommendations as well. Hope this initiative will help in making everyone conscious and accountable for a sustainable environment.

Prof. Ritanjali Dash

## PREFACE

**Prof. Manasi Goswami**  
Convener  
Environment Audit Team



Higher Educational Institutions have a social responsibility to actively participate in reducing global warming by implementing various measures to decrease their carbon footprint. RIE, Bhubaneswar, a premiere institution known for its teacher training programs, research, development, and extension initiatives in school and teacher education, recognizes the importance of maintaining a clean and environment friendly campus. To ensure the sustainable growth of the Institute, it is necessary to periodically evaluate its own contributions and efforts in creating a sustainable campus environment. The primary objective of the Environment Audit is to verify that the Institute's environmental monitoring system aligns with the goal of achieving sustainable development.

The process of conducting an audit involves the creation and completion of structured and semi-structured questionnaires, physically examining the facilities within the institutional campus, observing and identifying natural resources, reviewing documentation related to land usage, engaging with stakeholders, raising awareness, analyzing data, taking measurements and providing suggestions based on the findings. The comprehensive approach ensures a thorough assessment of the Institution's environmental practices and enables the identification of areas for improvement and sustainable actions.

The team members have diligently and responsibly conducted the aforementioned activities. They have meticulously studied and documented each aspect of the environment, including soil, water, energy, air, noise, biodiversity, green cover, endangered species, as well as human health and safety, toxic plants etc. Additionally, the faculty members have taken great care to ensure academic integrity while preparing the report. The remarkable efforts of student-teachers while doing surveys, collection of information, spotting of birds and counting have significantly enhanced their expertise in the field of environmental studies. The external expert team has meticulously evaluated the draft report and has given valuable recommendations. These recommendation and actions taken on those recommendations have been incorporated in the report.

The resulting report serves as a valuable resource for policy makers, administrators, students, and faculty members, providing them with a reliable source of data and references in the field of Environmental Education.

Environment Audit Team

विद्यया ऽ मृतमश्नुते  
**CERTIFICATE OF ENVIRONMENT AUDIT**

*This is to certify that*

**REGIONAL INSTITUTE OF EDUCATION (NCERT),  
BHUBANESWAR**

*has successfully conducted the Environment audit by a team in accordance with the applicable standards prescribed by the Ministry of Environment, Forests and Climatic Change, Government of India, during the academic year 2022-23. The audit team has assessed the Institute's environmental performance in a holistic manner with broader viewpoints. In the perspective of Environmental Initiatives the team has evaluated the Institute's contribution towards large varieties of environmental issues i.e., energy savings, solid and waste water management, carbon footprints, along with elaboration of green covers, biodiversity etc. The audit realized the substantial efforts by the Institute on the development of a clean and green campus and observable involvement of stakeholders, viz, administration, faculty members, students, alumni members and residents of the campus. Extensive audit process undertaken by the Institute involving different stakeholders in general and student-teachers in particular is an excellent environmental educative programme by itself for the campus community. The audit*



## विद्यया ऽ मृतमश्नुते

*gives a list of recommendations for further improvement which the Institute can follow for a sustainable environment. This environment audit report gives an open and transparent view in conformity with environmental auditing principles accepted in India.*

  
10.05.2023

Prof. Rama Chandra Mohanty  
Emeritus Professor in Botany &  
Former HOD, Department of Botany,  
Utkal University, Vani Vihar  
Bhubaneswar

  
10.05.2023.

Dr. Nihar Ranjan Sahoo  
Chief Environmental Engineer,  
State Pollution Control Board  
Bhubaneswar

एन सी ई आर टी  
NCERT



FAX : 2562822/2560955  
Tel : 2564033/2563924  
EPABX : 2561909/2562847  
Email : [paribesh1@spcboard.in](mailto:paribesh1@spcboard.in)  
Website : [www.ospcboard.org](http://www.ospcboard.org)

## **STATE POLLUTION CONTROL BOARD, ODISHA**

(Department of Forest & Environment, Govt. of Odisha)  
**Paribesh Bhawan, A/118, Nilakanthanagar, Unit-VIII**  
**Bhubaneswar – 751012**

**Dr. Nihar Ranjan Sahoo**  
**Chief Environmental Engineer.**

### **Environment Audit Report of Regional Institute of Education, Bhubaneswar.**

The Regional Institute of Education (RIE) conducted an internal Environmental Audit of the institute to make an assessment of the state of environment of the campus and assess the environmental performance of its activities in a systematic manner. First of all, the principal, the faculty members, and the students must be congratulated for their efforts in bringing the idea of auditing the environmental performance of the institute to reality. I am thankful to the Institute for giving me the opportunity to carry out the audit. During the auditing process we went through the Audit Report, interacted with the faculties and students, and visited some of the facilities developed for environmental conservation. The overall practice and systems in place for environmental protection within the institute are observed to be excellent. However, following are my review observations that identifies some areas of weakness, which I think the RIE may take up for further improvement in environmental quality.

The introductory Chapter of the report is well explained, and provides an all-round idea of the institute, its objectives, policies, and commitments. The demography and the infrastructure, which are an important component of any audit, are also explained in detail giving an idea of the institute even to a person who is not familiar with the RIE. The objectives of the audit, though clearly articulated, is mixed-up with benefits of the audit. It is suggested that *audit objectives* and *audit benefits* to be presented in two separate Sections.

The initiatives for water saving and water conservation within the campus is praise-worthy, particularly the rainwater harvesting efforts needs a special mention. The institute apparently

has adequate storage facilities. However, the overflow management system through manually controlled valves are little outdated and thus it is recommended to replace it with electronic controlled valves. There are some minor issues in the report, the units of water storage capacities are not consistent. At some places, it is mentioned as gallons and some places, it is presented in litres and kl. It is suggested to express all the values following a consistent unit system, either SI or Metric system of measurement.

The Chapters of Solid Waste management, Energy Consumption, Green Cover, Biodiversity, and Carbon footprint have covered all aspects of the campus activities and are well explained. However, the Chapter on Air Pollution and Noise needs a little more elaboration in terms of identifying and quantifying the sources of air pollution and noise. There are a few areas of environmental initiatives in the campus that need special mention and are praiseworthy. These are:

1. *Student initiatives on plastic collection to make the campus litter free.*
2. *Maintenance of green cover within the campus and students' participation in plantation programs.*
3. *Landscaping and gardening activities within the campus.*
4. *Waste to Energy through bio-gas digestion of organic waste.*

At the same time, we feel that the Institute is capable and poised to take up a few more initiatives for further improvement in its in-campus environmental quality and simultaneously, contribute to the overall environmental quality of the city. Therefore, it is recommended that the RIE may consider taking up some or all the activities indicated as following.

1. *Paper use in any educational institute is huge. Therefore, the Institute may consider adopting a Paper Conservation Program, that involves collecting wastepaper in a systematic manner and handing them over to a paper recycling unit, using more of recycled paper, maximising usage of paper, such as writing and printing on both sides etc.*
2. *The Biogas digester now receives only a part of organic waste generated in the campus. It is suggested that efforts be made to collect all the organic waste and produce biogas out of it.*

3. *Some efforts have been made to harness solar energy to produce in-campus electricity. These efforts are to be further enhanced to reduce the carbon footprint and reduce electricity consumption.*
4. *Since this is a close campus, it is recommended that this campus can be converted to a Green Mobility Campus by allowing students to use only bicycles as the mode of transportation. Even the faculties may also be motivated to use bicycles for coming to the Institute.*
5. *It is recommended that there should be adequate signages within the campus reminding the students, faculties, and visitors that this is a 'Litter free Campus' this is a 'Silence Zone' etc. Such signages, in adequate numbers, nudges all concerned to behave in a more responsible manner and help upkeep the environment.*

It gives me immense pleasure to conclude that the efforts of the faculty members with the guidance of the principal and participation of the students have resulted in an in-depth analysis of environmental issues in the campus. The depth of analysis clearly points to the clarity, objectivity, and commitments of all concerned in carrying out the audit. I deeply appreciate the efforts of the Principal, the Faculties and Students for their efforts in bringing out this audit report.

*Nihar*  
10/05/2023

**(Nihar Ranjan Sahoo)**



**Chief Environmental Engineer**  
**State Pollution Control Board**  
Bhubaneswar 751012  
[www.spccbod.org](http://www.spccbod.org)

## ACKNOWLEDGEMENT

The environment audit team takes this opportunity to convey its sincere appreciation to all stakeholders who have contributed to the successful completion of this Environmental Audit Report. The dedication, hard work, and creativity of the team in association with different departments of the Institute have resulted in drafting and auditing the environmental aspects of the campus in form of a report.

We are deeply indebted and would like to express our heartfelt gratitude to **Hon'ble Director, NCERT, Prof. Dinesh Kumar Saklani**, for his untiring encouragement and support for all kinds of academic endeavors.

We would like to express our special thanks to **Esteem Principal, Prof. Prakash Chandra Agarwal**, Regional Institute of Education, NCERT, Bhubaneswar, for providing us an opportunity to work on the theme "Environment Audit". We are indebted for his supportive and stimulating environment for carrying out the audit. His expertise and insights have been invaluable in shaping our ideas and improving our mode of work.

We extend our heartfelt gratitude to **Prof. Ritanjali Dash, Coordinator, IQAC and Head, DEE** for her support and motivation for drafting the Environmental Audit Report. We are also indebted to **Prof. Sandhya Rani Sahoo, Dean (I), Head, DESSH and Prof. S.K.Dash, Head, DESM** and for their support and constructive feedback during the surveys.

We are grateful to **Mr. Pushkar Behera, Administrative Officer** of the institute for facilitating resources timely. We would also like to acknowledge the constant help of Mr. Susant Kumar Rout, Ssection officer, Campus & Welfare Section for providing the relevant data on campus environment. We are thankful for valuable cooperation received from Accounts Section, Establishment Section, Academic Section and other related sections.

We would like to thank the entire team of Central Laboratory, State Pollution Control Board for analyzing the water and soil sample which added value to the Environment report of the Institute. We express our sincere appreciation and gratitude to the external auditors **Prof. R.C. Mohanty, Emiretus Professor in Botany, Utkal University and Dr. Nihar Ranjan Sahoo, Chief Environmental Engineer, SPCB, Odisha** who inspected our campus and evaluated the environmental audit report of our institution. We are grateful for their professionalism, expertise, and dedication to ensure that we are operating in an environmentally sustainable manner. The audit process was thorough and provided valuable insights and recommendations that will help us improve our environmental practices.

We would like to thank our staff members and stakeholders who cooperated and provided the necessary information and support during the audit. We recognize that our commitment to environment sustainability is a collective effort, and are grateful for the participation of everyone involved. We look forward to take action on audit findings and recommendations and work towards a more sustainable future for our institution and community.

Environmental Audit Team  
Regional Institute of Education, Bhubaneswar

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## Chapter 1

# Introduction

### 1.1 OVERVIEW OF THE INSTITUTE

Regional Institute of Education, Bhubaneswar is a constituent unit of National Council of Educational Research and Training (NCERT), New Delhi, India, the apex body to advice Ministry of Education, Government of India on various aspects of school education. The present Institute had started functioning from 5<sup>th</sup> August, 1963 as Regional College of Education (RCE) and it was renamed as Regional Institute of Education (RIE), with effect from 18<sup>th</sup> April, 1995. The Demonstration Multipurpose School (D.M. School) is an integral part of the Institute and the first CBSE affiliated school of the state. RIE, Bhubaneswar is affiliated to Utkal University and recognized by National Council of Teacher Education (NCTE).



**Fig.1 - Main Building of the Regional Institute of Education, Bhubaneswar**

## 1.2 MISSION AND VISION OF THE INSTITUTE

### VISION

*To be an acclaimed leader in school education and teacher education with focus on quality, equity, inclusiveness and excellence through research,*

### MISSION

- + To strengthen school education system with focus on holistic development of learners.*
- + To prepare teachers for meeting the challenges of the twenty first century by engaging them in a meaningful way and relevant learning environment.*
- + To collaborate with the central government and the state governments in areas of research, development, training and extension for implementation of educational policies.*
- + To provide need-based academic support to organizations working in the area of school education and teacher education.*
- + To build and sustain a network of mutual support with peer institutions in the matter of school and teacher education.*

## 1.3 DEPARTMENTS AND ACADEMIC PROGRAMMES

It is a premiere Institute strategically located to provide pre-service academic program to students of Odisha, West Bengal, Bihar, Jharkhand, Assam, Nagaland, Tripura, Arunachal Pradesh, Meghalaya, Mizoram, Sikkim, and Andaman & Nicobar Islands. The students are shortlisted into different academic programmes offered by the Institute through the Common Entrance Examination (CEE) conducted by NCERT every year.

The Institute comprises of four departments with various sections to ensure the quality of teaching and different programmes run by the Institute.

- (i) Department of Education (DE)
- (ii) Department of Education in Science and Mathematics (DESM)  
(Physics, Chemistry, Botany, Zoology, Mathematics and Agriculture Section)

(iii) Department of Education in Social Science and Humanities (DESSH)  
(Geography, Odia, Hindi, English, Bengali, History, Economics, Political Science)

(iv) Department of Extension Education (DEE)

The Institute provides a wide-ranging courses in the field of education. The academic programmes offered by the institute are as follows-

**Table 1- Different Academic Programmes Offered by the Institute and Allocated Seats Against Each Course.**

Course	Description	No. of seats
<b>B.A.B.Ed.</b>	4 year integrated program of teacher education i.e. Bachelor of Arts – Bachelor of Education	55
<b>B.Sc.B.Ed.</b>	4 year integrated program of teacher education i.e. Bachelor of Science – Bachelor of Education	PCM-55 CBZ-55
<b>B.Ed.</b>	2 year Bachelor of Education in Science and arts stream	Science-55 Arts-55
<b>M.Ed.</b>	2 year Masters in Education	36
<b>DCGC</b>	1 year Diploma in Guidance and Counselling for teachers, teacher educators etc.	55
<b>Ph.D. in Education</b>	Course work for pursuing Ph.D in Science and Education along with Ph.D supervision	10

The total student strength per academic year is approximately 1000. The Institute has carved out a niche for itself in the map of premiere Teacher Training and Research Institute in India. The institute gains momentum in academic excellence by inculcating a unique sense of discipline, punctuality, unity, honesty, accountability and best practices. It has achieved a commendable success in the area of innovations in pre- and in- service teacher training, development of new programs and teaching –learning materials, text book writing, quality research etc. **It is imperative to mention here that for undergraduate program an Ability Enhancement Compulsory Course (AECC-2, Regulations and Scheme of Studies, CBCS Syllabus, 2017) is offered to develop sensibility and work for sustainable environment.**

#### **1.4 LAYOUT OF THE CAMPUS**

The Institute is located on Sachivalaya Marg, Bhubaneswar, about 5 km away from the city railway station and 7 km away from Biju Pattnaik International airport. It lies at

20°15' north latitude and at 85° 50' east longitude. The Institute is surrounded by government residential quarters to the eastern side, Regional Science Center to the north, BDA-NICCO Park to its south side and the New AG colony towards the west. The entire Institute has a sprawling campus spread over 98.62 acres land which includes about 8 acres of built up area and 38.19 acres of green vegetation in the form of gardens, road side plantations and forestry.

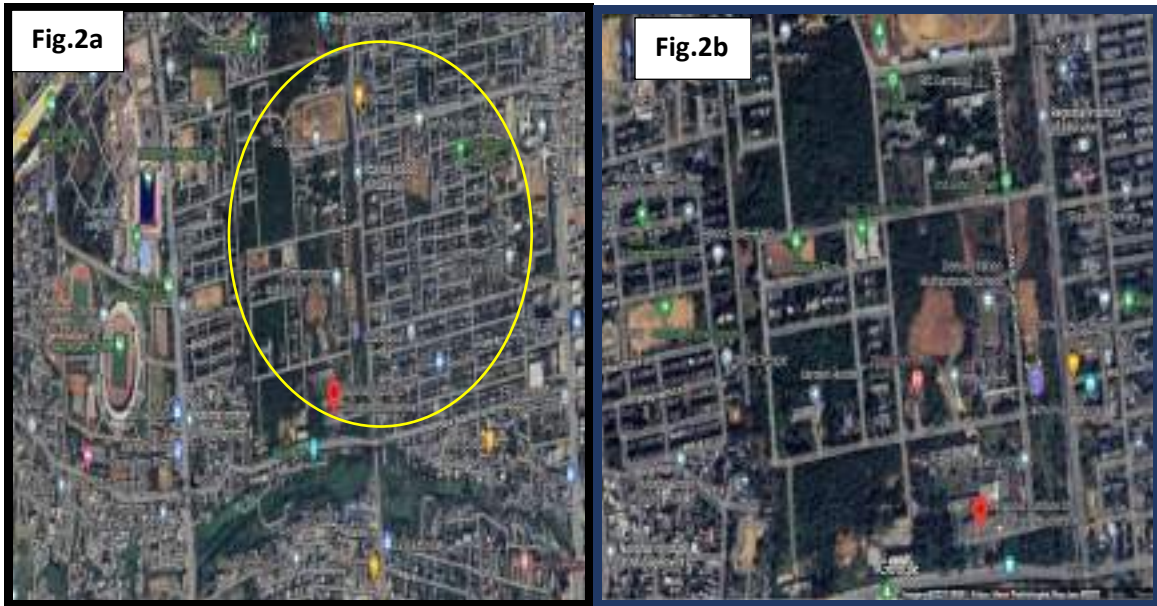


Fig. 2a,2b - Campus Location Layout as in Google Maps in Different Magnification

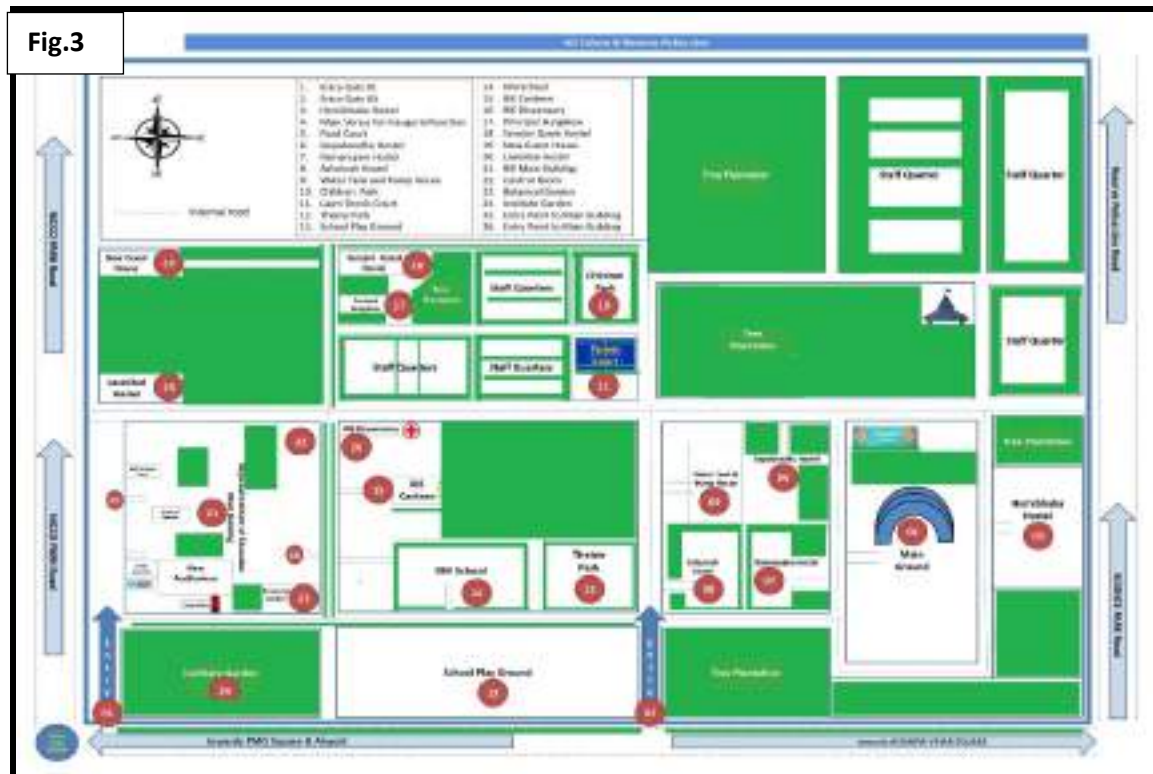


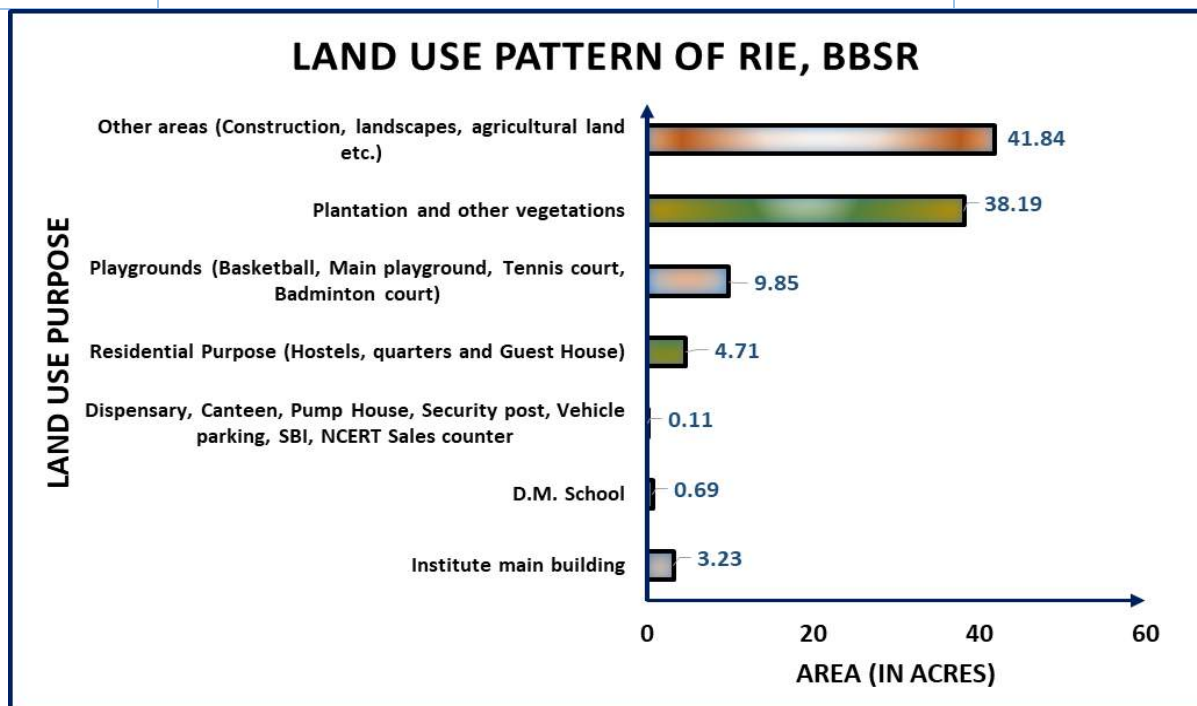
Fig. 3 –Layout of the Campus

### 1.5 LAND USE DATA OF RIE CAMPUS

98.62 acres of land of RIE, Bhubaneswar is used for built up area which includes academic, residential, playground etc. The built up area for academic purpose includes classrooms, library, laboratories, offices, auditoriums and conference halls, toilets etc.

**Table 2- Details of Land Usage of RIE, Bhubaneswar**

Sl.No.	Description of the area used	Area (in acres)
1.	<b>Institute Main Building</b>	<b>3.23</b>
2.	<b>D.M. School</b>	<b>0.69</b>
3.	<b>Dispensary, Canteen, Pump House, Security Post, Vehicle Parking, SBI, NCERT Sales Counter</b>	<b>0.11</b>
4.	<b>Residential Purpose (Hostels, Quarters and Guest Houses)</b>	<b>4.71</b>
5.	<b>Playgrounds (Basketball, Main Playground, Badminton Court, Lawn Tennis Courts, Volley Ball Courts)</b>	<b>9.85</b>
6.	<b>Total Built up Area (excluding playgrounds)</b>	<b>8.74</b>
7.	<b>Plantation and other vegetations</b>	<b>38.19</b>
8.	<b>Other areas (agricultural land, construction areas, landscapings, roads)</b>	<b>41.84</b>



**Fig.4 – Graphical Representation of the Land Use Pattern of RIE, Bhubaneswar**

## Chapter 2

# Pre Environment Audit

### 2.1 CONCEPT OF THE ENVIRONMENT AUDIT

A clean and green environment helps effective learning and provides an academic appetite for learning. There are various efforts around the world to address environmental education issues. Many institutions and organizations have started adopting compatible environmental management systems either voluntarily or by external certification. However, International Environmental Standards do not suit the existing Indian Educational Systems. Hence, a very simple indigenized system has been devised to monitor the environmental performances of HEIs. It comes with a series of questions to be answered on regular basis. Environmental conditions may be monitored from different angles that are relevant to Indian requirements, without stress on legal issues. This innovative scheme is user-friendly and easy to monitor and audit. The environmental management and monitoring system helps the institution to set an example for the community and stakeholders pertaining to protection of environment and sustainable development of the Institute. It educates young student- teachers of the institute to carry forward the best practices of the systems to their professional career and workplaces, either urban or rural situations.

Environmental Sustainability is one of the most pressing concerns confronting humanity today. Unsustainable actions have resulted in the deterioration of the environment. The process for environmental audit was first mentioned under the Environmental Protection Act, 1986 by the Ministry of Forest, Government of India on 13<sup>th</sup> March, 1992. Later, it was felt that Higher Education Institutes (HEIs) also have various responsibilities as well as opportunities to foster environmental sustainability. Therefore, all HEIs create their individual institutional policies based on major national and international declarations related to environmental protection. Hence, it is imperative to assess or audit the various approaches of HEIs towards its commitment to environmental sustainability, the degree to which these approaches help to save and protect environment and the best practices of environmental policies of HEIs. The key objectives of the environmental audit are to assess how well the environmental management system and its equipment are performing to attain its goal.

On the context of above mentioned facts, the National Assessment and Accreditation Council (NAAC) has made it mandatory from the year 2016-17 onwards that all HEIs should submit an annual Environment Audit Report. Moreover, it is part of Social Responsibility of the HEIs to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

In view of NAAC circular regarding Environment Audit, the Institute decided to conduct an Environment Audit and evaluated it by a competent Environment experts team. Environment Audit focuses on the green campus, waste management, air pollution, noise pollution, energy management and carbon footprint etc. being implemented by the Institute. The concept, structure, objectives, methodology, tools of analysis, further suggestions etc. are mentioned in the report.

The term Environment Audit for Higher Education Institutes means to assess and evaluate the policies and principles of the institutes formulated for perusing environmental sustainability. It also examines the degree to which these policies and environmental management systems are implemented in the institutes and how effectively they are performing to attain Sustainable Development Goals (SDG, WORLD BANK). Additionally, it also records the best practices for maintaining a sustainable environment in the institutes. Moreover, such audit gives innovative suggestions for better management, new eco -friendly gadgets and devices for protecting natural environment. The term 'audit' here also includes the activities like assessment, survey and review etc. to examine the entire performance of the plan, policy initiatives and management system related to environmental protection of the institute. Environment audit is highly indispensable for an institute to measure the outcomes of the policies executed by the institutes for better environment, to revisit its own environmental responsibilities and enhance its performance in commitment to environmental sustainability.

Moreover, some organizations believe that environmental audit addresses only matters related to green environment, whereas others perceive that the term means an audit of health, habit, safety, biodiversity, clean and green energy including other elements which are indispensable for a sustainable environment. As a teacher training Institute the responsibility and commitment towards a healthy environment is more pronounced because teachers used to teach the way they are taught. Although there is no universal or exact definition of green or environment audit, many leading HEIs follow the basic philosophy and approach summarized by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989).

*The ICC defines Environmental Auditing as:*

*“A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management, and equipment are performing with the aim of safeguarding the environment and natural resources in the operations/projects.”*

However, the outcome of environment audit should be established with concrete evidence that the measures undertaken and facilities in the Institution under environment audit.

## **2.2 OBJECTIVES OF THE ENVIRONMENT AUDIT**

The broad objectives of environment audit system would be

- ❖ Improving environmental standards through resource management and reducing the environmental impact
- ❖ Bench marking for environmental protection initiatives for improved sustainability
- ❖ To create plastic free, green campus, evolve health conscious reducing resource usage to save cost
- ❖ Curriculum enrichment through practical experience, field visits, teacher training, staff training etc.
- ❖ Development of ownership, personal, social responsibility for the institution and its surroundings
- ❖ Enhancement of Institute profile by demonstrating our commitment to environment sustainability
- ❖ Evolving an environmental ethics and value system in youngsters/student-teachers for future awareness
- ❖ Environmental education through environmental management systems approach

## **2.3 BENEFITS OF ENVIRONMENT AUDIT**

Conducting an Environmental Audit includes a wide range of benefits as follows -

- ❖ *Improved Environmental Performance:* Environmental audit help HEIs to identify areas where they can improve their environmental performance, reduce their environmental impact, and adopt sustainable practices.



- ❖ *Compliance with Environmental regulations:* Environmental audits ensure that HEIs comply with environmental regulations and standards, thereby avoiding legal penalties and reputational damage.
- ❖ *Cost Savings:* By identifying areas where energy and resource use can be reduced, environmental audits can help to save the money on utility bills and operational costs.
- ❖ *Sustainability Reporting:* Environmental audits provide a basis for sustainability reporting which can be used to communicate the environmental performance of the Institute to stakeholders and decision-makers.
- ❖ *Curriculum development:* Environmental audits can suggest the development of curricula and programmes that focus on environmental sustainability, thereby enrich students with the knowledge and skills needed to address environmental challenges.
- ❖ *Stakeholder Engagement:* Environmental audits provide an opportunity for the Institute to engage with the stakeholders, including students, faculty, staff, residents and the wider community, on environmental issues and sustainability initiatives

## 2.4 METHODOLOGY FOLLOWED FOR ENVIRONMENT AUDIT

### *STEP 1: Collection of Primary Data through Observations, Surveys, Interaction and Discussions*

- Onsite field visits were conducted by the student members of the Internal Audit Committee of the Institute along with faculty members on the basis of necessity
- Enquiries were conducted through structured and semi - structured questionnaire – different stakeholders like students, faculties, employees, other residential persons etc.
- Door to door survey was conducted to find out the water consumption, energy consumption, waste generated, uses and types of vehicles, pollution certificates etc.
- Waste collection points and waste management cycle was observed by the members
- Water and soil samples were collected and sent for analysis to Central Laboratory, State Pollution Control Board, Bhubaneswar, Odisha
- The Audit team members visited each and every department, sections in the premises for collecting different informations
- The floral diversity, faunal diversity and the avifaunal diversity of the campus was documented

## ***STEP 2: Collection of Secondary Data through Observations, Surveys, Interaction and Discussions***

(Collection of data through **questionnaire, google format, interviews, document verifications, field visits** was done)

- Electricity and water bill of the institute were retrieved from the Campus and Welfare Section (C&W section, RIE, BBSR)
- Details of water storage capacity, Genset, transformer, energy consumption, rain water harvesting, Biogas plant etc. were collected from the C&W section, RIE, BBSR
- Review of past documents related to environment was done. The published materials of the Institute for example, prospectus, annual reports, manuals, research publications, books published by the faculties and other magazines were considered
- With the help of google maps the green patches of the institute was spotted.
- During data collection awareness was created for effective water utilization, proper waste disposal methods for collection of plastics etc.

## ***STEP 3: Conduction of Comprehensive Environment Audit***

- Systematic assessment of all the data was done to ensure its accuracy, validity and represents the conditions being measured.
- Qualitative and quantitative data analysis was performed to identify trends, patterns and relationships, cause justification
- Data interpretation and recognizing gaps was done by the core group members along with the experts in the respective fields

## ***STEP 4: Reporting of the Environment Audit***

- An extensive and elaborative report including the findings, areas of concern, scope of improvement and recommendations for corrective actions was prepared.
- Opportunities for reduce/recycle/ reuse
- Opportunities for reduction of waste generated, recycle and management

## **2.5 PRE-AUDIT QUESTIONNAIRES**

### *General Questionnaire*

1. What is the area of the campus?
2. What is the total permanent population of the Institute?
3. Which of the following are available in the institute? Describe briefly

(a) Garden area, (b) Playground, (c) Kitchen, (d) Toilets, (e) Garbage or waste store yard, (f) Laboratory, (g) Canteen, (h) Hostels, (i) Staff quarters, (j) Dispensary, (k) Herbal Garden

4. Does the Institute conduct a Green/Environment Audit of the campus?
5. Which of the following are found near the Institute?

Sr.No.	Areas	Sr.No.	Areas
1.	Municipal Dump Yard	6.	Open drainage
2	Garbage Heap	7.	Industry
3	Public convenience	8.	Bus stops
4	Sewer line	9.	Railway station
5	Stagnant water	10.	Public Halls

### *Questionnaire on Water storage, Consumption and Conservation*

6. What are the sources of water in the Institute? Locate the point of entry and point of exit of water in the Institute.
7. List the uses of water in the Institute.
8. How does the Institute store water? Are there any water saving techniques followed in the Institute?
9. Is there any water recycling system?
10. Does the Institute harvest rain water?
11. What happens to the water used in labs? Whether it gets mixed with groundwater.
12. List the number of water purifiers in the campus.
13. List the number of bathrooms in administrative building, hostels etc.
14. Is there any water-saving techniques followed in the Institute? If yes, what are they?

### *Questionnaire on Solid waste generated and its management*

15. List the sources and types of waste generated in the Institute.
16. Is there any waste treatment system in the Institute?
17. What is the approximate amount of waste generated per day?(in kg/month)
18. How is the waste generated in the institute managed?
19. Do you use reused paper in the institute?
20. Do you recycle paper in the institute?

21. How would you spread the message of recycling to others in the community?

Specify the initiatives taken?

22. Can you achieve zero garbage in your institute?

### *Questionnaire on Energy Consumption and Conservation*

23. List few ways that you use energy in your institute (Electricity, LPG, Firewood).

24. List the usage of energy in the Institute (Electricity, electric stove, LPG, Firewood, Petrol etc.)

25. Are there any energy saving methods employed in your institute? If yes, please specify. If no, suggest some.

26. How many CFL/LED bulbs, tube lights and fans has been installed in the institute?

27. How many air conditioners have been installed in the Institute?

28. Are there any alternative energy source installed in your institute? Give the details of DG sets

29. Do you run “switch off” drills at your institute?

30. Are your computers and other devices put on power saving mode?

31. Does your machinery (TV, AC, Computer, Printers, etc.) run on standby modes most of the time?

### *Questionnaire on Air quality of the Campus*

32. Are the rooms inside campus well ventilated?

33. What is the windows floor ratio of rooms?

34. Provide details of institute owned motorized vehicles and staff owned vehicles in the campus.

35. Specify the types of fuel used by the vehicles.

36. Do students suffer from respiratory ailments?

37. What are the initiatives taken by the Institute for maintaining the Air quality of the campus?

### *Questionnaire on Greenery of the campus*

38. Number of trees plantation drives organized by college annually.

39. Mention the involvement of students in maintenance of green cover.

40. Does the college campus have any horticulture department?

41. Is there any garden in the Institute?

42. Do students spend time in the garden?

43. Total number of plants in the institute: trees, shrubs, grass cover?

44. What are the names of specific plants in the institute?

### *Questionnaire on Biodiversity of the Institute*

45. List the animals found inside your campus (Insects, Birds, Reptiles, Mammals)

46. Does the Institute have Biodiversity Programme?

### *Questionnaire on Environment Legislative Compliance*

47. Are the students and staffs aware of any environmental laws pertaining to different aspects of environment management?

48. Does water and waste water quality monitoring conducted by the Institute?

49. Is any warning notice, letter issued by the government bodies?

50. Does any hazardous waste generated by the institute?

51. Does any bio medical waste generated by your institute? If yes explain its category

*In our next section of this audit we have presented the answer to the above mentioned questions with evidential support, elaboration and geo-tagged photographs wherever necessary*



**Fig. 5a, b & c- Geo-tagged photos of the students while collection of primary data during the surveys.**

## Campus Environment Audit

### 3.1 DEMOGRAPHY DATA OF THE INSTITUTE

#### 1. What is the area of the campus?

The campus is spread over 98.62 acres of land.

#### 2. What is the total permanent population of the Institute?

Table 3- Demographic Data of the RIE, Bhubaneswar

Description	Total
Students (2022-23)	987
Teachers	60
Non-Teaching Staff	240
Residents	250-300
Sub total	1200
Approximate no. of visitors (per day)	10-15
Total no. of Working days of campus	220

### 3.2 CLIMATE AND TOPOGRAPHY OF THE INSTITUTE

#### ➤ What is the climate and topography details of the Institute?

##### ❖ Climate and Meteorology:

RIE, Bhubaneswar, located in the coastal region of Odisha about 40 km west of north of Bay of Bengal, enjoys a salubrious and moderately equable humid tropical climate. The campus experiences three distinct seasons. The Monsoon season is from mid-June to October. Winter starts from November to February followed by hot and humid summer from March to mid-June.

##### ❖ Rainfall:

RIE, Bhubaneswar receives about 120 cm rainfall during South-west Monsoon (June to September) which contributes to about 75% of annual rainfall. South-west Monsoon generally arrives over Bhubaneswar by second week of June and prevails up to second week of October. During this period, more than 45% days are rainy days.

❖ **Wind:**

During winter months (January and February) surface winds in the campus are light and variable. However, March to August strong (10 to 25 km/h) South Western wind prevails. During September and October winds are relatively light and variable. In November and December, winds are mostly northerly and relatively light.

❖ **Temperature:**

Hot weather prevails over campus during March to May. May is the hottest month with average maximum temperature around 38 degrees Celsius. Long term analysis of average maximum temperature for months of April and May months shows marginal rising trend. Relatively winter is not that severe over Bhubaneswar due to proximity to the sea. December and January are the coldest months with average minimum temperature of 16° Celsius.

❖ **Topography:**

Topographically RIE Campus forms an undulating hilly terrain. The average height of the campus is about 43.5 m above mean sea level. Broadly the city area is divided into two broad zones.

- a) North-Western Upland Zone
- b) South-Eastern Alluvial Plain Unit

❖ **Geology:**

Geologically, Bhubaneswar and its environs come under Gondwana landmass, one of the Oldest and stable landmasses in the world. The South-Eastern part consists of rock of Eastern ghat group. The rock types found in the region ranges from Archean to Jurassic and recent period. The Acheans are mainly represented by Khondalite group of rock and occurs mainly on the denudational and residual hills. Fine to coarse grained sandstone, grits and conglomerates mostly found in north-west part that belong to upper Gondwana i.e., Jurassic. The pleistocene and recent rocks are represented by laterites and alluvium of recent to sub-recent age.

❖ **Vegetation:**

The flora of RIE Campus (Bhubaneswar city) and its surroundings are broadly classified as Northern Tropical moist deciduous (mixed) type. The entire campus area before the construction of the Capital city was under different reserved protected forest like Bharatpur and Rampur and protected (Nayapalli, Jagannathprasad and Ghatikia) forest. These forests were dominated by Sal (*Sorea robusta*) and Baunsa (*Bambosa arndiacea*). At present in the western and northern part of the city, the Bharatpur Reserve Forest.

### 3.3 INFRASTRUCTURE OF THE INSTITUTE

#### 3. Which of the following are available in the Institute?

Table 4- Facilities Available in the RIE, Bhubaneswar

Areas	Availability	Details	
<b>Garden area</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Academic building with gardens</li> <li>• Other garden areas near entrance and beside roads</li> <li>• Dispensary having garden</li> <li>• DM School having garden</li> <li>• Quadrangle areas inside the campus</li> <li>• Garden inside the campus</li> <li>• Hostel gardens and kitchen gardens in the backyard.</li> </ul>	
<b>Playground: Outdoor</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Main Playground</li> <li>• Volleyball Ground</li> <li>• Tennis Court</li> </ul>	<ul style="list-style-type: none"> <li>• Open Gymnasium</li> <li>• Children's Park</li> <li>• Basketball ground</li> </ul>
<b>Indoor</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Badminton court</li> </ul>	<ul style="list-style-type: none"> <li>• Table Tennis court</li> </ul>
<b>Kitchen</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Canteen</li> </ul>	<ul style="list-style-type: none"> <li>• Hostels</li> </ul>
<b>Toilets</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Separate for male and female in the academic building</li> <li>• Toilets for physically challenged is also available</li> </ul>	
<b>Garbage or waste store yard</b>	<b>Available</b>	Segregated dustbins are placed for dry waste and wet waste with distinct colours	
<b>Laboratory</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Physics</li> <li>• Chemistry</li> <li>• Botany</li> <li>• Zoology</li> <li>• Geography</li> </ul>	<ul style="list-style-type: none"> <li>• Psychology</li> <li>• Wood Lab</li> <li>• ET Lab</li> <li>• Language Lab</li> </ul>
<b>Canteen</b>	<b>Available</b>	Open and well spacious canteen operates	
<b>Hostel Facility</b>	<b>Available</b>	<ul style="list-style-type: none"> <li>• Homibhabha Hostel</li> <li>• Asutosh Hostel</li> <li>• Ramanujan Hostel</li> </ul>	<ul style="list-style-type: none"> <li>• Gopabandhu Hostel</li> <li>• Laxmibai Hostel</li> </ul>
<b>Staff quarters</b>	<b>Available</b>	Vegetable gardens, Flower gardens	
<b>Herbal garden</b>	<b>Available</b>	Well maintained herbal garden is maintained by the institute	
<b>Dispensary</b>	<b>Available</b>	To meet the medical needs of the campus, one Dispensary is available with 2 Doctors and 2 Pharmacists	





**Fig. 6a Frontview of the Institution, 6b - Backview of the Institution**



**Fig. 6c & 6d – Garden Areas Inside the Main Building of RIE, Bhubaneswar**



**Fig. 6e & 6f– Hostel Gardens of Homibhabha hostel.**



**Fig. 6g & 6h– Hostel Gardens of Ramanujan and Gopabandhu Hostels.**



**Fig. 6i & 6j – Kitchen Gardens maintained by the hostels.**



**Fig. 6k- In-campus Open Gymnasium of RIE, Bhubaneswar; 6l - Children's Park of RIE campus**



**Fig. 7a – Ladies Toilet of the Institute, 7b – Gents Toilet of the Institute**



**Fig. 7c & d– Segregated coloured dustbins for disposal of wet & dry waste is maintained**



**Fig. 7e-Botany Laboratory, 7f -Chemistry Laboratory**



Fig. 8a

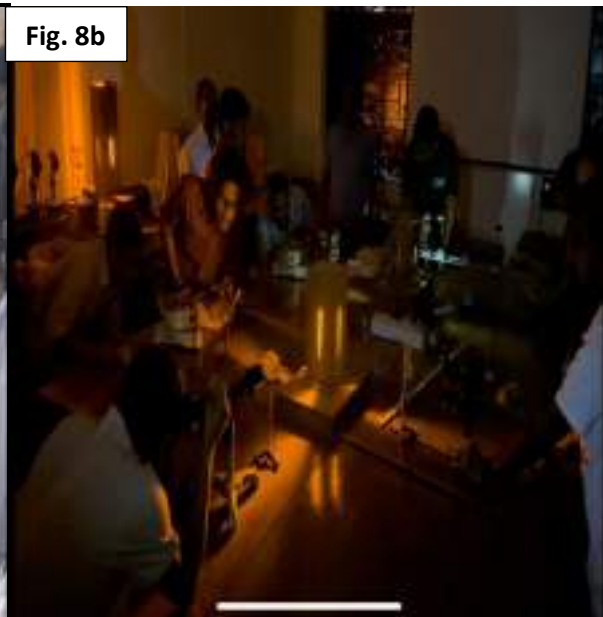


Fig. 8b

Fig. 8a - Zoology Laboratory

Fig. 8b – Physics Laboratory



Fig. 8c

Bhubaneswar, Odisha, India  
7RQJ+8CM, New AG Colony, Bhubaneswar, Odisha 751022, India  
Lat 20.288327°  
Long 85.832614°  
16/09/22 01:27 PM GMT +05:30



Fig. 8d

Bhubaneswar, Odisha, India  
584, Nicco Park Rd, Unit 4, Madhusudan Nagar, Bhubaneswar, Odisha 751012, India  
Lat 20.287741°  
Long 85.830433°  
16/09/22 02:36 PM GMT +05:30

Fig. 8c - In-campus Canteen Facility of RIE

Fig. 8d - Sarojini Guest House



Fig. 8e

Bhubaneswar, Odisha, India  
7RPH+JKJ, Old Nayapalli, New AG Colony, Bhubaneswar, Odisha 751022, India  
Lat 20.2867°  
Long 85.829838°  
16/09/22 02:37 PM GMT +05:30

Fig. 8e – New Guest House,



Fig. 8f

Bhubaneswar, Odisha, India  
New AG Colony, Bhubaneswar, Odisha, India  
Lat 20.287594°  
Long 85.833454°  
16/09/22 02:43 PM GMT +05:30

Fig. 8f -Gopabandhu Hostel for girls



Fig. 8g – Ramanujan Hostel for girls



Fig. 8h– Asutosh Hostel for girls



Fig. 8i –Homibhabha Hostel for Boys, Fig. 8j - In-campus Dispensary with Garden



Fig. 8k - In-campus Herbal Garden

#### 4. Does the Institution conduct a green or environmental audit of the campus?

The Institute conducted the Environment Audit in two phases- Pre Audit (by the Internal Audit Team) and Post Audit (by the External Audit Team).



Fig. 9 – Environment Audit in Presence of the Internal and External Audit Committee

#### 5. Which of the following are found near the Institute?

Table 5 – Areas subjected to Interfere with the Campus Environment found near the Campus

Sl.No.	Areas	Remarks
1.	Municipal Dump yard	• Present 500 mtrs away from the campus
2.	Garbage heap	• No garbage heaps inside the campus
3.	Public convenience	• Yes
4.	Sewer line	• Closed sewer lines
5.	Stagnant water	• No stagnant water
6.	Open drainage	• No
7.	Industry	• No
8.	Bus stops	• Outside the campus
9.	Railway station	• Faraway from campus (3 kms from the Institute)
10.	Airport	• Biju Pattnaik International Airport ( 5 kms from the Institute)
11.	Public halls	• Yes

## Chapter 4

## Water

**NO WATER, NO LIFE, NO GREEN, NO BLUE** – Sylvia Earle

#### 4.1 SOURCES OF FRESHWATER IN THE INSTITUTE

Water is the most important component that sustains life on this planet. Despite its abundance, access to clean and safe drinking water remains a challenge in many parts of the world. Water scarcity and contamination can induce severe impacts on human health, environment and economic development.

6. *What are the sources of water in the Institute? Locate the point of entry and point of exit of water in the Institute.*

**Table 6a - Sources of Freshwater in the RIE campus, Bhubaneswar**

	Description	Nos.	Locations
1.	PHD Water supply	1	Near Homibhabha Hostel
2.	Borewells	2	Near Gopabandhu Hostel
		1	Near Asutosh Hostel
		1	Near Cycle stand of DM School

**Table 6b - Point of Entry and Exit of Water in the Institute**

	Description	Nos.	Locations
1.	Point of Entry	2	PHD Water supply Borewells
2.	Point of Exit	1	Through water drainage system



**Fig. 10a – Borewell near D.M.School Cycle Stand; Fig. 10b – Photograph of overhead tank which supplies water in the Institute**

#### 4.2 WATER USAGE IN THE CAMPUS

##### 7. List uses of water in the Institute.

**Table 7 – Details of Water Usage in the Institute on Daily Basis**

Sl.No.	Description	Amount
1.	Drinking	20 kL/day
2.	Gardening and Agricultural field	30 kL/day*
3.	Kitchens and toilets (Canteen, Administrative, Dispensary)	60 kL/day <sup>¶</sup>
4.	Laboratory Usage	10 kL/day <sup>¶</sup>
5.	Hostels	250 kL/day <sup>¶</sup>
6.	Quarters	200 kL/day <sup>¶</sup>
7.	Cleaning purposes (Toilets and Corridors)	100 kL/day
8.	Construction purposes**	200 kL/day (approx.)
9.	Total	870 kL/ day

(\*Variable as per seasonal changes, ¶- variable on the basis of academic calendar)

[The above data is documented on the basis of maximal usage of water during peak period]



### 4.3 WATER STORAGE CAPACITY OF THE CAMPUS

#### 8. How does the Institute store water?

Table 8 – Details of Water Storage in the Institute

S.No	Description	Number		Capacity	Location
1.	Sump (Underground)	1		1895 L/ 1.895 kL (500 gallons)	Near Homibhabha Hostel
2.	Overhead Tank	1		3062.32 kL (8,08,000 gallons)	Near Gopabandhu Hostel
3.	Subtanks	Academic building -	17	1500 L	In each section, blocks and quarters
	Hostels & Guest houses	32			
	Canteen	2			
	Dispensary	2			

#### 9. Is there any water recycling system?

Currently, we don't have the water recycling system. However, the Institute is planning to set up a recycling plant in near future.

### 4.4 RAINWATER HARVESTING SYSTEM OF THE CAMPUS

#### 10. Does the Institute harvest rain water?

Yes, 5 rainwater harvesting system of 100 kL capacity has been constructed in the Institute to recharge the groundwater table inside the campus



Fig. 11

Fig.11 – Rainwater Harvesting Inside the RIE campus, Bhubaneswar

## 4.5 WATER AND SOIL QUALITY TESTING AND ANALYSIS REPORT

Water samples of the Institute were collected and sent to Central Laboratory, State Pollution Control Board for analysis. The details of the parameters analysed are recorded in the table below.



**Fig.12a – Collection of Water Sample from the Borewell for Water Quality Testing, 12b- Soil and Water Samples Packed and Labelled as per the Instructions by the SPCB, Odisha**  
**INTEPRETATION OF WATER TEST RESULTS**

Water quality of the borewell and the aquaguard are nearly equal. This concludes that the underground water is free from chemical as well bacterial contamination and is safe for drinking purpose.

### *For Drinking*

The pH value of water was found to be 6.3 which is slightly acidic but it lies within the permissible range of 6.0-8.5 for drinking water set by Bureau of Indian Sandards (BIS). The total alkalinity is 20 mg/L of calcium carbonate is within the recommended range of 20-200 mg/L for drinking water. The total hardness, total solids, low counts of total coliform and faecal coliform counts are very low, indicating that the water is safe for drinking. However, the elevated electrical conductivity of 151  $\mu\text{S}/\text{cm}$  indicates the presence of dissolved salts which may affect the taste of water.

### *For Agriculture and gardening*

The pH of 6.3 is within the acceptable of 6.0-7.5 for most crops. The total alkalinity of 20 mg/L as calcium carbonate is relatively low, which may require additional buffering for some crops. The EC of 151  $\mu\text{S}/\text{cm}$  is within the recommended range of 100 to 700  $\mu\text{S}/\text{cm}$  for irrigation water, but the presence of salts in the water may require additional soil management practices as leaching.

**Table 9 – Results of Water Quality Testing of Drinking Water sample Collected from Aquaguard and Groundwater Samples Collected from Borewells**

Sl No	Parameter	Unit	Drinking Water	Borewell Water	Remarks
1.	pH	-	6.3	6.4	Under permissible range
2.	Electrical Conductivity (EC)	µS/cm	151.0	177.0	Under permissible range
3.	Turbidity (Turb)	NTU	1.6	1.2	Under permissible range
4.	Dissolved Oxygen (DO)	mg/L	7.6	7.3	Under permissible range
5.	Total Alkalinity as CaCO <sub>3</sub>	mg/L	20.0	32.0	Under permissible range
6.	Total Hardness as CaCO <sub>3</sub>	mg/L	32.0	44.0	Under permissible range
7.	Total Solids (TS)	mg/L	120.0	124.0	Under permissible range
8.	Acidity	mg/L	8.0	8.0	Under permissible range
9.	Total Coliform (TC)	MPN/100 ml	< 1.8	< 1.8	Under permissible range
10.	Faecal Coliform (FC)	MPN/100 ml	< 1.8	< 1.8	Under permissible range

The turbidity of 1.6 NTU (Nephelometric Turbidity Units) is within the recommended range of less than 5 NTU for irrigation water, but high turbidity levels may cause clogging of irrigation systems and reduce water availability to crops.

The dissolved oxygen level of 7.6 mg/L indicates that the water is relatively well aerated and can support aquatic life. The low levels of total coliform and fecal coliform indicate that the water is relatively free from harmful microorganisms. However, the high turbidity of 1.6 NTU may affect light penetration in the water, which can negatively impact

aquatic plants and animals. The presence of salts in the water due to elevated EC may also affect the water quality and availability for some aquatic organisms.

## INTEPRETATION OF SOIL TEST RESULTS

### *Methodology:*

Soil Testing – Soil sample from two different sites were collected from the Institute premises by sterilized containers provided by the SPCB, Bhubaneswar on 08.02.2023 by quadrat method. Soil was deposited for analysis in the Central Laboratory, SPCB, Bhubaneswar, Odisha.

**Table 10 – Results of Soil Quality Testing of Soil Samples Collected from Rose Garden and Agricultural Field.**

Sl.No.	Parameter,Unit	Test Method	Sample 1	Sample 2
1.	pH (1:5 ratio)	(Ref: IS 2720 (P-26) 1987 Reaffirmed 2016)	6.3	5.2
2.	Conductivity (µS/cm) (1:5 ratio)	(Ref: IS 14767:2000)	85.49	48.90
3.	Moisture content (%)	(Ref: IS 2720 (P-2) 1973 Reaffirmed 2015)	6.71	8.84

### **I. Soil sample- 1 (Garden Soil)**

#### *Agricultural context*

The pH of the soil sample 1 collected from the garden site is found to be 6.3. It is known that for agricultural context, the optimal range for most of the crops lies between 6.0 -7.0. Hence, the observed pH of the soil is found in accordance with the optimal range. Therefore, the soil sample can be considered to have a good pH for plant growth.

The conductivity of 85.49 µS/cm indicates that the soil has a moderate amount of nutrients, which lies in between the admissible range of EC having a range of 11- 570µS/cm. This indicates that the soil is non- saline and is not excessively rich in nutrients, which will not lead to over fertilization and pollution of water resources.

The moisture content of the soil is found to be 6.71%, which falls within the permissible range of 5-20%. This value is considered optimal for most crops, indicating that the soil has adequate water availability for the growth of plants.

## *Conclusion*

From the above analysis, it may be concluded that the soil parameters possess optimal range of values for overall indicator of soil fertility.

## *Environmental Context*

In the environmental context, pH 6.3 of soil sample indicates that the soil is slightly acidic, which is typical value of natural soils without any contamination of pollutants. The conductivity of 85.49 suggests that the soil has a moderate level of soluble salts, which doesn't has a concern for environmental toxicity. The moisture content of 6.71% suggests that soil is not over wet or dry, which could affect its stability.

## **II. Soil sample- 2 (Agricultural Field)**

### *Agricultural Context*

The pH value of the second sample collected from Agricultural field is found to be 5.2 which lies below the permissible range of 6.0-7.5. This indicates that the soil is acidic in nature and suitable for growth of crops that prefer a slightly acidic to neutral pH range of 6.0 to 7.5. However, the acidophilic crops like potatoes, sweet potatoes, tomatoes, cucumber, carrot, onion, radish, berries etc. which flourish in acidic soils may be considered suitable for cultivation. Therefore, the soil sample can be considered suitable for other crops as well after some agricultural interventions.

The conductivity of soil sample from the agricultural field was analyze to be 48.90  $\mu\text{S}/\text{cm}$  which is quite low in reference to the permissible range of EC for soils. Therefore, it can be concluded that the soil has low nutrient levels which can limit plant growth and productivity.

The moisture content of 8.84% is within the optimal range of 5-20% for most crops, indicating that the soil has adequate water availability.

### *Environmental context*

The pH of 5.2 indicates that the soil is highly acidic. Acidic soils can cause nutrient imbalances, and the solubility of metals and other contaminants may increase, leading potential environment as it reduces the risk of salinization and water pollution. The moisture content of 8.84% is not enough to draw conclusions about the quality of soil as it depends on the specific ecosystem and its water balance.

### *Suggestions:*

#### *Soil pH adjustment:*

If the soil pH is not optimal for the specific type of plant that are targeted on above soil quality, the soil pH can be adjusted using amendments such as lime to raise the pH or sulfur to lower pH. However, it is important to carefully follow the recommended application rates to avoid over-acidification and over-alkalization of the soil.

#### *Soil Nutrient Management:*

If the nutrient levels are low, it is advisable to apply organic and inorganic fertilizers to provide the necessary nutrients to the soil. However, excessive fertilizer application can lead to nutrient imbalances, over-fertilization and environmental toxicity. Therefore, it is important to determine the nutrient requirements of the specific plants and soil type and apply fertilizers accordingly.

#### *Soil Organic Matter Addition:*

Adding organic matter to the soil can improve the soil structure, water holding capacity, and nutrient availability. This can be done by adding compost, animal manure, or other organic materials to the soil

#### *Soil Water Management:*

Maintenance of proper soil moisture levels is crucial for plant growth. If the soil moisture content is too low, drip or sprinkler irrigation systems may be used to provide water to the plants.

#### *Crop Rotation*

Planting different types of crops in a sequence can help to maintain soil fertility, reduce pest and disease pressure, and improve soil structure. This is because different crops have different nutrient requirements and root systems which can help to break up soil compaction and improve soil structure.

## **4.6 MANAGEMENT OF WATER IN THE INSTITUTE**

### *11. What happens to the water used in the laboratory? Whether it gets mixed with groundwater?*

The contaminated water from the concerned laboratories like Chemistry and Zoology is not allowed to contaminate the groundwater. However, it is drained through closed sewer lines connected to the main sewer line under Bhubaneswar Municipal Corporation City Management Plan.

**12. List the numbers of Water purifier installed.**

The Institute has provision of drinking water by installing water purifiers in the academic building, canteen, dispensary, hostels etc. The quarters have separately installed purifiers.

**Table 11 – Number of Water Purifiers Installed in the RIE Campus, Bhubaneswar**

Sl.No.	Description	No. of Water purifier
1.	Academic Building	4
2.	Canteen	1
3.	Dispensary	1
4.	Hostels	12

**13. List the number of washrooms in the Institute**

**Table 12 – Number of Washrooms in the RIE Campus, Bhubaneswar**

Sl.No.	Description	No. of washrooms
1.	Academic Building	18
2.	Canteen	2
3.	Dispensary	2
4.	Hostels	139

**14. Are there any water saving techniques followed in the Institute?**

- ❖ Overflow of water is controlled with the help of automatic valves
- ❖ Frequent checks of all the faucets, pipelines are being conducted to keep an eye on the leakage
- ❖ Leakage taps are removed immediately
- ❖ All the students, staffs and faculty members are aware of the unnecessary use of water and its conservation

➤ *If there is water wastage, specify why and how can the wastage be prevented /stopped? Write down few ways that could reduce the amount of water used in your locality*

There is no wastage of water in the Institute

- ❖ Closing the tap after use or when not necessary
- ❖ Maintenance of water closing valves to avoid leakage
- ❖ Water conservation awareness for new comers
- ❖ Reuse of RO discarded water and AC condensed water



Fig.13 - a, b, c & d- Photos for Awareness, Signages in the RIE Campus Toilets Displaying Quotes on Water Conservation.

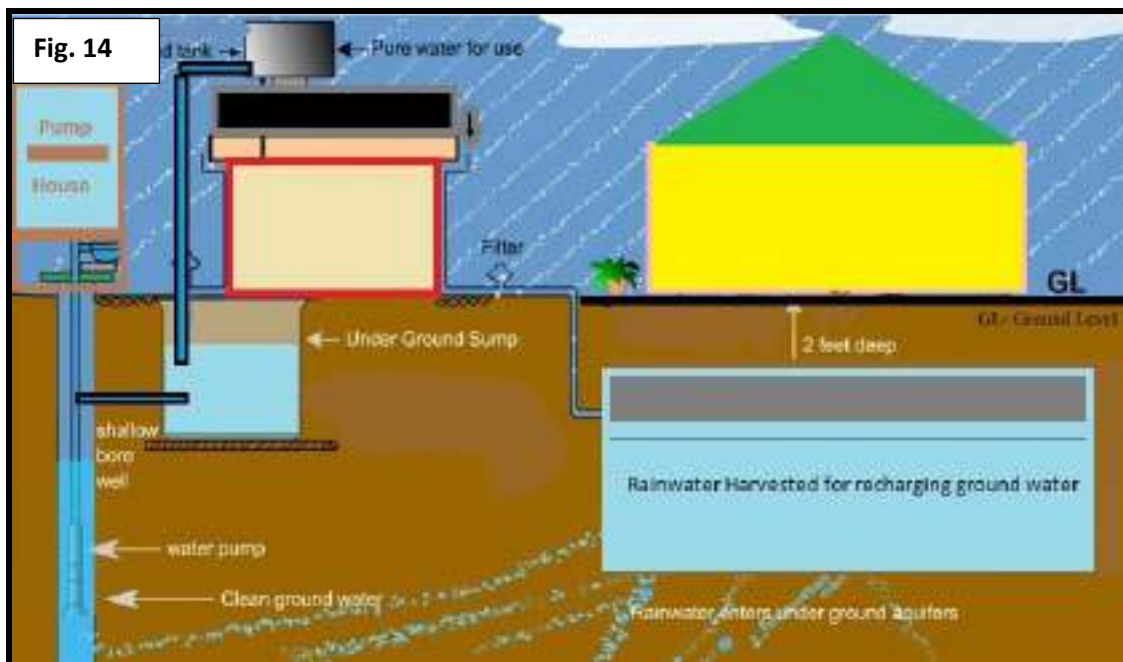


Fig. 14 - Water Circuit Diagram of the Borewell and Rainwater Harvest Utilization in RIE, Bhubaneswar



# Solid Waste Management

## CLEAN UP AND FLUORISH, ELSE PILE UP AND PERISH

### 5.1 SOURCES OF SOLID WASTE GENERATED IN THE CAMPUS

#### 15. Does your institute generate any waste? If so, what are they?

Yes the Institute generates following types of wastes are generated in the RIE, Bhubaneswar campus from different sources.

**Table 13. Details of Waste Generated in RIE, Bhubaneswar campus**

Sl.No	Type of Waste	Description
1.	<i>Solid waste</i>	Waste paper, pens, refills, Rejected clothes, bags, and unused houseware, glass wastes, Online parcels received via cardboard packagings, food packets, used paper cups, plates,gunny bags
2.	<i>Food waste</i>	Leftover food from hostels and staff quarters
3.	<i>Canteen waste</i>	Food waste and other wastes inclusive of paper and plastic waste
4.	<i>Plastic waste</i>	Plastic wrappers, cans, Pens, Polythenesetc.
5.	<i>Construction &amp; Demolition waste</i>	The waste is generated due to expansion of buildings, Construction of hostels etc. Coloring of the Institute
6.	<i>Toiletry waste</i>	Sanitary napkins and Tissues
7.	<i>Horticultural waste</i>	Dead leaves, twigs, branches etc.
8.	<i>Chemical waste</i>	From laboratories
9.	<i>E-waste</i>	Outdated Desktops, Phones, Charging cables etc.
10.	<i>Medical Waste</i>	Used needles, blades, saline bottles, medicine strips, Used Bandage



**Fig. 15a & b - Food and dry waste generated from hostels**

**16. Is there any waste treatment system in the Institute?**

Currently we don't have a waste treatment plant in the Institute.

**17. What is the approximate amount of waste generated per day? (in kg/month)**

**Table 14- Details of Wet and Dry Waste Generated in the Institute on Monthly Basis**

Waste collected from	Wet waste collected	Dry waste collected
Hostel	180 kg	100 kg
Quarters	30 kg	20 kg

**5.2 WASTE MANAGEMENT CYCLE OF THE INSTITUTE**

**18. How is the waste generated in the Institute managed?**

- Wastes from all the departments of Institute along with the administrative offices are collected in respective color segregated dustbins which are then collected by the housekeeping staffs regularly. It is collected by waste collecting vehicles deputed by Bhubaneswar Municipal Corporation (BMC) on regular basis.



Fig. 16a & b - Collection of Food and Dry Waste Generated from Hostels by BMC workers



Fig. 16c & d - Collection of Food and Dry Waste Generated from Canteen and Hostels by BMC workers

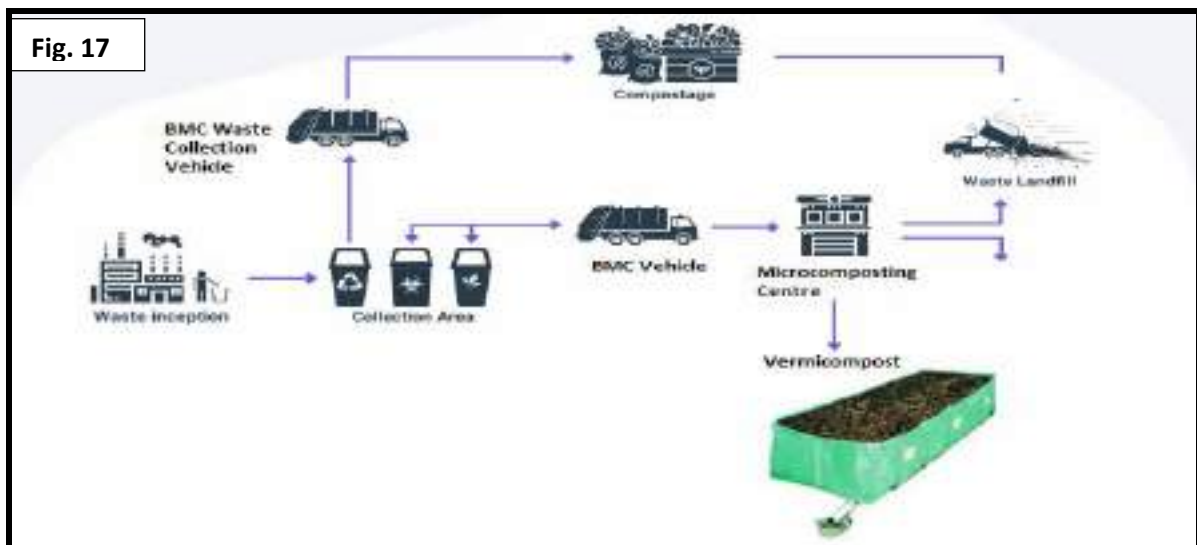


Fig.17- Waste Collection and Disposal Diagram of the Institute

- The electronic wastes of the campus are collected by the BMC vehicles on Saturdays.
- Wood waste is used by the training teachers and students to develop various models which are displayed in the wood workshop of the Institute.
- Kitchen wastes (e.g. vegetable peels etc.) are used to maintain the kitchen garden of the hostels
- **Student Initiative:** The students initiated an innovative process to collect the plastics/polypacks in the plastic bottles to capture the macro-sized plastics to micro-sized plastics. This process will avoid spreading of plastics, choking of the drains by those plastics. These bottles can be further given to BMC or it can be creatively used for decorative purposes.

Additionally, the waste generated in the Institute is managed by Institute's Waste Management Policy





**Fig. 18(a – f) -Kitchen Gardens from Kitchen Wastes Maintained by the Hostels in the Backyard and Frontyard of Different Hostels of RIE, Bhubaneswar.**



**Fig. 19 (a –b) - The non-biodegradable plastics and single use plastics are carefully collected in bottles and are handed over to BMC.**



**Fig. 19 (c – d) – Paintings Made out of Paper Wastes by the Students of the Institute to Spread Awareness Regarding Recycling of Paper Wastes**

**19. Do you use reused paper in the institute?**

Yes, we reuse the newspapers for developing teaching resource models, Blank pages of discarded printed documents are reused by the faculties and office works for notices etc.

**20. Do you use recycled paper in the institute?**

No, however, we have proposals for the use of recycled paper

**21. How would you spread the message of recycling to others in the community? Specify the initiatives taken?**

- Cleanliness drives are organized in the campus for cleaning of campus as well as hostels where the students, teachers and non-teaching staffs participate to clean each and every corner of the campus.



**Fig. 20 (a – d) – Cleanliness Drives Organized in the Institute in Different Occasions Involving Faculty Members, Staff Members and Students.**

- Student led initiatives like collection of plastic wastes in bottles, developing crafts from the trash etc. are encouraged in the campus.
- Developing different teaching models from the plastic waste, paper waste is greatly encouraged which spreads a message of environmental sustainability as well as educational resource.
- As partial fulfillment of the courses, “Working with Community” is made compulsory for all the final year students. Through this program they spread the message of recycling to others in the community.



**Fig. 21 – Cleanliness of the Surroundings Maintained by the Institute Staffs on Daily Basis**

## **22. Can you achieve zero garbage in the Institute?**

Yes. For this purpose we need to work on minimal waste generation and different management practices for waste disposal based on expert advices.

### **5.3 BIOGAS**

#### ***FOOD & KITCHEN WASTE BASED BIO-GAS DIGESTER***

- ❖ The bio-gas produced from food waste, decomposable Organic materials and kitchen waste consisting of methane & a little amount of Carbon dioxide is an alternative fuel

for cooking gas (LPG). Also the waste materials can be disposed of efficiently without any odour or flies and the digested slurry from the bio-gas unit can be used as Organic manure in the garden.

- ❖ The major components of the bio-gas plant are a digester tank, food crusher, an inlet for feeding the kitchen waste, gas holder tank, an outlet for the digested slurry, bio-gas purification system & the gas delivery system for taking out and utilizing the produced gas.
- ❖ The project is also useful to have a hands-on learning experiences in Bio-Gas plant construction and operation.
- ❖ This is a basic prototype of a Bio-Gas system using the food waste, decomposable organic materials and kitchen waste to produce gas. The medium size biogas plant can be installed for the waste generated from different hostels Dairy farm and agricultural residues in the campus.

**Table 15 – Specifications of Biogas Plant Installed in the Institute**

Sl No.	Description	Unit	Capacity of Bio gas Digester
1	Capacity of bio-gas Digester	cum	4
2	Availability of kitchen waste /Day	kg	40
3	Waste Requirement/Day	L	40
4	Bio-Gas Generation /Day	cum	4.13
5	Bio-Gas Generation/Month	cum	110.35
6	Bio-Gas Generation/Day	kg	2.41
7	Slurry Generation /Day	L	50
8	Equivalent Bio Manure Production /Day	kg	12
9	Equivalent Liquid Fertilizer Production /Day	L	46
10	Cost of Bio-gas /kg	kg	Rs. 2953
11	Cost of Bio manure /kg	kg	Rs. 2025



12	Cost of Liquid fertilizer /Day	kg	Rs, 1148
13	Area Required	Sq.ft	04ft × 7ft
14	Revenue Generated from Bio-Gas/Month	kg	Rs. 2953
15	Revenue Generated from Bio manure /Month	kg	Rs.2025
16	Revenue Generated from Liquid fertilizer/Month	kg	Rs.1148
17	Total Revenue Generated /month	kg	Rs.6126

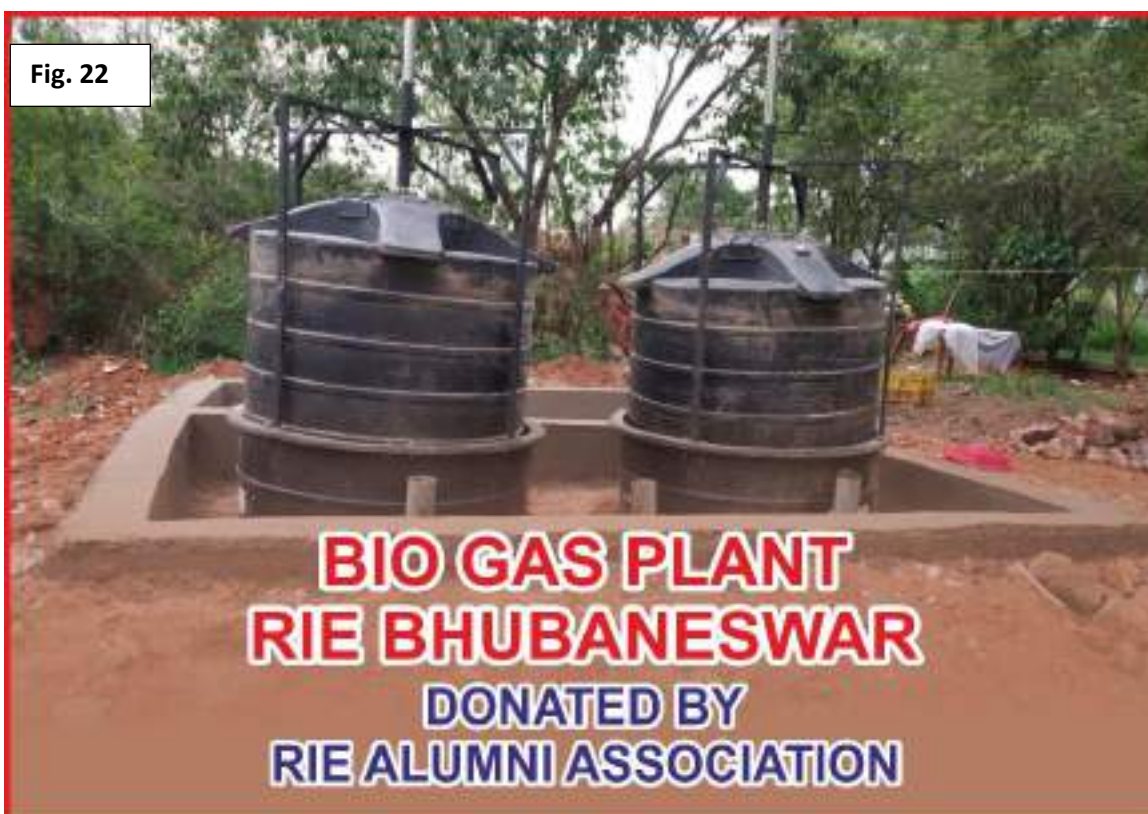


Fig.22- Biogas Plant Installed in the Institute Behind the Canteen

## Energy Consumption and Management

**THE EASIEST WAY TO SAVE MONEY IS TO WASTE LESS ENERGY**

**BARACK OBAMA**

### 6.1 CONSUMPTION AND MANAGEMENT OF ELECTRICITY

23. List few ways that you use energy in your institute. (Electricity, LPG, firewood)

❖ **Electricity:**

- Electricity is used for illumination, running the pump houses, working of PCs in computer labs, ICT Studio, Charging of electronic appliances, working of weighing balance, spectrophotometer, centrifuge machine in laboratories
- Electricity is also used for cooking purpose where use of Induction, microwaves, rice cooker, toaster, geyser etc. are preferred

❖ **LPG:**

- ❖ LPG is mostly used for the purpose of cooking in the campus both at residential quarters, canteen, hostels and chemistry and physics lab

❖ **Firewood:**

- Use of firewood has been restricted in the campus

24. Electricity usage of the Institute.

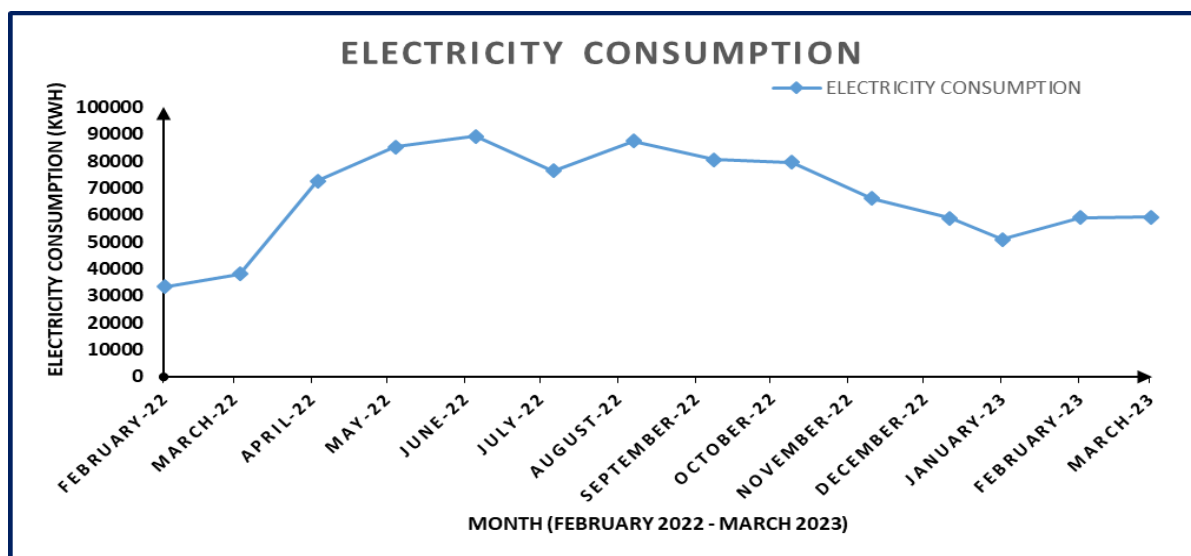


Fig. 23- Electricity Consumption of the Institute from February 2022 – March 2023

### **6.1.1 CONSUMPTION AND MANAGEMENT OF ELECTRICITY**

**25. Are there any energy saving methods employed in the Institute?**

*If yes, please specify. If no, suggest some*

The Energy consumption of the Institute is strictly monitored by avoiding unnecessary and careless usage of the electricity

- ❖ Unnecessary illumination is avoided
- ❖ Electronic equipments like desktop are put on power –saving mode
- ❖ Students and faculty members are directed and made aware of switching off the lights, fans when not in use/ before leaving classrooms

**26. How many CFL/LED bulbs have been installed in the Institute?**

A detailed count of number of fans, lights and other electronic appliances has been documented in the Energy Audit of the Institute. 99 percent of the illumination is by CFL/LED bulbs. No conventional bulbs are used in practice.

**27. How many air conditioners have been installed in the Institute?**

Number of ACs have been counted and mentioned in Energy Audit

**28. Are there any alternative energy sources installed in your Institute?**

Yes, we have recently made a work order for installation of Solar Panel in the Dispensary of the Institute (Please refer Section 6.2)

**29. Do you run “switch off” drills at institute?**

Yes, we do run switch off drills

**30. Are your computers and other equipment put on power-saving mode?**

Yes, the computers of our computer applications centre, smartboards and projector and other electronic gadgets run on power saving mode.

**31. Does your machinery (TV, AC, Computer, weighing balance, printers etc.) run on standby modes most of the time?**

Yes in working hours (approx. 6 hrs)

➤ **Details of DG sets:**

2 DG sets – (1) 180 kV- 3 phase, (2) 100 kV- 3 phase (Silence generator)

➤ **Details of the transformer of the Institute**

Two numbers of environment friendly green transformers of 500 kVA are recently installed for institutional building. These are noiseless and dry cell operated transformer. The new transformers do not use mineral oils for insulations. Hence, no hazardous gases are produced during its cooling and heating, additionally, it helps minimizing the leakage of gases responsible for air pollution. These transformers require very minimum maintenance and are maintained by electrical section of CPWD.



**Fig. 24(a-b) – Transformer Installed in the Residential Area and Institute**



**Fig. 24(a-b) – Transformer and DG Installed in the Institute.**

## 6.2 SOLAR ENERGY AND SOLAR PANELS

RIE, Bhubaneswar being situated in tropical climate zone receives an average 2430 of sunshine hours per year based on the average hours of sun shines per day. This confirms that RIE, Bhubaneswar has rightly decided to install solar plant to reduce the demand of electricity for ensuring healthy environment. A Solar power plant uses concentrated solar power (CSP) system or photovoltage to convert sunlight directly into energy. CSP system uses lenses, mirror and tracing devices to concentrate a huge area of sunlight into a narrow beam.

Electricity is generated when the concentrated light is converted to heat using photoelectric effect:- solar power facilities installed since 1980's has become incredibly advantageous due to emerging technologies. A solar power plant not only helps save money on electricity but it also benefits the environment

The following are the benefits of Solar Plant

- ❖ Energy savings and generating green energy
- ❖ Versatility
- ❖ Environmental benefits
- ❖ Increased home value

- ❖ Long performance warranties
- ❖ Saving money
- ❖ Low maintenance
- ❖ Improving grid security
- ❖ Energy production in most efficient way
- ❖ Can be installed even in the most deserted area like an island

### **Solar panel installed in the Institute**

Recently, the Institute has taken initiatives to install 4 solar panels of 2.1 m × 1.1 m dimension at the roof top of the RIE, Dispensary buildings. These panels will generate 450 W × 4 (= 1800 W/1.8 kW) of electricity which seems to be sufficient for all purpose use of Dispensary. The solar panels will trap the solar energy to be stored in the lead acid battery. Subsequently all hostel buildings and the main building of the Institute will be provided with solar panels.



**Fig. 25 – Proposed Solar Panels for Installation in Dispensary of RIE, Bhubaneswar**

## Chapter 7

# Clean Air and Noise Quality Management

### 7.1 AIR QUALITY OF BHUBANESWAR CITY

The air quality of Bhubaneswar city is recorded by Continuous Ambient Air Quality Monitoring Station (CAAQMS) set up by Central Pollution Control Board (CPCB). The Air Quality Index (AQI) of 14 days has been recorded below:

**Table 16 - Ambient Air Quality of Bhubaneswar City Recorded within 14 days.**

Date	No. of monitoring stations	SO <sub>2</sub>	NO <sub>2</sub>	NH <sub>3</sub>	O <sub>3</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>	AQI value With Prominent Pollutant	AQI Category
		Average values are expressed in µg/m <sup>3</sup>							
27.4.23	04	BDL	15.8	39.8	27.9	77	34	77(PM <sub>10</sub> )	Satisfactory
29.4.23	02	BDL	17.3	39.2	27.6	99	29	99(PM <sub>10</sub> )	Satisfactory
1.5.23	02	BDL	19.1	28.8	30.1	97	43	97(PM <sub>10</sub> )	Satisfactory
02.5.23	02	BDL	18.1	42.8	29.3	81	26	81(PM <sub>10</sub> )	Satisfactory
03.5.23	02	BDL	17.4	32.1	27.6	84	27	84(PM <sub>10</sub> )	Satisfactory
04.5.23	02	BDL	15.5	42.9	30.8	86	24	86(PM <sub>10</sub> )	Satisfactory
05.5.23	02	BDL	16.5	37.5	27.1	89	32	89(PM <sub>10</sub> )	Satisfactory
06.5.23	02	BDL	15.0	38.7	27.7	76	36	76(PM <sub>10</sub> )	Satisfactory
07.5.23	02	BDL	15.5	36.1	27.6	86	42	86(PM <sub>10</sub> )	Satisfactory
08.5.23	02	BDL	19.0	28.7	28.1	97	47	97(PM <sub>10</sub> )	Satisfactory
09.5.23	02	BDL	16.5	39.4	28.1	95	37	95(PM <sub>10</sub> )	Satisfactory
10.5.23	04	BDL	17.5	35.9	27.8	93	41	93(PM <sub>10</sub> )	Satisfactory
11.5.23	02	BDL	15.3	39.4	27.9	98	34	98(PM <sub>10</sub> )	Satisfactory
12.5.23	01	BDL	14.7	36.3	27.0	74	29	74(PM <sub>10</sub> )	Satisfactory

## 7.2 AIR QUALITY MANAGEMENT IN THE CAMPUS

### 32. *Are the rooms in campus well ventilated?*

Yes, the rooms of the Institute buildings, classrooms, laboratories, hostels, quarters etc. are well ventilated as per National Building Code Guidelines

### 33. *What is the windows floor ratio of the rooms?*

The windows floor ratio of the rooms in the Institute has not been estimated. However, every room of the building has a windows as per necessity.

### 34. *Provide details of motorized vehicles and cycles in the Institute staff quarters along with the status of pollution checked certificate?*

Pollution checked vehicles contribute to the air quality index of the premises as well as the surroundings.

**Pre-Audit Stage:** Before the Audit only 65 % of the owners had conducted their pollution check up. Based upon this, the administration made it compulsory to obtain PUC for all the vehicles inside the campus

**Table 17a – Details of 2- Wheeler, 4- Wheeler, e- Vehicles and Cycles in the Institute with their Pollution Certificate Status in the Pre-Audit Stage**

No. of cycles	No. of two wheelers	Pollution checked vehicle (2-wheeler)	No. of four wheeler	Pollution checked vehicle (4-wheeler)	No. of e-vehicles
46	53	36	17	10	4

### **Post-Audit Stage:**

**Table 17b – Details of 2- Wheeler, 4- Wheeler, e- Vehicles and Cycles in the Institute with their Pollution Certificate Status in the Post Audit Stage**

No. of cycles	No. of two wheelers	Pollution checked vehicle (2-wheeler)	No. of four wheeler	Pollution checked vehicle (4-wheeler)	No. of e-vehicles
46	53	49	17	16	4



Pollution checked vehicles contribute to the air quality index of the premises as well as the surroundings.



**Fig.26 (a-b) – Provision of Designated Parking Space for Parking of 2-Wheeler, 4-Wheeler and Cycles for Faculty Members, Staff Members and Students in the Institute.**

*35. Provide details of the Institute owned motorized vehicles. Specify the type of fuel used by the Institute's vehicles.*

The Institute has only one motorized vehicle.

*36. Do the Students suffer from respiratory ailments?*

No, students have not reported any kind of respiratory ailments after residing in the Institute. Except, the students who had past medical history manage with the periodic tests and medications.

### **7.3 NOISE QUALITY MANAGEMENT IN THE CAMPUS**

➤ *Are there any honking free zones in the campus?*

Yes there are honking free zones in the campus like the D.M.School Area, Institute's main building.

*37. List out some measures taken to minimize noise inside the campus*

- ❖ Use of loud music, DJ systems is restricted and strictly checked inside campus
- ❖ Replacement of old fans, noiseless gensets also contribute to minimization of noise
- ❖ Recent upgradation of ACs, soundless fans are another measure through AMC conditions
- ❖ Awareness campaign for cracker- free campus

# Sustenance of Green Cover

### 8.1 GREENERIES OF THE CAMPUS

To keep the greeneries in the campus, the Institute regularly maintains the gardens which are looked after by concerned staff members under the guidance of higher authorities of the Institute. Activities organized to create greenery and its conservation at the Institute campus are as follows-

- ❖ Plantation of Diversified Species, Uses of Medicinal Plants, Identification of plants Species
- ❖ Waste Management Plan and Disposal Facility
- ❖ Awareness of Carbon Consumption and Carbon Footprint Program

To create a green cover, eco-friendly atmosphere and ensure pure oxygen at the Institute campus, a plantation program is organized every year with active participation from the Institute community and visitors. A committee has been formed as the Institute Horticulture Committee to keep the greeneries in the Institute campus. All gardens are regularly maintained and looked after by Horticulture Section under the guidance of committee members.

Various departmental activities are being carried out every year such as

- ❖ Plantations and other Landscaping Activities
- ❖ Maintenance of Gardens and Landscape
- ❖ Maintenance of Plantations

The horticultural activities for landscaping and beautification of Regional Institute of Education, Bhubaneswar was started with constitution of a Landscaping Committee in 1995. There were transformation and redeemed of certain natural vegetation patches for requisite infrastructure development to facilitate the emerging needs for the growth of the Institute. However, spaces for academic, administrative and recreational areas are delineated in harmony with the landscape to ensure an eco-friendly campus. Horticulture section of the Institute is looking after all the plantation and other landscaping activities within the Institute campus under the guidance of a Institute Horticultural Committee. This committee member develops strategies for smooth execution of plantation, maintenance

and overall protection of the landscape. Therefore, greenery of the large area in the campus is well maintained besides keeping remnants of the natural vegetation patches undisturbed. There are block plantation, plantations along roads side, garden space of departmental building premises, and along the residential compounds, while several tree species regenerated naturally and there are seasonal herbaceous plants that cover the whole natural landscapes. Several indigenous trees, shrubs and ornamental plants are carefully selected for the plantation to provide shelter for birds and to deliver a shaded walkway. Massive plantations and different landscaping/beautification activities have already been carried out in different parts of the Institute campus.

## 8.2 PLANTATION DRIVES

### 38. *Trees plantation drives organized by the Institute*

Towards the sustainable land use practice, a total of 12,978 plant saplings of different species have been planted in various sites in the last 3 decades (from July'1987 to March 2023) through routine and special plantation drives organized by the Horticulture Section of RIE, Bhubaneswar on various national and international events/occasions with active participation from university communities and guests. This program helps in encouraging an eco-friendly environment that provides pure oxygen within the institute and awareness among staff members and students. The plantation program includes various types of indigenous species of ornamental and medicinal wild plant species. The plants have medicinal value, which faculty members of the Department of Botany help students to identify with scientific names and give information about medicinal uses of the plants. Different occasions on which plantation is done

**Table 18 – List of Occasions in which Plantation Programmes are carried out in RIE, Bhubaneswar**

<b>1. Foundation day of NCERT</b>	<b>5. Foundation day of RIE</b>
<b>2. National Education day</b>	6. Superannuation day of each employee
<b>3. Van Mahotsav day</b>	7. Special visit by the dignitaries
<b>4. Occasional plantation by the alumni association</b>	8. Kala Utsav plantation programme

Good care is taken by the staff members and gardeners of horticulture department to ensure the maximal survivability of the saplings



**Fig. 27 – Plantation by Esteemed Principal of the Institute Prof. P.C.Agarwal on the Occasion of the Foundation Day of NCERT**



**Fig. 28 – Plantation by Head, DEE and IQAC Coordinator, Prof. Ritanjali Dash on the Occasion of the Foundation Day of NCERT**



**Fig. 29 – Plantation by Dean of Instructions and Head DESSH, Prof. Sandhya Rani Sahoo on the Occasion of the Foundation Day of RIE, Bhubaneswar**



**Fig. 30 – Plantation by Head DESM, Prof. Sarat Kumar Dash on the Occasion of the Foundation Day of RIE, Bhubaneswar**



**Fig. 31 – Photographs of Plantation Drives Organized in the Institute Involving Faculty Members, Staffs Members, Alumni and Students**



**Fig. 32- Photographs of Plantation Drive Organized by the Institute on the Occasion of Kala Utsav 2023 Involving Participants from all 30 States.**

### **8.3 LANDSCAPING AND GARDENING ACTIVITIES**

In addition, to carry out different plantation programs, efforts were also made by the Horticulture Section, RIE, Bhubaneswar for beautification of different parts of the Institute campus by the development of flower gardens and other landscaping activities such as the development of lawns, hedges, ornamental and avenue plantations, etc. From July'1987 to March'2023, landscaping and gardening work in most of the prime locations of the Institute campus like the front side of the Entrance gate, different Administrative and Academic buildings, Guest House, Library, Hostels, Principals residence, etc. and other amenity centers have been completed. Moreover, plantation of different types of fruit orchard in the west side of the Institute campus has also been done for further beautification of the landscape.



#### 8.4 MAINTENANCE OF GARDEN AND LANDSCAPE

In addition to new plantation drives and landscaping/beautification activities, all essential maintenance work (like lawn, hedge, existing plants /shrubs, growing of seasonal flowers) for previously developed flower and other gardens, as well as other locations of the Institute campus, is done regularly under the supervision of Mr. C.R. Mohapatra, Assistant Horticulturist and Mallis leded by Mr. D. Subhas of the Horticulture Section.

#### 8.5 MAINTAINANCE OF PLANTATION

Apart from the maintenance of gardens, all previously planted trees (like roadside & other plantations) in different locations of the Institute campus are regularly nurtured by cleaning, fertilization, watering, etc.



Fig. 33 – Maintenance of garden by the Gardeners of the Horticulture Department of the Institute

## 8.6 HOUSE PLANTS

House plants do not just look good – they can make us feel good, too. Studies have shown that house plants-

- ❖ Boost our mood, productivity, concentration, and creativity
- ❖ Reduce our stress, fatigue, sore throats, and colds
- ❖ Help clean indoor air by absorbing toxins, increasing humidity & producing oxygen
- ❖ Add life to a sterile space, give privacy and reduce noise levels

Considering the different benefits of house plants, currently, about 250 House plant pots are placed in the interior space of different Administrative offices and Academic buildings, Guest House, Library, Canteen, Principal Residence etc. and other amenity centers for beautification, greenery, and purifying the air. Essential maintenance works of these house plants are carried out regularly under the supervision of the Horticulture Section, RIE, Bhubaneswar.

## 8.7 CAMPUS INVOLVEMENT

### 39. *Mention the involvement of students in maintenance of green cover*

For sustainable use of resources and for the mission of “GO-GREEN” it is necessary that the students, faculty, and administration welcome it. Regional Institute of Education, Bhubaneswar is an environment that invites opportunities to better its community through campus organizations. The green initiative started in the campus many years ago. The Institute students are actively participating and solely concerned with the environment. These students under the guidance of faculties strive to create an environmentally friendly campus. Their purpose is to create awareness and eventually act on that awareness. The Institute is also actively conducting environmental awareness programs on campus regularly.



**Fig. 34 – Maintenance of Indoor plants by the Students of the Institute**

## 8.8 ENVIRONMENTAL CONSERVATION PROGRAM OF THE INSTITUTE

The Institute is very active in the practical education of the students with regard to environmental conservation. The Institute has arranged visits to their faculties to the Botanical Garden, Sanctuaries, Nandankanan Zoological Park, Regional Plant Resource center, Medicinal Plant Knowledge Center, Sacred grooves, different Universities etc. in order to educate their students. The Institute also took their students to different National Park in order to educate the students about in situ Conservation of Wildlife.



Fig. 35 – Photos of the Observation of World Forestry Day in RIE, Bhubaneswar

### 8.8.1 Horticulture Section

#### 40. Does the college campus have any horticultural department

The campus has a dedicated horticulture section that takes care of all green activities including plantation, maintenance of the botanical garden, nursery, areas of all department buildings, and new plantations in the campus. This section plays a major role to make the campus Green and Environment friendly. The entire green activities in the campus are managed by the Horticulture Section under the monitoring and guidance of Mr. C.R. Mohapatra, Assistant Horticulturist and Mallis led by Mr. D. Subhas of the Horticulture Section.

### 8.8.2 Botanical Garden for Medicinal Plants

#### 41. Is there any garden in the Institute?

The campus has a very vast and beautiful Botanical Garden. Inside the R.I.E, Bhubaneswar campus, adjacent to the Institute's main building, the Herbal Garden of Medicinal Plants has been developed within an area of about 1.5 acres. More than 200

types of common, rare and endangered species of medicinal plants have been planted and grown with utmost care and devotion. The main objective is to disseminate the knowledge of herbal medicines and medicinal plants among school children, institute students and lay public. The maintenance of the garden is done by the gardeners engaged by Coordinator of PAC Programme of NCERT along with Campus & Welfare section of the Institute.

### **8.8.3 Institute Nursery**

The Horticulture section has a **nursery**, which is the source of seedlings of ornamental/avenue trees, fruit trees, shrubs, valuable timber trees, indoor plants of different types, and also some seasonal flowers for the use of the Institute. It is located within the premise of the Rose Garden of the Institute. Essential maintenance works of the nursery are carried out throughout the year and excess seedlings are also sold to the Institute employees and outsiders from time to time. The horticulture section conducts various activities in order to make the campus green, beautiful and bright which includes the Plantation and landscape activities, Maintenance of gardens, and landscape and plantations. Towards the sustainable land use practice, a total of 12,978 plant saplings of different species have been planted in various sites in the last 3 decades (from July'1987 to March 2023) through routine and special plantation drives organized by the Horticulture Section, RIE, Bhubaneswar on various national and international events/occasions with active participation from Institute communities and guests. In addition to new plantation drives

and landscaping/beautification activities, all essential maintenance work (like lawn, hedge, existing plants /shrubs, growing of seasonal flowers) for previously developed flower and other gardens, as well as other locations of the Institute campus, is done regularly under the supervision of Horticulture Section. Apart from the maintenance of gardens, all old plantations (like roadside and other plantations) in different locations of the Institute campus are regularly nurtured by cleaning, fertilization, watering, etc. In addition to that campus celebrates various events like Special Plantation Drive every year on World Environment Day and other extension activities like the Plantation program

Nursery helps in decorating the Seminar Halls, Corridors, Auditorium Dias, etc. during different programmes and special visits of the dignitaries to the Institute on other special days.

## 42. Do students spend time in the garden?

- ❖ Students of the Institute spend time in the garden mostly during the morning and evening hours. The rose garden of the Institute is open for everyone from 9 am to 3 pm.
- ❖ Seasonally, the official garden visits by pre-primary and primary students of the D.M.School are conducted

### ➤ *What is the survival percentage of the plants in the campus?*

The survival percentage of the plants is almost 75 % on an average.

### ➤ *Plant distribution program for students and community*

Yes, saplings are distributed to students. During different workshops potted plants instead of the flower bouquets are distributed among the faculty members and other dignitaries.

### ➤ *Plant ownership program*

Various trees are planted and owned by students, staff members etc. The names of the plants are also displayed on the body of the trees.



**Fig. 36 – Potted Plant Presented by the Esteemed Principal of Institute to the Guest on the Occasion of Mathematics Day, Potted Plant Presented by Prof. L.D. Behera to Prof. Saurabh Kapoor during Mathematics Conference**

## Chapter 9

**Biodiversity of the Campus**

**WE ARE NOT ABOVE THE NATURE, WE ARE A PART OF IT.**

**9.1 FLORAL DIVERSITY OF THE INSTITUTE**

43. *Total number of plants in the Institute: trees, shrubs, grass cover?*

Table 19 – List of types of plants and their numbers in RIE, Bhubaneswar

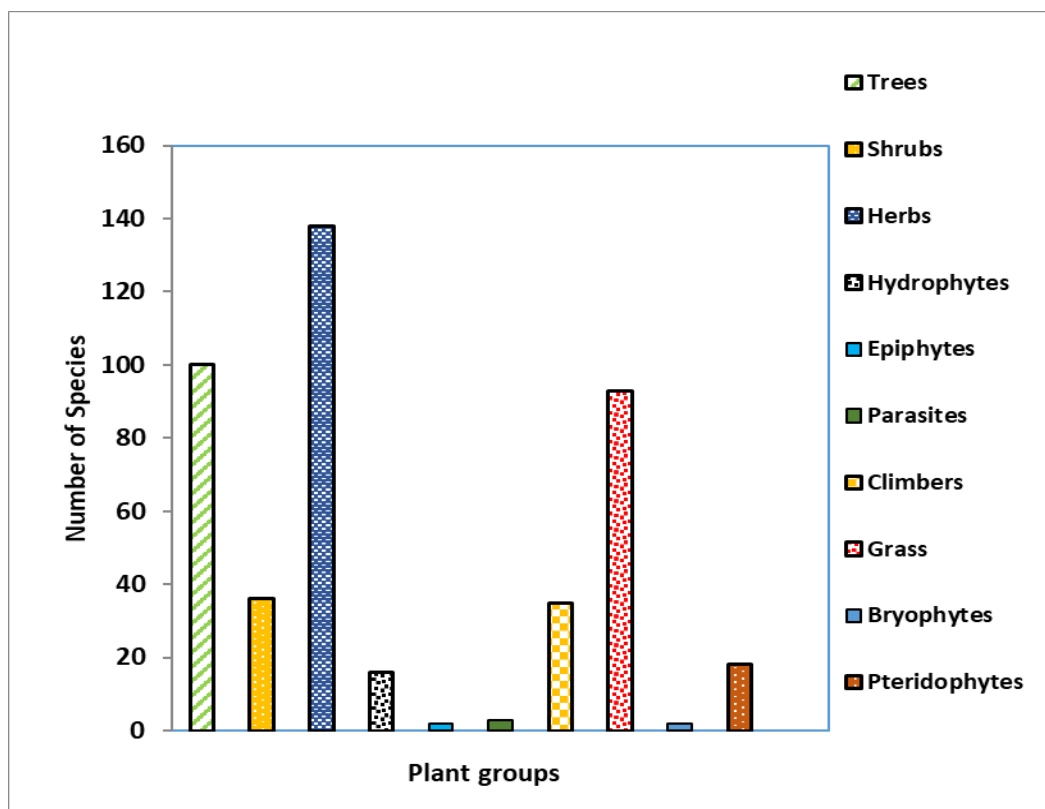
Plant Types	Approx. Number
Herbs	138
Shrubs	36
Trees	100
Grasses	93
Climbers	35
Parasites	03
Epiphytes	02
Gymnosperms	18
Pteridophytes	18
Bryophytes	02
Hydrophytes	16
<b>Total</b>	<b>442</b>

44. *What are the name of specific plants in the Institute?*

Varieties of plants are available in the institute and has been documented. A total of 442 uncommon plant species were recorded belonging to 304 genera and 97 families. The collection embraced as many as 138 herbs, 36 shrubs, 100 trees, 35 climbers, 93 grasses, 16 hydrophytes, 2 epiphytes, 3 parasites, 2 bryophytes and 18 pteridophytes. The excerpts of which has been inserted in Appendix as well as Green Audit of the Institute for reference.

Among families, Fabaceae, Asteraceae and Euphorbiaceae were the dominant families in dicotyledons whereas in monocotyledons, Poaceae and Cyperaceae were the dominant families. Out of 97 families, the 10 most dominant families having plants in

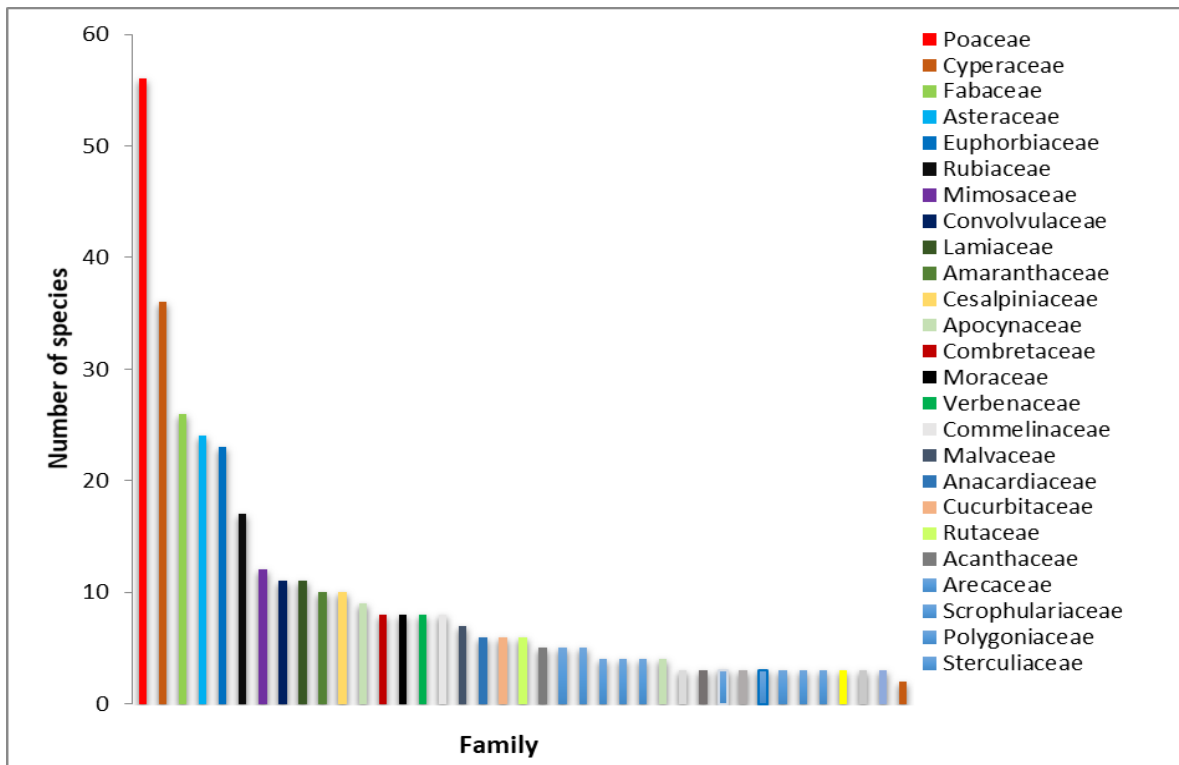
decreasing order are presented in the table below. Family wise distribution of plants of the RIE, BBSR has been reflected in the graph.



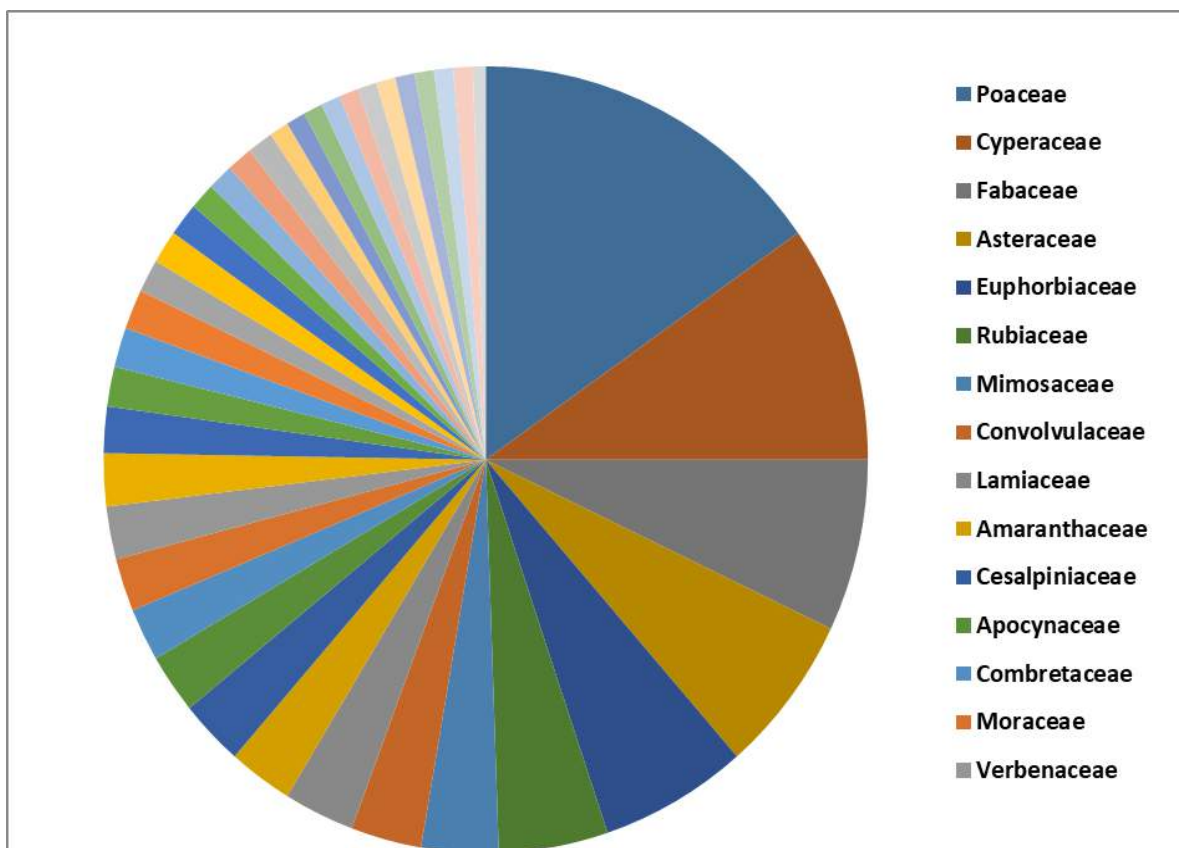
**Fig. 37 - Habit-wise Distribution of Plants Recorded (in %) in RIE Campus, Bhubaneswar**

**Table 20 – Family-wise Distribution of Plants Recorded in RIE Campus, Bhubaneswar**

S.No.	Family	Nos
1	Poaceae	56
2	Cyperaceae	36
3	Fabaceae	26
4	Asteraceae	24
5	Euphorbiaceae	23
6	Rubiaceae	17
7	Mimosaceae	12
8	Convolvulaceae	11
9	Amaranthaceae	10



**Fig. 38 - Bar Graph Representing Family-wise Distribution of Total Plant species in RIE Campus, Bhubaneswar**



**Fig. 39 – Family-wise Distribution (in number) of Total Plant Species in RIE Campus, Bhubaneswar**





*Anacardium occidentale* L.



*Anthocephalus cadamba*  
(Roxb.)Miq.



*Santalum album* L.



*Artocarpus heterophyllus* Lam.



*Melia azadirachta* L.



*Plumeria rubra* L.



*Cassia fistula* L.



*Tectona grandis* L.f.



*Terminalia bellirica* (Gaertn.)Roxb.



*Strychnos potatorum* L.



*Strychnos nux-vomica* L.



*Phyllanthus emblica* L.



*Terminalia arjuna* (Roxb.ex Dc.) Wight   *Ziziphus mauritiana* Lam.   *Phyllanthus acidus* (L.) Skeels.



*Peltophorum pterocarpum* ( DC.)   *Lagerstroemia reginae* Roxb.   *Elaeagnus argentea* Roxb.  
Backer ex K.Heyne

**Fig. 40- Photographs of Trees Found in RIE campus, Bhubaneswar**



*Cassia occidentalis* L.

*Lawsonia inermis* L.

*Abutilon indicum* (L.) Sweet



*Cassia hirsute* L.

*Calotropis gigantea* R.Br.

*Vitex negundo* L.



*Clerodendrum viscosum* Vent



*Phyllanthus reticulatus* Poir.



*Ziziphus mauritiana* Lam.



*Justicia adhatoda* L.



*Lantana camara* L. var. *aculaeta* (L.) Mold.



*Jatropha gossypifolia* L.



*Nerium oleander* L.



*Rauvolfia tetraphylla* L.



*Ricinus communis* L.



*Ichnocarpus frutescens* (L.) R.Br.



*Punica granatum* L.

**Fig. 41- Photographs of Shrubs Found in RIE campus, Bhubaneswar**



*Ageratum conyzoides* L.



*Costus speciosus* (Koenig) Sm.



*Curcuma longa* L.



*Andrographis paniculata* (Burm.f.)



*Cissus quadrangular* L. *Hemidesmus indicus* (L.) R.Br.  
Wall.ex.Nees Nicolson Var.



*Leucas aspera* (Willd.) Link  
Urb.



*Ocimum tenuiflorum* L.



*Centella asiatica* (L.)



*Euphorbia hirta* L.



*Impatiens balsamina* L.



*Ayapana triplinervis* (Vahl)

R.M.King & H.Rob



*Ocimum gratissimum* L.



*Rosmarinus officinalis* L.



*Bacopa monnieri* (L.) Pennell.



*Paederia foetida* L.



*Cymbopogon citrates*( DC) Stapf



*Kalanchoe pinnata*( Lam.) P

**Fig. 42- Photographs of Herbs Found in RIE campus, Bhubaneswar**



*Cuscuta reflexa* Roxb. (Parasite)



*Cassytha filiformis* L. (Parasite)



*Vanda tessellate* (Roxb.)Hook ex.(Epiphyte)



*Viscum articulatum* Burm.f. (Epiphyte)

**Fig. 43- Photographs of Parasites and Epiphytes found in RIE campus, Bhubaneswar**



*Quisqualis indica* L.



*Momordica dioicia* Roxb.ex.Willd.



*Antigonon leptosus* Hook.& Arm.



*Aristolochia indica* L.



*Ipomoea quamoclit* L.



*Mikania micrantia* kunth.

**Fig.44 - Photographs of Climbers Found in RIE campus, Bhubaneswar**

**Table 21- List of Endangered, Threatened and Endemic species recorded in RIE Campus, Bhubaneswar**

Sl.No.	Botanical Name	Family	Status
1.	<i>Atylosia cajanifolia</i> Haines	Fabaceae	Threatened
2.	<i>Bulbostylis subspinsens</i> C.B.Cl.	Cyperaceae	Threatened
3.	<i>Dracaena spicata</i> Roxb.	Agavaceae	Threatened
4.	<i>Gloriosa superba</i> L.	Liliaceae	Endangered
5.	<i>Paederia foetida</i> L.	Rubiaceae	Vulnerable
6.	<i>Piper longum</i> L.	Piperaceae	Endangered
7.	<i>Pterocarpus marsupium</i> Roxb. subsp. <i>Marsupium</i>	Fabaceae	Endangered
8.	<i>Rauwolfia serpentine</i> (L.) Benth. Ex Kurz.	Apocynaceae	Endangered
9.	<i>Saraca asoca</i> (Roxb.) de Wilde	Caesalpiniaceae	Criticcally Endangered
10.	<i>Strychnos potatorum</i> L.	Strychnaceae	Vulnerable



*Glorisa superba* L.(Endangered)



*Piper longum* L. (Endangered)



*Strychnos potatorum* L. (Vulnerable)



*Paederia foetida* L. (Vulnerable)



*Rauwolfia serpentina* (L.) Benth.ex Kurtz.  
( Endangered )



*Saraca asoca* ( Roxb.) de Wilde  
( Critically Endangered)

**Fig. 45- Photographs of endangered/critically endangered/vulnerable species found in RIE campus, Bhubaneswar**

**Table 22- List of Alien Plant Species recorded in RIE Campus of Bhubaneswar City**

Sl.No.	Name of the Species	Family	Habit	Use	Nativity
1.	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Herb	M	Africa
2.	<i>Acanthospermum hispidum</i> DC.	Asteraceae	Herb	M	Brazil
3.	<i>Ageratum conyzoides</i> L.	Asteraceae	Herb	M	Tropical America
4.	<i>Alternanthera paronychioides</i> St. Hil	Amaranthaceae	Herb	M	Tropical America
5.	<i>Antigonum leptopus</i> Hook & Arn.	Polygonaceae	Climber	M	Tropical America
6.	<i>Argemone maxicana</i> L.	Papaveraceae	Herb	A,M	Tropical Central & South America
7.	<i>Azolla pinnata</i> R.Br.	Azollaceae	Herb	WT	Asia, Africa
8.	<i>Blumea lacera</i> (Burm.f.) DC.	Asteraceae	Herb	M	Tropical America
9.	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	H, Fo	Tropical Africa
10.	<i>Calotropis gigantean</i> R.Br.	Asclepiadaceae	Shrub	M	Tropical Africa



11.	<i>Calotropis procera</i> (Ait.) R.Br.	Asclepiadaceae	Shrub	M	Tropical Africa
12.	<i>Cassia alata</i> L.	Caesalpiaceae	Tree	M	West Indies
13.	<i>Cassia hirsute</i> L.	Caesalpiaceae	Shrub	M	Tropical America
14.	<i>Cassia occidentalis</i> L.	Caesalpiaceae	Herb	C	Tropical South America
15.	<i>Cassia tora</i> L.	Caesalpiaceae	Herb	M	Tropical South America
16.	<i>Celosia argentea</i> L.	Amaranthaceae	Herb	C,M	Tropical Africa
17.	<i>Chloris barbata</i> Sw.	Poaceae	Herb	Fo	Tropical America
18.	<i>Cleome rutidosperma</i> DC	Capparaceae	Herb	M	Tropical America



1



2



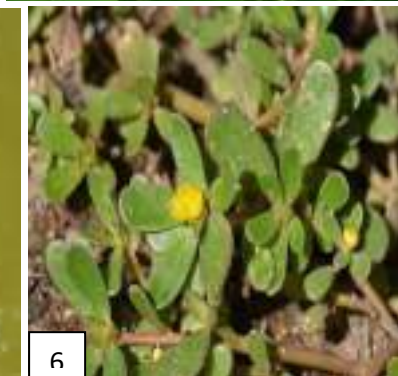
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4



5



6



**Fig. 46- Invasive Alien Plant Species in RIE Campus, 1. *Borassus flabellifer* L. 2. *Cassia alata* L. 3. *Cassia tora* L. 4. *Cleome viscosa* L. 5. *Eichhornia crassipes*( mart.) Solms-Laub, 6. *Portularia oleracea* L. 7. *Impatiens balsaminia* L. 8. *Macropodium purpureum* 9. *Mikania micrantha* Kunth.**

**Table 23- List of Poisonous Plants found in RIE, Bhubaneswar Campus**

Sl. No.	Name of the Plant	Family	Common/ English Name	Habit
1.	<i>Argemone mexicana</i> L.	Papaveraceae	Mexican Poppy	Herb
2.	<i>Anacardium occidentale</i> L.	Anacardiaceae	Cashew Nut	Tree
3.	<i>Abrus precatorius</i> L.	Fabaceae	Indian liquorice	Herb
4.	<i>Amorphophallus campanulatus</i> Roxb.	Araceae	Elephant foot yam	Herb
5.	<i>Cascabela thevetia</i> L. / <i>Thevetia nerifolia</i> (Jess.)	Apocyanaceae	Yellow oleander	Shrub
6.	<i>Calotropis gigantea</i> R.Br.	Asclepiadaceae	Crown flower	Shrub
7.	<i>Calophyllum inophyllum</i> L.	Guttiferae	Alexandrian laurel	Tree
8.	<i>Colocasia esculenta</i> L.	Araceae	Elephant eartaro	Herb
9.	<i>Datura stramonium</i> L.	Solanaceae	Thornapple	Shrub
10.	<i>Diffenbachia seguine</i> Schutt&Schutt / <i>D. maculata</i>	Araceae	Dumb cane	Herb
11.	<i>Euphorbia nivulia</i> Ham.	Euphorbiaceae	Indian spurg tree	Shrub
12.	<i>Fleurya interrupta</i> (L.)Gaud.	Urticaceae	Hen's nettle	Herb

13.	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Pink morning glory	Shrub
14.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Purging nut	Shrub
15.	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Bellyache bush	Shrub
16.	<i>Lantana camara</i> L.	Verbenaceae	Wild sage	Shrub
17.	<i>Mucuna pruriens</i> L.	Fabaceae Subfamily: Papilionaceae	Buffalo bean	Shrub
18.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Bitter weed	Herb
19.	<i>Pedilanthus tithymaloides</i> L.	Euphorbiaceae	Slipper plant	Shrub
20.	<i>Ricinus communis</i> L.	Euphorbiaceae	Castor bean	Shrub



*Aeghonia mexicana* L.



*Abrus precatorius* L.



*Calotropis gigantea* R.Br.



*Parthenium hysterophorus* L.



*Datura stramonium* L.

*Fleurya interrupta* (L.) Gaud.

**Fig. 47 - Photographs of Poisonous Plants found in RIE campus, Bhubaneswar**

## 9.2 AVIFAUNAL DIVERSITY OF THE INSTITUTE

### 45. List the names of animals found inside the Campus (Insects, Birds, Reptiles, Mammals)

A variety of birds have been spotted inside the campus during early morning hours. A group of students were engaged in groups to spot different birds with adequate identification information like beak colour and structure, body colouration, mode of flight, chirping noises etc. The students observed and recorded the presence of following birds in the campus for 10 days at following spots.

**Table 24 – List of Bird Species found in RIE, Bhubaneswar Campus with their Spotting Site**

Sl	Common Name	Scientific Name	Site of spotting inside campus
1.	Common Kingfisher	<i>Alcedo atthis</i>	Near the fountain and water pots in the rose garden
2.	Pied Kingfisher	<i>Ceryle rudis</i>	Near the fountain and water pots in the rose garden
3.	House Crow	<i>Corvus splendens</i>	spotted ubiquitously in the campus
4.	Large billed crow	<i>Corvus macrorhynchos</i>	spotted ubiquitously in the campus
5.	Rock Pigeon	<i>Columba livia</i>	Inside main buildings, hostels etc.
6.	Indian Robin	<i>Saxicoloides fulicatus</i>	Near Gopabandhu and Asutosh Hostels

7.	Oriental Magpie-Ribbon	<i>Copsychus saularis</i>	Near all plantation areas, Gopabandhu, Asutosh and Ramanujan Hostels
8.	Pied Buschat	<i>Saxicola caprata</i>	Near all plantation areas, Gopabandhu, Asutosh and Ramanujan Hostels
9.	Common Myna	<i>Acridotheres tristis</i>	Spotted ubiquitously in the campus
10.	Asian Pied Starling	<i>Gracupica contra</i>	Near fruit orchard plantation, temple area plantation, Infront of G.B.Hostel
11.	Eurasian Hoopoe	<i>Upupa epops</i>	Spotted in the grounds of main playground
12.	Tricolored Munia	<i>Lonchura malacca</i>	Near all plantation areas, Gopabandhu, Asutosh and Ramanujan Hostels
13.	Scaly breasted Munia	<i>Lonchura punctulata</i>	Near all hostel areas and plantation areas near Gate No. 2
14.	Red Vented Bulbul	<i>Pycnonotus cafe</i>	GB and Ramanujan hostel areas, staff quarters, Plantation area near Gate No.2
15.	Red Whiskered Bulbul	<i>Pycnonotus jocosus</i>	Fruit orchard, Plantation areas near Gate No.1, Hostel areas
16.	Brown headed Barbet	<i>Psilopogon zeylanicus</i>	Plantation areas near Gate No.2, Asutosh and Ramanujan Hostel
17.	Asian Koel	<i>Eudynamys scolopaceus</i>	Near all plantation areas, Gopabandhu, Asutosh and Ramanujan Hostels
18.	Rose-ringed Parakeet	<i>Psittacula krameri</i>	Asutosh Hostel, Sunflower plantation areas in the rose garden
19.	Indian Golden Oriole	<i>Oriolus kundoo</i>	Temple and fruit orchard areas

20.	Black Drongo	<i>Dicrurus macrocercus</i>	Near the HB, GB and the Asutosh Hostel areas
21.	Common Tailor bird	<i>Orthotomus sutorius</i>	Near staff quarters and plantation areas
22.	Spotted Owl	<i>Athene brama</i>	Near the HB, GB and the Asutosh Hostel areas
23.	Black Kite	<i>Milvus migrans</i>	Spotted above the hostel terrace.
24.	Greenish Warbler	<i>Phylloscopus trochiloides</i>	Staff quarters, Asutosh Hostel, Plantation area near Gtae No.2
25.	Pale- billed flowerpecker	<i>Dicaeum erythrorhynchos</i>	Tree plantation near staff quarter of Sarojini Hostel, Temple area plantations
26.	Jungle Babbler	<i>Argya striata</i>	Spotted ubiquitously in the campus

### 9.3 FAUNA DIVERSITY OF THE INSTITUTE

Table 25 – List of Animal Species found in RIE, Bhubaneswar Campus with their Scientific Name

Sl.No.	Common Name	Scientific Name
	<b>MAMMALS</b>	
1.	Asian Palm civet	<i>Paradoxurus hermaphroditus</i>
2.	Cat	<i>Felis catus</i>
3.	Dog	<i>Canis lupus familiaris</i>
4.	Indian Palm Squirrel	<i>Funambulus palmarum</i>
5.	Common Rat	<i>Rattus norvegicus</i>
6.	Rhesus Monkey	<i>Macaca mulatta</i>
7.	Mongoose	<i>Herpestes</i>
	<b>REPTILES</b>	
8.	Garden Lizard	<i>Calotes versicolor</i>
9.	Cobra	<i>Naja Naja</i>
10.	Common kraits	<i>Bungarus caeruleus</i>
11.	House Gecko	<i>Hemidactylus turcicus</i>
	<b>AMPHIBIA</b>	
12.	Asian common toad	<i>Duttaphrynus melanostictus</i>
13.	Tree frog	<i>Polypedates leucomystax</i>
14.	Frog	<i>Rana tigrina</i>

Different varieties of spider found in RIE were also documented from the family Araneidae, Corinnidae, Hersilidae, Lycosidae, Miturgidae, Nephilidae, Oxyopidae, Phlocidae, Pisauridae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, Uloboridae etc. The genus and species name include:

**Table 26 – List of Spider Species found in RIE, Bhubaneswar Campus with their Scientific Name**

<i>Argiop anasuja</i>	<i>Argiope phlchella</i>
<i>Cyclosa bifida</i>	<i>Cyrtarachne</i>
<i>Cyrtophora citricola</i>	<i>Eriovixia excelsa-</i>
<i>Eriovixia sp.</i>	<i>Gastracanthu sp.</i>
<i>Larinia phthisa –</i>	<i>Neoscona bengalensin</i>
<i>Neoscona nautica</i>	<i>Neoscona vigilans</i>
<i>Neoscona sp.</i>	<i>Parawixia dehaani</i>
<i>Zygiella sp.</i>	<i>Castianeria zetes</i>
<i>Hersilia savignyeni</i>	<i>Hersilis sp.</i>
<i>Hippasa agelenoides</i>	<i>Pardosa psuedoannulata</i>
<i>Cheiracathium danieli</i>	<i>Cheiracathium inchusum</i>
<i>Nephila maculate</i>	<i>Oxyopes biraminus</i>
<i>Oxyopes javanus</i>	<i>Oxyopes lineatipes</i>
<i>Oxyopes papuanus</i>	<i>Oxyopes shweta</i>
<i>Pencetia viridana</i>	<i>Crossopriza lyoni</i>
<i>Perenethis venusta</i>	<i>Carrhotus vidnus</i>
<i>Hasarins adansoni</i>	<i>Hyllus semicnprens</i>
<i>Myrmarachne oricntales</i>	<i>Myrmarachne plataleoides</i>
<i>Phintella vittate</i>	<i>Plexippus petersi</i>
<i>Plexippus payknlli</i>	<i>Telamonia dimidata</i>
<i>Heteropoda venatoria</i>	<i>Olios millet</i>
<i>Leucauge decorate</i>	<i>Tetragnalhe mandibulata</i>
<i>Argyrodes andamanensis</i>	<i>Camaricus formosus</i>
<i>Camaricus khandalaensis</i>	<i>Thomisus lobosus</i>
<i>Thomisus projeetus</i>	<i>Xysticus minuta</i>

➤ *How many dogs in your area have undergone Animal Birth Control-Anti Rabies (ABC-AR)?*

Periodically, the Animal Birth Control-Anti Rabies (ABC-AR) programme is conducted by the Veterinary department and BMC in the Institute.

**46. Does the Institute have a biodiversity programme?**

- ❖ Our students have taken part in promoting biodiversity in the campus and beyond the campus. Students of B.Sc.B.Ed. actively participated in Backyard Bird

Watching and Counting Programme where they learnt about the bird identification.

- ❖ The students have visited the Mulberry Silk Seed Station in Chandaka, Bhubaneswar to get an idea of the silkworms and their hostplants



**Fig. 48- Bird Watching and Counting by Students in Ekamrakanan as a part of Biodiversity Conservation Programme, Guided by Dr. Abhipsa Bal, Internal Member of the Audit Team**





**Fig. 47- Field Visit by Students to Mulberry Silkworm Seed Station to understand the silkworm rearing and cultivation of host plants as a part Biodiversity Conservation Programme, Guided by Dr. Abhipsa Bal, Internal Member of the Audit Team**

## Initiatives for a Sustainable Environment

### 10.1 PUBLICATIONS AND CURRICULUM

47. Are the faculties and students aware of any environmental Laws pertaining to different aspects of environment management?

Yes our faculties are aware of the environmental laws and have contributed in spreading the knowledge in form published books as follows:

**Table 27- List of Books Published by the Faculty Members of our Institute**

Sl.No.	Name of the Book	Name of the Authors
1.	Handbook of Herbal plants for gardening	Prof. Ch. A.Ramulu, Prof. P.C.Agarwal, A.K.Parida
2.	Botanical Garden for outdoor science exhibition	Prof. Ch. A. Ramulu, A.K.Parida
3.	Medicinal Botany	Prof. Ch. A. Ramulu, A.K.Parida, P.Mishra
4.	Poisonous plants of Bhubaneswar	Prof. Mahendra K. Satpathy, Dr. Sanjeeb Kumar Das,
5.	Botanical Garden as learning centre for children science education	Prof. P.C.Agarwal, Prof. Ch. A.Ramulu, A.K.Parida
6.	Flora of Regional Institute of Education Campus, Bhubaneswar	A.K. Parida, P.P. Behera
7.	Green Education Plants for Fun and Game	Prof. Mahendra Kumar Satpathy, Sidhanta Sekhar Bisoyi
8.	Education environment and Sustainable Development	Prof. Mahendra Kumar Satpathy
9.	People who make a change – Men and Women in Environmental Movements	Prof. Dhanalaxmi Dash, Prof. Mahendra Kumar Satpathy
10.	Spider Diversity in RIE campus	Prof. Animesh Kumar Mohapatra, Shri Tutan Biswas, Siba Prasad Parida



**Fig.48 – Photos of Books Published by the Faculty Members of the Institute**  
*Awareness about the Environmental Laws*

After the United Nations Conference in Stockholm in 1972, the Indian Constitution underwent an amendment that made environmental protection a moral as well as constitutional obligation. The 42<sup>nd</sup> Amendment through the inclusion of clause (g) in Article 51A states that it is the fundamental duty of every citizen in India to safeguard and enhance the natural environment, encompassing lakes, forests, wildlife, rivers and compassion towards all living beings. As one of the Directive Principles of State Policy, a policy or directive empowers the state to undertake measures aimed at protecting and improving the environment. The Ministry of Environment was established in 1980, which

came into force as Ministry of Environment and Forests in 1985 to ensure and improve the environment, forests and wildlife. The Ministry is now known as Ministry of Environment, Forest and Climate Change

**Table 28- List of Environmental Acts Laid Down by the Ministry of Environment, Forests and Climate Change.**

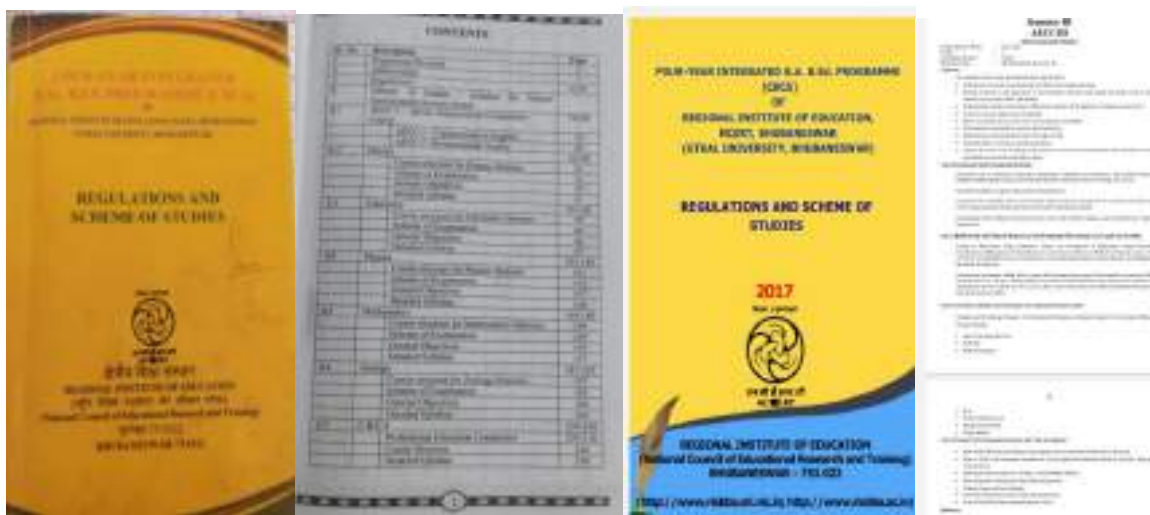
<i>Sl.No.</i>	<i>Name of the Environmental Act and Policies</i>	<i>Year established</i>	<i>Year Amended</i>
1.	Indian Forest Act	1927	--
2.	The Wildlife Protection Act	1972	1992
3.	The Water Act (Prevention and Control of Pollution)	1974	1988
4.	The Forest Conservation Act	1980	1992
5.	The Air Act (Prevention and Control of Pollution)	1981	1987
6.	The Environment Protection Act	1986	--
7.	The Factories Amendment Act	1987	
8.	National Forest Policy	1988	2018
9.	The National Environment Tribunal Act,	1995	2010
10.	The National Environment Appellate Authority Act	1997	--
11.	The Biomedical Waste (Management and Handling)	1998	2018
12.	The Environment (Siting for Industrial Projects) Rules	1999	--
13.	The Municipal Solid Waste (Management and Handling)	2000	--
14.	The Ozone Depleting Substances (Regulation and Control) Rules	2000	--
15.	The Energy Conservation Act	2001	--
16.	The Batteries (Management and Handling) Rules	2001	--
17.	The Biological Diversity Act	2002	--
18.	Scheduled Tribes and Othe Traditional Forest Dwellers (Recognition of Forest Rights)	2006	--
19.	The Noise Pollution (Regulation and Control)	2010	--
20.	The National Green Tribunal Act	2010	--
21.	Compensatory Afforestation Fund Act	2016	--
22.	Solid Waste Management Rules	2016	--
23.	Plastic Waste Management Rule	2016	2018

24.	Wetland Conservation and Management	2017	--
25.	Coastal Regulation Zone Notification	2018	--
26.	The Wildlife (Protection) Amendment Bill	2021	--
27.	Hazardous and other Wastes (Management and Transboundary Movement)	2016	2019

➤ **ENVIRONMENTAL STUDIES AS A PART OF CURRICULUM**

Environmental Studies has been introduced as a compulsory subject for students enrolled into different courses as AECC (Ability Enhancement Compulsory Course) for 4 –yr Integrated B.Sc.B.Ed. and B.A.B.Ed. programme in Semester I and III respectively. The theory paper carries a weightage of 4 credit hours and 100 marks. It has also been introduced as environmental education for 2 yr B.Ed. and M.Ed. programme. The objective of the course is to –

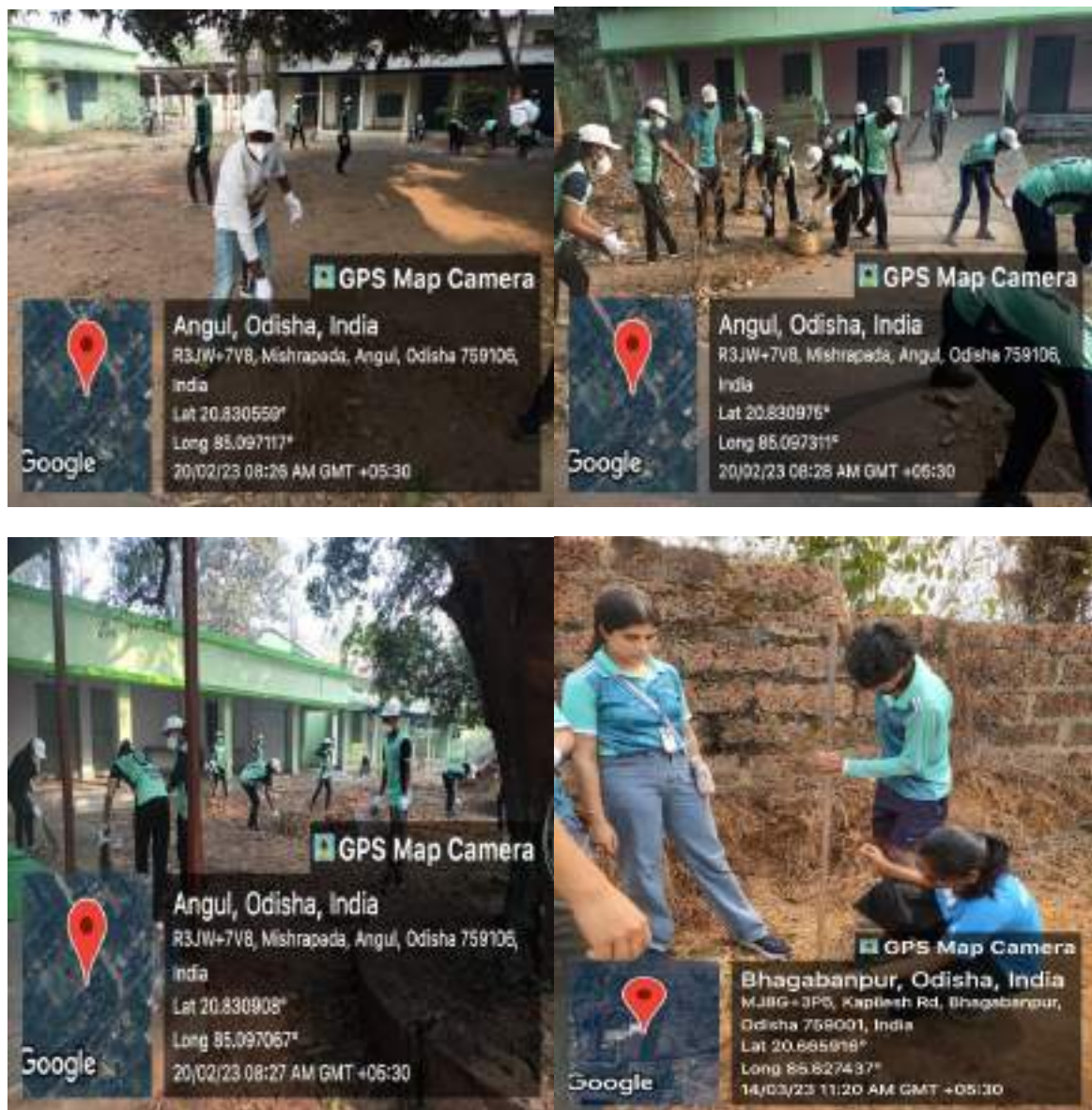
- ❖ Understand the structure and functions of different ecosystems
- ❖ Understand environmental laws and associated regulations
- ❖ Participation in environmental protection and its improvement
- ❖ Follow ecofriendly practices and work for environmental sustainability
- ❖ Attend the skills for solving environmental problems



**Fig.48 – Photos of CBCS Syllabi followed by the Institute of which Environmental Education is a Mandatory Inclusion**

## WORKING WITH COMMUNITY PROGRAMME

The compulsory programme “working with community” in all final year students aims to specialize and socialize our student teachers to interact with different communities on various aspects of sustainable development. In the academic year 2022, students of RIE, Bhubaneswar worked with community from the rural belts of Angul and Dhenkanal for a period of 7 days. Within this 7 days, the students undertook plantation activities, cleanliness activities, inculcated awareness among the residents of the communities about cleanliness, health, hygiene and environmental conservation through nukkad natak (street plays)



**Fig.49 – Photos of Cleanliness and Plantation Activities Performed by Students of RIE, Bhubaneswar in Rural Areas of Odisha (Dhenkanal and Angul)**

## 10.2 DISASTER RESILIENT INFRASTRUCTURE IN THE INSTITUTE

The geographical location of Odisha makes it more vulnerable to a number of cyclones and low depressions. In recent years, Phailin (2013), Hudhud (2018), Fani (2019) etc. have created much havoc in the campus environment. After Fani, the Institute management has focused on establishing disaster resilient infrastructure as follows-

- (i) Underground electric cables
- (ii) Cyclone resilient plantations
- (iii) Corona discharge antennae and proper earthing facilities to reduce the threat of lightning
- (iv) More number of borewells

### (i) Underground Electric Cable Installation

In view of its location and past history of facing severe to very severe cyclonic storms, the Institute increased its resilience to power disruption caused due to destruction of above ground cable installations. The Institute installed the **underground electric cable installations** for power supply following the local electric codes, regulations and safety standards during the installation process. Underground cables have several advantages –

- ❖ Less vulnerable to damage caused by natural disaster
- ❖ Less likely to experience power outages during extreme weather conditions
- ❖ Facilitate Faster Restoration
- ❖ Improved the visual appearance/ aesthetics of the campus

### (ii) Disaster Resilient plants in the Campus

While the eastern part of coastal belt of India is considered as one of the most cyclone prone areas in the world, Odisha is considered as more vulnerable as compared to the other eastern states of India. Cyclones can be detrimental to the environment. There are several major and minor cyclonic storms were found to be affected Odisha coast, Among which some major cyclonic storms like:

RIE Campus was also affected severely by these natural disasters. Some of the cyclone resistant plants are listed in the table survived against cyclone and recorded. Cyclone resistant trees play a significant role as it controls the speed of wind, it also captures the windborne debris which plays a major role in destruction of property as well as lives.

Hence, RIE, Bhubaneswar campus has planted following cyclone resilient plants in the campus as per the advices of Forest Department.

## (ii) Earthing and Lightning Protection

Lightning, a long distance electrical discharge, often results in severe threats to human life and properties due to its high destructive capacity. Lightning, not only damages electrical and electronic gadgets, but also induces human and animal fatalities. To protect life and property against lightning the roof tops of the main building of the Institute and D.M. School have already been provided with copper lightning arresters. A lightning arrester is a device used to protect buildings, power lines, electrical equipment and structures from the volatile surges caused by lightning strikes. RIE, BBSR has installed number of arrestors, which offer a bypass through lowest resistant path for the safe transfer of the voltage to the ground. The high quality earthing system of the Institute are maintained with periodical inspections of earthing sites.

**Table 29. List of Cyclone Resilient Plants in the RIE, Bhubaneswar**

Sr.No.	Botanical Names	Common Names
1.	<i>Azadirachta indica</i> A.Juss.	Nimba (O), Neem (E)
2.	<i>Millettia pinnata</i> (L.) Panigrahi	Indian beech(E), Karanja (O)
3.	<i>Mimusops elengi</i> L.	Spanish cherry(E), Baula (O)
4.	<i>Syzygium cumini</i> (L.) Skeels)	Black berry(E), Jamu (O)
5.	<i>Alstonia scholaris</i> (L.) R. Br.	Devil's tree(E), Chatian (O)
6.	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Arjun tree(E), Arjuna(O)
7.	<i>Saraca asoca</i> (Roxb.)Willd.	Ashoka (E & O)
8.	<i>Terminalia chebula</i> Retz.	Indian walnut(E), Harida (O)
9.	<i>Terminalia bellirica</i> (Gaertn)Roxb.	Beach almond(E), Bahada (O)
10.	<i>Dalbergia sissoo</i> Roxb. ex DC.	Indian Rosewood(E), Sisso (O)
11.	<i>Magnolia champaca</i> L.	Pagoda tree(E), Katha Champa (O)





**Fig. 50 – Lightning Arrestors in the Terrace of Institute’s Main Building and D.M.School Building**

### **10.3 CARBON FOOTPRINT AND EFFORTS FOR CARBON NEUTRALITY**

In today's world, one of the biggest issues faced by all of us is global warming. Global warming refers to an increase in the average global temperature of mother Earth. The main cause of global warming is an increase in the concentration of greenhouse gases (GHGs) in the atmosphere due to anthropogenic activities and their level is determined with the help of global warming potential (GWP) and expressed as Carbon Footprint (CF). Carbon Footprint is another phenomenon used for GHGs or carbon dioxide emission in terms of CO<sub>2</sub> equivalents. There are various definitions of carbon footprint are in literature. But the most recognized definition given by Wiedmann is *“the Carbon footprint is the measure of carbon dioxide emissions directly or indirectly caused by an activity or accumulated over the life stages of a product.”* In other words, *“A carbon footprint is the total greenhouse gas (GHG) emissions caused directly and indirectly by an individual, organization, event or product.”*

As Regional Institute of Education, Bhubaneswar is considered an institutional organization; various energy resources like electricity, solar rooftop systems are used. It is necessary to calculate the carbon footprint of the Institute to upgrade the Clean Developmental Mechanism (CDM) in various processes. All the data from the various sources were collected from all the sectors where energy resources are used. The collected data is calculated by using standard emission factors.

### **10.4 EFFORTS FOR CARBON NEUTRALITY**

Air pollution is a matter of concern in the campus owing to its urban location. Regional Institute of Education, Bhubaneswar as a responsible Institution understands the

importance of its carbon footprint and has developed a plan to reduce greenhouse gas emissions in all its activities. Institute has strictly banned burning of dried leaves and waste paper in Institute. Use of firewood at hostels, canteen and other places are strictly prohibited.

### *Electricity Carbon Footprint*

In the Institute, electricity is used for various purposes like residential, office use, classrooms and laboratories. Computer, Printers, Xerox Machines, Servers, routers etc. liberates huge mass of CO<sub>2</sub> per year. The laboratory equipment consumes the highest electricity which emits a large amount of carbon CO<sub>2</sub> per year. Therefore, patches of greeneries, gardens are maintained to absorb the CO<sub>2</sub> emitted by the machinery and devices. Moreover, the Institute purchases BEE star appliances and equipment to reduce the carbondioxide emission. The computer, smartboards and projector are used in power saving mode to reduce carbon emmissions. The solar panels are installed on the roof of various buildings produce electricity from solar panels which further saves ample mass of CO<sub>2</sub> per year.

### *Paper Carbon Footprint*

The Institute has substantially reduced the use of paper by communicating official notices etc. to faculty, staff members and student through e-mail, whatsapp groups etc. During covid period, online assessment was performed which greatly reduced the use of paper.

## 10.5 ENVIRONMENT FRIENDLY PRACTICES IN THE INSTITUTE



**Fig. 51a – Sanitary Napkin Vending Machine Installed in the Ladies Hostel  
51b- Automatic Dispensing Sanitizer Machine**



**Fig. 52a- Wearing Lab Coats and Using Proper Protection measures while doing experiment ensures laboratory safety. 52b-Fire Extinguishers Installed Outside Labs**



**Fig. 53 – Signages at Entrance of the Institute displaying “NO SMOKING ZONES” and “TOBACCO FREE ZONES” to Maintain a Clean and Hygenic Campus**



**Fig. 54- Flower garden of the Institute**



**Fig.55 - Botanical Garden for Medicinal Plants Maintained by RIE, Bhubaneswar**

## Chapter 11

# Post Audit

### 11.1 SUGGESTIONS FOR EFFECTIVE ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

An environmental management system is a set of officially approved process and practices that enable an institute to reduce its environmental impacts and increase its performance efficiency. Institute management policies and resources utilization strategies plays a pivotal role for its environmental cure and concerns.

- ❖ For sustainable development, the Institute must have a green policy / environment policy.
- ❖ Careful implementation of environmental policy by administration and effective monitoring is the need of the hour.
- ❖ The Institute should have an eco- friendly purchase and procurement policy as well as a policy on environment awareness training programmes for staff members and administrators

### 11.2 FOLLOW UP AND CONTINUOUS MONITORING OF EMS

The process of conducting environment audit itself is an academic exercise which generates a significant amount of useful management data. It has taken a lot of time, money and efforts to complete the task , thus the utility of this report must be justified. Management strategies and implementation need to be developed basing on the findings reported in the document. Follow up plan of audit report is a positive step in the larger process of continuous development. Without follow up , the audit degenerates into a singular one time occurrence that is quickly forgotten due to the demands of management priorities over the passage of time .

### 11.3 SUGGESTIVE ENVIRONMENTAL PROGRAMME

The following environmental programmes may be implemented in the institute before next environmental auditing.

- ❖ Training programmes in the management of solid waste and liquid waste, nursery for fruit bearing and timber yielding plants, the management of water ( treated water for

gardening ) vegetable cultivation , drip irrigation , air pollution monitoring, more numbers of sewage treatment plants .

- ❖ Increase the number of informational signs about environmental awareness such as ‘ plastic free campus ‘, save water , save soil, save oil , save fuel, save electricity , don’t waste food and water , no smoking.
- ❖ Promote and expand environmental / eco-clubs
- ❖ Execute e- office to reduce the use of papers
- ❖ Prizes to the students in the form of saplings
- ❖ Conduct recycling waste product exhibitions
- ❖ Installation of a chemical treatment system for laboratory waste water, or special drainage for waste/chemically contaminated water from chemistry, botany and zoology laboratories
- ❖ Adequate safety awareness in form of sign boards in each laboratory
- ❖ Avoid burning of dry leaves /logs/ woods/ waste papers openly (use technology to reduce carbon emission)
- ❖ One working day in a week may be marked for walking and cycling (at least for residents) to institute, to reduce vehicular carbon emission
- ❖ Water meter for monitoring the volume of water used
- ❖ Similar to car pulling , AC pulling may be initiated
- ❖ Vermicompost pits for each block in the residential quarters of the campus
- ❖ Awareness among students and residents for ‘no cracker campus’
- ❖ Involving residents during plantation drives

#### **11.4 SPECIFIC SUGGESTION BY EXTERNAL EXPERTS**

The following suggestions and recommendations have been given by two external experts on Environment after physical verification and reviewing the draft report developed by the Internal Environment Audit Committee of RIE, Bhubaneswar-

- ❖ Paper use in any educational institute is huge. Therefore, the Institute may consider adopting a ‘Paper Conservation Programme’, that involves collecting waste paper in a systematic manner and handing them over to a paper recycling unit, using more of recycled paper, maximizing usage of paper such as writing and printing on both sides etc.
- ❖ The biogas digester now receives only a part of organic waste generated in the campus. It is suggested that efforts be made to collect all the organic waste and produce biogas out of it.

- ❖ Some efforts have been made to harness solar energy to produce in-campus electricity. These efforts are to be further enhanced to reduce the carbon footprint and reduce electricity consumption.
- ❖ Since, this is a closed campus, it is recommended that this campus can be converted to a green mobility campus by allowing students to use only bicycles as the mode of transportation. Even the faculties may also be motivated to use bicycles for coming to the Institute.
- ❖ It is recommended that there should be adequate signages within the campus reminding the student faculties and visitors that this is a “litter free campus”, “This is a silence zone” etc. Such signages in adequate numbers, nudges all concerned to behave in a more responsible manner and help upkeep the environment.
- ❖ To construct and maintain a water body inside the campus to sustain the biodiversity.
- ❖ To make an effective environmental management plan in consultation with all stakeholders and environment experts.
- ❖ The curriculum of AECC concerned with Environmental Studies may include a practical component for better understanding and addressing of environmental issues.
- ❖ Installation of low flow systems in the urinals and water meter devices at water entry point to monitor the water usage in the campus.
- ❖ Institute must take initiatives to celebrate different National and International Days such as – World Environment Day, World Water Day, National Energy Conservation Day, Biodiversity Day etc. to spread awareness on different policies and acts formulated by the Ministry of Environment, Forests and Climate Change.

### **11.5 ACTION TAKEN OVER SUGGESTIONS**

Based on the above mentioned suggestions of the Internal Audit Team and the recommendations of External Expert for the Environmental Audit of the Institute, following actions were taken

- ❖ The Pre-audit programme by the team motivated the residents to obtain a PUC for their vehicles as a mandate realized by the RTO
- ❖ The residents and students in the hostels have learnt during the awareness spread during the surveys by the student-teachers of the Internal Audit Team to collect the small fragments of wrappers, pouches etc. made up of single use plastics in a larger



size bottles to ensure ease of collection as well as avoiding those plastics to mix with the soil and drainage systems

- ❖ Initiatives have been taken to print and write on both sides of the paper. Official notices are usually communicated to the faculty and staff members by mail to reduce the usage of paper. Additionally, efforts are under progress to introduced handmade and chlorine-free papers in the Institute.
- ❖ The Institute has made efforts to spread the awareness of using bicycles and walking through campaigns like cyclathon, walkathon and yoga camps etc.
- ❖ As suggested by the Experts, the plan for extension of Solar Plant and Biogas Plant for the hostel buildings, administrative buildings etc. are under progress.

The Internal Audit Team has officially put forth the other necessary recommendation to the competent authority for further actions.



**Fig. Photographs of cyclathon, walkathon and yoga camp organized in the RIE, Bhubaneswar**



## APPENDIX

Sl.No.	Scientific Name	Local Name	Family
<b>TREES</b>			
1.	<i>Acacia auriculiformis</i> A.Cunn. ex Benth. in Hook	Karanasaka	Mimosaceae
2.	<i>Acacia catechu</i> (L.f.) Willd.	Khaira	Mimosaceae
3.	<i>Acacia leucophloea</i> (Roxb.) Willd.	Gohira	Mimosaceae
4.	<i>Acacia nilotica</i> (L.) Delile ssp. <i>Indica</i> (Benth.) Brenan	Babul	Mimosaceae
5.	<i>Adenanthera pavonina</i> L.	Mandakaincha	Mimosaceae
6.	<i>Aegle marmelos</i> (L.) Corr.	Bela	Rutaceae
7.	<i>Ailanthus excels</i> Roxb.	Ghora nimba / Mahala	Simaroubaceae
8.	<i>Albizia lebeck</i> (L.) Benth.	Sirisa	Mimosaceae
9.	<i>Alstonia scholaris</i> (L.) R.Br.	Chhatiana	Apocynaceae
10.	<i>Anacardium occidentale</i> L.	Kaju/Lanka Amba	Anacardiaceae
11.	<i>Annona reticulate</i> L.	Ata/Ram-phal	Annonaceae
12.	<i>Annona squamosa</i> L.	Ata/Sita-phala	Annonaceae
13.	<i>Anogeissus acuminata</i> (Roxb.ex DC.)Guill.& Per.	Phasi	Combretaceae
14.	<i>Artocarpus heterophyllus</i> Lam.	Panasa	Moraceae
15.	<i>Azadirachta indica</i> A. Juss.	Nimba	Meliaceae
16.	<i>Bauhinia acuminata</i> L.	Dhala kanchana	Caesalpiniaceae
17.	<i>Bauhinia purpurea</i> L.	Barada / Kuilari	Caesalpiniaceae
18.	<i>Bauhinia variegata</i> L.	Kanchana	Caesalpiniaceae
19.	<i>Bombax ceiba</i> L.	Simili	Bombacaceae
20.	<i>Borassus flabellifer</i> L.	Tala	Arecaceae
21.	<i>Bridelia retusa</i> (L.) Spreng.	Kasi/Pani kasi	Euphorbiaceae
22.	<i>Buchanania lanzan</i> Spreng.	Chara	Anacardiaceae
23.	<i>Butea monosperma</i> (Lam.) Taub.	Palasa	Fabaceae
24.	<i>Careya arborea</i> Roxb.	Kumbhi	Barringtoniaceae
25.	<i>Caryota urens</i> L.	Salapa	Arecaceae
26.	<i>Cassia fistula</i> L.	Sunari	Caesalpiniaceae
27.	<i>Casuarina equisetifolia</i> L.	Jhaun	Casuarinaceae
28.	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Mahana / Phatua	Rubiaceae
29.	<i>Ceiba pentandra</i> (L.) Gaertn.	Sweta Simili	Bombacaceae
30.	<i>Chloroxylon swietiana</i> DC.	Bheru	Rutaceae
31.	<i>Cleistanthus collinus</i> (Roxb.) Benth.	Karada	Euphorbiaceae
32.	<i>Cocos nucifera</i> L.	Nadia	Arecaceae
33.	<i>Cordia oblique</i> Willd.	Guala / Dhuala	Ehretiaceae
34.	<i>Dalbergia lanceolaria</i> L.f.	Chakundia	Fabaceae
35.	<i>Dalbergia sisso</i> Roxb.	Sisu	Fabaceae
36.	<i>Selonix regia</i> (Boj.ex Hook) Raf.	Krushnachuda	Caesalpiniaceae
37.	<i>Dillenia indica</i> L.	Oou	Dilleniaceae

38.	<i>Diospyros malabarica</i> (Desr.) Kostel.	Mankadakendu	Ebenaceae
39.	<i>Diospyros melanoxylon</i> Roxb.	Kendu	Ebenaceae
40.	<i>Drypetes roxburghii</i> (Wall.) Hurus.	Poichandia	Euphorbiaceae
41.	<i>Erythrina suberosa</i> Roxb.	Paldhua / Chaldhua/Balthia	Fabaceae
42.	<i>Erythrina variegata</i> L.	Paladhua	Fabaceae
43.	<i>Eucalyptus citriodora</i> Hook.	Nilagiri	Myrtaceae
44.	<i>Ficus benghalensis</i> L.	Bara	Moraceae
45.	<i>Ficus benjamina</i> L. var. <i>nuda</i> (Miq.) Barrett.	Kujibara	Moraceae
46.	<i>Ficus hispida</i> L.f.	Bai-dimiri	Moraceae
47.	<i>Ficus racemosa</i> L.	Dimiri	Moraceae
48.	<i>Ficus religiosa</i> L.	Aswastha/Pipal/Usta	Moraceae
49.	<i>Ficus tinctoria</i> Forst. f. ssp. <i>Gibbosa</i> (Willd.) Corner	Jhirang	Moraceae
50.	<i>Gardenia latifolia</i> Ait.	Dambaru / Katarang	Rubiaceae
51.	<i>Gmelina arborea</i> Roxb.	Gambhari	Verbenaceae
52.	<i>Grewia tiliifolia</i> Vahl.	Mirga-chara / Gara Bursu	Tiliaceae
53.	<i>Guazuma ulmifolia</i> Lam.	Sana-giringa	Sterculiaceae
54.	<i>Haldinia cordifolia</i> (Roxb.) Ridsd.	Kurum	Rubiaceae
55.	<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G. Don.	Koruan	Apocynaceae
56.	<i>Holoptelia integrifolia</i> (Roxb.) Planch.	Dhau	Ulmaceae
57.	<i>Ixora pavetta</i> Andr.	Teloruan	Rubiaceae
58.	<i>Lagerstroemia parviflora</i> Roxb.	Sidha	Lythraceae
59.	<i>Lagerstroemia reginae</i> Roxb.	Patali	Lythraceae
60.	<i>Lannea coromandelica</i> (Houtt.) Merr.	Mahi/Jivala	Anacardiaceae
61.	<i>Leucaena leucocephala</i> (Lam.) de Wit.	Nagarjuna	Mimosaceae
62.	<i>Limonia acidissima</i> L.	Kaintha	Rutaceae
63.	<i>Madhuca indica</i> Gmel.	Mahula/Mahua/Tola	Sapotaceae
64.	<i>Mallotus philippensis</i> (Lam.) Muell.	Kapilagundi/Sinduri	Euphorbiaceae
65.	<i>Mangifera indica</i> L.	Amba	Anacardiaceae
66.	<i>Melia azedarach</i> L.	Mahanimba	Meliaceae
67.	<i>Michelia champaca</i> L.	Champa	Magnoliaceae
68.	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Mundi/Kelikadamba	Rubiaceae
69.	<i>Morinda pubescens</i> Sm. In Rees	Achhu	Rubiaceae
70.	<i>Moringa oleifera</i> Lam.	Sajana	Moringaceae
71.	<i>Naringi crenulata</i> (Roxb.) Nicolson	Baintha	Rutaceae
72.	<i>Neolamarckia cadamba</i> (Roxb.) Bosser.	Kadamba	Rubiaceae
73.	<i>Peltophorum pterocarpum</i> (DC.) Backer ex K. Heyne	Radhachuda	Caesalpiniaceae
74.	<i>Phoenix sylvestris</i> (L.) Roxb.	Khajuri	Arecaceae
75.	<i>Phyllanthus acidus</i> (L.) Skeels.	Narkoli	Euphorbiaceae
76.	<i>Phyllanthus emblica</i> L.	Aenla	Euphorbiaceae
77.	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Sima kaiyan / Bilati kaiyan	Mimosaceae

78.	<i>Plumeria rubra</i> L.	Katha champa	Apocynaceae
79.	<i>Polyalthia rubra</i> L.	Debadaru	Apocynaceae
80.	<i>Pongamia pinnata</i> (L.) Pierre.	Karanja	Fabaceae
81.	<i>Psidium guajava</i> L.	Pijuli	Myrtaceae
82.	<i>Pterocarpus marsupium</i> Roxb.	Pisal	Fabaceae
83.	<i>Samanea saman</i> (Jacq.) Merr.	Nidrabati / Chakhunda	Mimosaceae
84.	<i>Santalum album</i> L.	Chandan	Santalaceae
85.	<i>Schleichera oleosa</i> (Lour.) Oken.	Kusuma	Sapindaceae
86.	<i>Semecarpus anacardium</i> L.f.	Bhalia / Kala valia	Anacardiaceae
87.	<i>Shorea robusta</i> Gaertn. f.	Sal	Dipterocarpaceae
88.	<i>Simarouba glauca</i> DC.	Simarouba	Simaroubaceae
89.	<i>Spondias pinnata</i> (L.f.) Kurz.	Ambada	Anacardiaceae
90.	<i>Streblus asper</i> Lour.	Sahada	Moraceae
91.	<i>Strychnos nux-vomia</i> L.	Kochila	Loganiaceae
92.	<i>Strychnos potatorum</i> L.	Kataka	Loganiaceae
93.	<i>Syzygium cumini</i> (L.) Skeels.	Jammu	Myrtaceae
94.	<i>Tamarindus indica</i> L.	Kainyan	Caesalpiniaceae
95.	<i>Tectona grandis</i> L.f.	Saguan	Verbenaceae
96.	<i>Terminalia alata</i> Heyne ex. Roth.	Ashana	Combretaceae
97.	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight.	Arjuna	Combretaceae
98.	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bahada	Combretaceae
99.	<i>Terminalia chebula</i> Retz.	Harida	Combretaceae
100.	<i>Ziziphus mauritiana</i> Lam.	Bara koli	Rhamnaceae

**SHRUBS**

1.	<i>Atalantia malabarica</i> (Rafin.) Tanaka	Narguni	Rutaceae
2.	<i>Breynia vitis-idaea</i> (Burm.f.) Fischer	Jhanjika	Euphorbiaceae
3.	<i>Calotropis gigantea</i> R.Br.	Arakha	Asclepiadaceae
4.	<i>Calotropis procera</i> (Ait.) R.Br.	Dhala Arakha	Asclepiadaceae
5.	<i>Capparis zeylanica</i> L.	Asadhua	Capparaceae
6.	<i>Carissa carandas</i> L.	Kaniar	Apocynaceae
7.	<i>Cassia occidentalis</i> L.	Chakunda	Caesalpiniaceae
8.	<i>Chromolaena odorata</i> (L.) King. & Robins.	Pokasunga	Asteraceae
9.	<i>Cissus quadrangula</i> L.	Hadabhanga	Vitaceae
10.	<i>Clerodendrum inerme</i> (L.) Gaertn.	Guchia	Verbenaceae
11.	<i>Clerodendrum viscosum</i> Vent.	Kharkhari	Verbenaceae
12.	<i>Croton roxburghii</i> Balak.	Masudi / Debachandan	Euphorbiaceae
13.	<i>Glycosmis pentaphylla</i> (Retz.) DC.	Chaula-dhua koli	Rutaceae
14.	<i>Helicteres isora</i> L.	Modimokika / Kukurabicha	Sterculiaceae
15.	<i>Nerium oleander</i> L.	Karabira	Apocynaceae
16.	<i>Ipomoea carnea</i> Jacq. Spp. fistulosa (Mart. Ex Choisy) Austin	Amari	Convolvulaceae

17.	<i>Ixora coccinea</i> L.	Ixora	Rubiaceae
18.	<i>Jasminum scandens</i> Vahl.	Banamalli	Oleaceae
19.	<i>Jatropha gossypifolia</i> L.	Nali-baigaba	Euphorbiaceae
20.	<i>Justicia adhatoda</i> L.	Basanga / Basak	Acanthaceae
21.	<i>Lantana camara</i> L. var. <i>aculaeta</i> (L.) Mold.	Nagabairi / Jaikoli	Verbenaceae
22.	<i>Lippia javanica</i> (Burm.f.) Spreng.	Nagadamana / Naguari	Verbenaceae
23.	<i>Mallotus repandus</i> (Willd.) Muell.-Arg.	Dhankari/ Ghiirgudia	Euphorbiaceae
24.	<i>Melastoma malabathricum</i> L.	Gangei / Karati	Melastomataceae
25.	<i>Mimosa himalayana</i> Gamble.	Kirikichi / Kirikichikanta	Mimosaceae
26.	<i>Nerium oleander</i> L.	Karabira	Apocynaceae
27.	<i>Nyctanthes arbor-tristis</i> L.	Gangasiuli / Sephali	Oleaceae
28.	<i>Opuntia stricta</i> (Haw.) Haw. Var. <i>dillenii</i> (Ker-Gawl.) Benson	Nagapheni	Cactaceae
29.	<i>Pavetta crassicaulis</i> Bremek.	Kathachampa	Rubiaceae
30.	<i>Phyllanthus reticulatus</i> Poir.in	Macharanka / Kukureehellia	Euphorbiaceae
31.	<i>Phoenix acaulis</i> Buch.-Ham. ex. Roxb.	Banakhajuri / Kujikhajuri	Arecaceae
32.	<i>Rauwolfia tetraphylla</i> L.	Patalagaruda	Apocynaceae
33.	<i>Ricinus communis</i> L.	Jada / Gaba	Euphorbiaceae
34.	<i>Vitex negundo</i> L.	Begunia	Verbenaceae
35.	<i>Woodfordia fruticosa</i> (L.) Kurz.	Dhataki	Lythraceae
36.	<i>Ziziphus oenoplia</i> (L.) Mill.	Kanteikoli	Rhamnaceae
<b>CLIMBER</b>			
1.	<i>Acacia pennata</i> (L.) Willd.	Dhantari	Mimosaceae
2.	<i>Aganosma caryophyllata</i> (Roxb. ex Sims.)	Malati	Apocynaceae
3.	<i>Ampelocissus latifolia</i> (Roxb.) Planch.	Kanjianai	Vitaceae
4.	<i>Antigonon leptopus</i> Hook. & Arn.	Snehalata	Polygonaceae
5.	<i>Argyria nervosa</i> (Burm. f.) Boj.	Bataraj	Convolvulaceae
6.	<i>Aristolochia indica</i> L.	Panairi	Aristolochiaceae
7.	<i>Asparagus racemosus</i> Willd.	Satabari	Liliaceae
8.	<i>Bauhinia vahlii</i> Wight. & Arn.	Sialipatra	Caesalpiniaceae
9.	<i>Butea superba</i> Roxb.	Latapalasa	Fabaceae
10.	<i>Cardiospermum halicacabum</i> L.	Photaka / Phutuphutika	Sapindaceae
11.	<i>Cayratia pedata</i> (Lour.) Juss. ex . Gagnep.	Pitapotala	Vitaceae
12.	<i>Cayratia trifolia</i> (L.) Domin.	Chatua / Amalalata	Vitaceae
13.	<i>Clitoria ternatea</i> L.	Aparajita	Fabaceae
14.	<i>Coccineagrandsis</i> (L.) Voigt.	Kainchi-kakudi	Cucurbitacea

15.	<i>Dioscorea pentaphylla</i> L.	Karaba	Dioscoreaceae
16.	<i>Dioscorea wallichii</i> Hook.f.	Pita allu	Dioscoreaceae
17.	<i>Dolichos trilobus</i> L.	Banakolatha	Fabaceae
18.	<i>Hemidesmus indicus</i> (L.) R.Br.	Anantamulla	Asclepiadiaceae
19.	<i>Ipomoea cairica</i> (L.) Sweet.	Bankamala	Convolvulaceae
20.	<i>Ipomoea hederifolia</i> L.	Panikoda	Convolvulaceae
21.	<i>Ipomoea nil</i> (L.) Roth.	Nilakalama / Khamikhondo	Convolvulaceae
22.	<i>Ipomoea quamoclit</i> L.	Kunjolata	Convolvulaceae
23.	<i>Lablab purpureus</i> (L.) Sweet var. <i>lignosus</i> (Prain) Kumari	Simba	Fabaceae
24.	<i>Lagenaria siceraria</i> (Molina) Standly	Lau	Cucurbitaceae
25.	<i>Luffa aegyptiaca</i> Mill.	Salamari	Cucurbitaceae
26.	<i>Mikania micrantha</i> Kunth.	Salamari	Asteraceae
27.	<i>Momordica charantia</i> L.	Kalara	Cucurbitaceae
28.	<i>Momordica dioica</i> Roxb. ex. Willd.	Kankada	Cucurbitaceae
29.	<i>Mucuna pruriens</i> (L.) DC.	Baidanka	Fabaceae
30.	<i>Paederia foetida</i> L.	Parsaruni	Rubiaceae
31.	<i>Passiflora foetida</i> L.	Gandhatamala	Passifloraceae
32.	<i>Quisqualis indica</i> L.	Madhumalati	Combetaceae
33.	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thoms.	Guluchilata	Menispermaceae
34.	<i>Tragia involucrate</i> L.	Bichuati / Latabichuati	Euphorbiaceae
35.	<i>Trichosanthes tricuspidata</i> Lour.	Mahakalaphal	Cucurbitaceae
<b>HERBS</b>			
1.	<i>Abelmoschus manihot</i> (L.) Medic. ssp. <i>Tetraphyllus</i> (Roxb. ex Horn) Borssum	Banabhendi	Malvaceae
2.	<i>Abutilon indicum</i> (L.) Sweet.	Pedipedika	Malvaceae
3.	<i>Acalypha indica</i> L.	Indiramaricha	Euphorbiaceae
4.	<i>Acanthospermum hispidum</i> DC.	Gokhuri	Asteraceae
5.	<i>Achyranthes aspera</i> L.	Apamaranga	Amaranthaceae
6.	<i>Adenosma indianum</i> (Lour.) Merr.		Scrophulariaceae
7.	<i>Adenostemma lavenia</i> (L.) Kuntze.	Panipokasunga	Asteraceae
8.	<i>Aerva lanata</i> (L.) Juss.	Paunsia	Amaranthaceae
9.	<i>Aerva sanguinolenta</i> (L.) Blume	Chaulandhua	Amaranthaceae
10.	<i>Agave Americana</i> L.	Baramasi / Sudarshanlahi	Agavaceae
11.	<i>Ageratum conyzoides</i> L.	Pokasunga	Asteraceae
12.	<i>Alternanthera paronychiodes</i> St. Hill	Madaranga	Amaranthaceae
13.	<i>Alternanthera pungens</i> Kunth.	Madaranga	Amaranthaceae
14.	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC	Madaranga	Amaranthaceae
15.	<i>Alternanthera tenella</i> Colla.	Madaranga	Amaranthaceae
16.	<i>Amaranthus viridis</i> L.	Leutia saga	Madaranga
17.	<i>Amorphophallus bulbifer</i> (Roxb.) Bl.	Jungli olua / Dhara olua	Araceae

18.	<i>Amorphophallus paenifollius</i> (Dennst.) Nicolson	Olua	Araceae
19.	<i>Andrographis paniculata</i> (Burm.f.) Wall. ex Nees	Bhuinnimba / Chireita	Acanthaceae
20.	<i>Anisochilus carnosus</i> (L.f.) Wall.	Bennia	Lamiaceae
21.	<i>Anisomeles indica</i> (L.) Kuntze	Landabaguli	Lamiaceae
22.	<i>Argemone mexicana</i> L.	Agara / Kantakusum	Papaveraceae
23.	<i>Atylosia cajanifolia</i> Haines.	Jangali harada	Fabaceae
24.	<i>Barleria cristata</i> L.	Daskarenta	Acanthaceae
25.	<i>Bidens biternata</i> (Lour.) Merr.	Maghalatenga	Asteraceae
26.	<i>Biophytum sensitivum</i> (L.) DC.	Chotalajakuli	Oxalidaceae
27.	<i>Blumea aurita</i> (L.f.) DC.	Pokasunga	Asteraceae
28.	<i>Blumea lacera</i> (Burm.f.) DC.	Pokasunga/ Kukursunga	Asteraceae
29.	<i>Boerhavia diffusa</i> L.	Puruni	Nyctaginaceae
30.	<i>Cajanus cajan</i> (L.) Huth.	Harada	Fabaceae
31.	<i>Canscora decussate</i> (Roxb.) Sch. & Sch.f.	Shankhapuspi/ Dandipohala	Gentianaceae
32.	<i>Canscora diffusa</i> (Vahl.) R.Br.	Bururia	Gentianaceae
33.	<i>Cassia pumila</i> Lam.		Caesalpiniaceae
34.	<i>Celosia argentea</i> L.	Lahanga	Amaranthaceae
35.	<i>Chenopodium album</i> L.	Bathua	Chenopodiaceae
36.	<i>Cleome viscosa</i> L.	Anasorisa	Capparaceae
37.	<i>Coldenia procumbens</i> L.	Hansapadi / Gandharilata	Boraginaceae
38.	<i>Commelina benghalensis</i> L.	Kanisiri	Commelinaceae
39.	<i>Commelina erecta</i> L.	Kanisiri	Commelinaceae
40.	<i>Commelina longifolia</i> Lam.	Kanisiri	Commelinaceae
41.	<i>Commelina paludosa</i> Bl.		Commelinaceae
42.	<i>Corchorus aestuans</i> L.	Bananalita	Tiliaceae
43.	<i>Costus speciosus</i> (Koenig) Sm.	Gaigobara	Zingiberaceae
44.	<i>Crassocephalum crepidioides</i> (Benth.) Moore		Asteraceae
45.	<i>Crotalaria pallida</i> Ait.	Jhun-Junuka	Fabaceae
46.	<i>Crotalaria retusa</i> L.		Fabaceae
47.	<i>Crotalaria spectabilis</i> Roth.	Jhunka	Fabaceae
48.	<i>Crotalaria verrucosa</i> L.	Bali Jhunka	Fabaceae
49.	<i>Croton bonplandianus</i> Baill.	Bana lanka maricha	Euphorbiaceae
50.	<i>Cucumis trigonus</i> Roxb.	Banakakudi / Kainchikakudi	Cucurbitaceae
51.	<i>Curcuma longa</i> L.	Haldi	Zingiberaceae
52.	<i>Cyanotis cristata</i> (L.) D.Don.		Commelinaceae
53.	<i>Eclipta prostrate</i> (L.) L.	Bhrungaraj	Asteraceae
54.	<i>Elephantopus scaber</i> L.	Mayurchulia	Asteraceae
55.	<i>Emilia sonchifolia</i> (L.) DC.	Sarkara	Asteraceae
56.	<i>Enydra fluctuans</i> Lour.	Hidimichika	Asteraceae
57.	<i>Euphorbia hirta</i> L.	Chitakutei /	Euphorbiaceae



		Hariharika	
58.	<i>Euphorbia rosea</i> Retz.	Chitira	Euphorbiaceae
59.	<i>Euphorbia thymifolia</i> L.	Bhinsiju	Euphorbiaceae
60.	<i>Evolvulus alsinoides</i> (L.) L.	Sankhapuspi	Convolvulaceae
61.	<i>Evolvulus nummularius</i> (L.) L.	Bichhamalia	Convolvulaceae
62.	<i>Glinus lotoides</i> L.	Ghodapitasaga	Molluginaceae
63.	<i>Glinus oppositifolius</i> (L.) A.DC.	Pitasaga	Molluginaceae
64.	<i>Gnaphalium pensylvanicum</i> Willd.		Asteraceae
65.	<i>Gomphrena celosioides</i> Mart.		Amaranthaceae
66.	<i>Grangea maderaspatana</i> (L.) Poir.	Agnikumari	Asteraceae
67.	<i>Hedyotis corymbosa</i> (L.) Lam.	Gharpodia	Rubiaceae
68.	<i>Hedyotis diffusa</i> Willd.	Gharpodia	Rubiaceae
69.	<i>Hedyotis herbacea</i> L.	Gharpodia	Rubiaceae
70.	<i>Heliotropium indicum</i> L.	Hatisundha	Boraginaceae
71.	<i>Hybanthus enneaspermus</i> (L.) F.V. Muell.	Madanmastak	Violaceae
72.	<i>Hyptis suaveolens</i> (L.) Poit.	Gangatulasi / Gaitulasi	Lamiaceae
73.	<i>Indigofera linnaei</i> Ali	Latahai	Fabaceae
74.	<i>Indigofera prostrata</i> Willd.		Fabaceae
75.	<i>Ipomoea pes-tigridis</i> L.	Bileipada	Convolvulaceae
76.	<i>Jatropha curcas</i> L.	Rama jada / Dhalabaigaba	Euphorbiaceae
77.	<i>Justicia quinqueangularis</i> Koenig ex Roxb.		Acanthaceae
78.	<i>Knoxia sumatrensis</i> (Retz.) DC.		Rubiaceae
79.	<i>Laportea interrupta</i> (L.) Chew.	Ghodabichuati	Urticaceae
80.	<i>Launaea aspleniifolia</i> (Willd.) Hook.f.	Birmalla	Asteraceae
81.	<i>Leonotis nepetifolia</i> (L.) R.Br.	Kantasia	Lamiaceae
82.	<i>Lepidagathis rustacean</i> (Retz.) Nees	Rasna	Acanthaceae
83.	<i>Leucas aspera</i> (Willd.) Link.	Gayasa	Lamiaceae
84.	<i>Leuccas cephalotes</i> (Roth) Spreng.	Gayasa	Lamiaceae
85.	<i>Lindernia ciliate</i> (Colsm.) Pennell.	Khekura	Scrophulariaceae
86.	<i>Lindernia crustacean</i> (L.) F.V. Muell.	-	Scrophulariaceae
87.	<i>Ludwigia perennis</i> L.	Bilalabanga	Onagraceae
88.	<i>Ludwigia prostrata</i> Roxb.	Bilalabanga	Onagraceae
89.	<i>Malachra capitata</i> (L.) L.	-	Malvaceae
90.	<i>Martynia annua</i> L.	Baghanakhi	Pedalliaceae
91.	<i>Mazus pumilus</i> (Burm.f.) Steenis		Scrophulariaceae
92.	<i>Melochia corchorifolia</i> L.	-	Sterculiaceae
93.	<i>Merremia tridentate</i> (L.) Hall.f. subsp. <i>hastate</i> (Hall.f.) Ooststr.		Convolvulaceae
94.	<i>Micrococa mercurialis</i> (L.) Benth.		Euphorbiaceae
95.	<i>Mimosa pudica</i> L.	Lajakuli	Mimosaceae
96.	<i>Mirabilis jalapa</i> L.	Rangani	Nyctaginaceae
97.	<i>Nutraceutical villosus</i> (Sw.) DC.	Sanagharapodia	Rubiaceae

98.	<i>Mollugo pentaphylla</i> L.	Pitagaham / Pita saga	Molluginaceae
99.	<i>Ocimum basilicum</i> L.	Subasi/Sugandhi	Lamiaceae
100.	<i>Ocimum canum</i> Sims.	Ganga-tulasi	Lamiaceae
101.	<i>Ocimum gratissimum</i> L.	Gandha-tulasi / Bana Tulasi	Lamiaceae
102.	<i>Ocimum sanctum</i> L.	Tulasi / Kala Tulasi	Lamiaceae
103.	<i>Pentanema indicum</i> (L.) Y. Ling	Banasebati	Asteraceae
104.	<i>Peperomia pellucida</i> (L.) Kunth.	Ghusuripana	Piperaceae
105.	<i>Phyla nodiflora</i> (L.) Greene	Gosingi	Verbenaceae
106.	<i>Phyllanthus fraternus</i> Webster	Badiamla	Euphorbiaceae
107.	<i>Phyllanthus urinaria</i> L.	Bhuinamla	Euphorbiaceae
108.	<i>Phyllanthus virgatus</i> Forst.f.	Bhuinamla	Euphorbiaceae
109.	<i>Polygonum barbatum</i> L.		Polygonaceae
110.	<i>Polygonum plebeium</i> R.Br.	Muthisaga / Chantisagar	Polygonaceae
111.	<i>Portulaca oleracea</i> L.	Badabalbalua	Portulacaceae
112.	<i>Scoparia dulcis</i> L.	Khetapapada	Scrophulariaceae
113.	<i>Sesamum orientale</i> L.	Khasa/Tila	Pedaliaceae
114.	<i>Sesbania cannabina</i> (Retz.) Pers.	Dhanicha	Fabaceae
115.	<i>Sesbania javanica</i> Miq.	Kathasola	Fabaceae
116.	<i>Sida acuta</i> Burn.f.	Bajramuli	Malvaceae
117.	<i>Sida cordata</i> (Burm.f.) Borssum	Bisiripi	Malvaceae
118.	<i>Sida cordifolia</i> L.	Biswakopari/ Bisiripi	Malvaceae
119.	<i>Spermacoce aricularis</i> L.f.	Solaganthi/ Sanagharpodia	Rubiaceae
120.	<i>Spermacoce mauritiana</i> Osea Gideon ex Verdc.		Rubiaceae
121.	<i>Sphaeranthus indicus</i> L.	Bhuinkadamba	Asteraceae
122.	<i>Spilanthes paniculata</i> Wall. ex DC.		Asteraceae
123.	<i>Synedrella nodiflora</i> (L.) Gaertn.		Asteraceae
124.	<i>Tephrosia pumila</i> (Lam.) Pers.	Mainsia / Kolathia	Fabaceae
125.	<i>Tephrosia purpurea</i> (L.) Pers.	Nalipahara / Bananila	Fabaceae
126.	<i>Tonningia axillaris</i> (L.) Kuntze.	Godhuli	Commelinaceae
127.	<i>Trichodesma zeylanicum</i> (Burm.f.) R.Br.	Heta mundia / Henturi	Boraginaceae
128.	<i>Tridax procumbens</i> L.	Bisalyakarini	Asteraceae
129.	<i>Triumfetta pentandra</i> A.Rich.	Bana-nalita	Tiliaceae
130.	<i>Turnera ulmifolia</i> L.	Basanti	Turneraceae
131.	<i>Urena lobata</i> L.	Rakta pheni / Bilakapasia	Malvaceae
132.	<i>Vernonia cinerea</i> (L.) Less.	Pokasunga	Asteraceae
133.	<i>Vigna mungo</i> (L.) Happer.	Biri	Fabaceae
134.	<i>Waltheria indica</i> L.	Bilanalita	Sterculiaceae

135.	<i>Wedelia chinensis</i> (Osbeck) Merr.	Kasaraj/Bhringaraj	Asteraceae
136.	<i>Xanthium indicum</i> Koenig.	Badagokhara	Asteraceae
137.	<i>Zingiber officinale</i> Rosc.	Ada	Zingiberaceae
138.	<i>Zingiber rubens</i> Roxb.	Gaigaruda	Zingiberaceae
<b>GRASS</b>			
1.	<i>Alloteropsis semialata</i> (R.Br.) Hitchc.	Kantabaunsa	Poaceae
2.	<i>Andropogon pumilus</i> Roxb.	Gandabena	Poaceae
3.	<i>Bambusa bambos</i> (L.) Voss.	Basana	Poaceae
4.	<i>Bothriochloa bladhii</i> (Retz.) S.T. Blake		Poaceae
5.	<i>Bothriochloa pertusa</i> (L.) A.Camus	Para ghasa	Poaceae
6.	<i>Brachiaria distachya</i> (L.) Stapf.	Baunsiaghasa	Poaceae
7.	<i>Brachiaria mutica</i> (Forssk.) Stapf.		Poaceae
8.	<i>Brachiaria ramosa</i> (L.) Stapf.		Poaceae
9.	<i>Bulbostylis densa</i> (Wall.) Hand.	Jergi Gandhi	Cyperaceae
10.	<i>Bulbostylis sub-spinescens</i> C.B.Cl.	Guguchia	Cyperaceae
11.	<i>Chloris barbata</i> Sw.		Poaceae
12.	<i>Chrysopogon aciculatus</i> (Retz.) Treen.		Poaceae
13.	<i>Chrysopogon verticillatus</i> Roxb.		Poaceae
14.	<i>Coix aquatic</i> Roxb.	Gargara	Poaceae
15.	<i>Coix gigantean</i> Koenig	Dhanwantari	Poaceae
16.	<i>Coix lacryma-jobi</i> L.		Poaceae
17.	<i>Cymbopogon flexuosus</i> (Nees ex Seud.) Wats.	Dubaghasa	Poaceae
18.	<i>Cynodon barberi</i> Rang. & Tad.		Poaceae
19.	<i>Cynodon dactylon</i> (L.) Pers.		Poaceae
20.	<i>Cyperus flabelliformis</i> Rottb.	Swanti	Cyperaceae
21.	<i>Cyperus imbricatus</i> Retz.		Cyperaceae
22.	<i>Cyperus</i> L.		Cyperaceae
23.	<i>Cyperus leucocephalus</i> Retz.		Cyperaceae
24.	<i>Cyperus articulatus</i> L.		Cyperaceae
25.	<i>Cyperus brevifolius</i> (Rottb.) Hassk.	Chancha	Cyperaceae
26.	<i>Cyperus compactus</i> Retz.		Cyperaceae
27.	<i>Cyperus compressus</i> L.		Cyperaceae
28.	<i>Cyperus conglomeratus</i> Rottb.		Cyperaceae
29.	<i>Cyperus corymbosus</i> Rottb.	Suneli	Cyperaceae
30.	<i>Cyperus cuspidatus</i> Kunth.		Cyperaceae
31.	<i>Cyperus difformis</i> L.		Cyperaceae
32.	<i>Cyperus diffuses</i> Vahl.		Cyperaceae
33.	<i>Cyperus distans</i> L.f.		Cyperaceae
34.	<i>Cyperus halpan</i> L.	Balsuryamukhi	Cyperaceae
35.	<i>Cyperus kyllingia</i> Endl.		Cyperaceae
36.	<i>Cyperus niveus</i> Retz.		Cyperaceae
37.	<i>Cyperus nutans</i> Vahl.		Cyperaceae
38.	<i>Cyperus platystylis</i> R.Br.		Cyperaceae

39.	<i>Cyperus polystachyos</i> Roxb.		Cyperaceae
40.	<i>Cyperus pulchellus</i> R.Br.	Mutha	Cyperaceae
41.	<i>Cyperus puncticulatus</i> Vahl.	Mutha	Cyperaceae
42.	<i>Cyperus rotundus</i> var. <i>tuberosus</i> (Rottb.) Kuek.		Cyperaceae
43.	<i>Cyperus rotundus</i> L. var. <i>rotundus</i> Kern.	Kakudia	Cyperaceae
44.	<i>Cyperus triceps</i> Endl.	Chirichira	Cyperaceae
45.	<i>Dactyloctenium aegyptium</i> (L.) P. Beauv.	Badabetha	Poaceae
46.	<i>Digitaria abludens</i> (Roem. and Schult.) Veldk.		Poaceae
47.	<i>Digitaria ciliaris</i> (Retz.) Koeler.	Suan	Poaceae
48.	<i>Digitaria longfolia</i> (Retz.) Pers.		Poaceae
49.	<i>Echinochloa colona</i> (L.) Link.		Poaceae
50.	<i>Eleocharis geniculata</i> (L.) Roem.		Cyperaceae
51.	<i>Eleocharis acutangula</i> (Roxb.) Schult.		Cyperaceae
52.	<i>Eleocharis atropurpurea</i> (Retz.) Prest.		Cyperaceae
53.	<i>Eleocharis congesta</i> D.Don	Ana mandia	Cyperaceae
54.	<i>Eleocharis dulcis</i> (Burm.f.) Henschef.		Cyperaceae
55.	<i>Eleusine indica</i> (L.) Gaertn.	Kankrachera	Poaceae
56.	<i>Eragrostis ciliate</i> (Roxb.) Nees.		Poaceae
57.	<i>Eragrostis japonica</i> (Thunb.) Trin.		Poaceae
58.	<i>Eragrostis minor</i> Host.	Furfuri	Poaceae
59.	<i>Eragrostis pilosa</i> (L.) P.Beauv.	Badaswonli	Poaceae
60.	<i>Eragrostis unioides</i> (Retz.) Nees	Swonli	Poaceae
61.	<i>Fimbristylis dichotoma</i> (L.) Vahl.		Cyperaceae
62.	<i>Fimbristylis miliacea</i> (L.) Vahl.	Sankuli	Cyperaceae
63.	<i>Fimbristylis polytrichoides</i> (Retz.) R.Br.	Khara grass	Cyperaceae
64.	<i>Heteropogon contortus</i> (L.) P.Beauv.	Kander	Poaceae
65.	<i>Imperata cylindrical</i> (L.) Raeusch.		Poaceae
66.	<i>Ischaemum indicum</i> (Houtt.) Merr.		Poaceae
67.	<i>Ischaemum rugosum</i> Salisb.		Poaceae
68.	<i>Ischaemum prostratum</i> (L.) Aders.		Poaceae
69.	<i>Lipocarphas phacelata</i> (Vahl.) Kuntze.	Kauguria	Cyperaceae
70.	<i>Myriostachya wightiana</i> (Nees ex Steud.)	Balunga	Poaceae
71.	<i>Oplismenus compositus</i> (L.) P.Beauv.		Poaceae
72.	<i>Oryza rufipogon</i> Griff.		Poaceae
73.	<i>Oryza sativa</i> L.		Poaceae
74.	<i>Panicum brevifolium</i> L.		Poaceae
75.	<i>Panicum notatum</i> Retz.		Poaceae
76.	<i>Panicum paludosum</i> Roxb.	Reda	Poaceae
77.	<i>Panicum psilopodium</i> Trin.	Bileilanji	Poaceae
78.	<i>Panicum repens</i> L.		Poaceae
79.	<i>Paspalum flavidum</i> (Retz.) A.Camus	Kodua	Poaceae
80.	<i>Paspalum geminatum</i> (Forssk.) Stapf.		Poaceae
81.	<i>Paspalum scrobiculatum</i> L.	Swati	Poaceae

82.	<i>Paspalum vaginatum</i> Sw.	Nakatoka	Poaceae
83.	<i>Pennisetum pedicellatum</i> Trin.		Poaceae
84.	<i>Perotis indica</i> (L.) Kuntze		Poaceae
85.	<i>Phalaris minor</i> Retz.	Kasatandi	Poaceae
86.	<i>Pogonatherum crinitum</i> (Tnunb.) Kunth.	Gaichara	Poaceae
87.	<i>Saccharum spontaneum</i> L.	Sialalanguda	Poaceae
88.	<i>Scirpus articulatus</i> L.		Cyperaceae
89.	<i>Setaria pumila</i> (Poir.) Roem & Schult.	Phuljhadu	Poaceae
90.	<i>Sporobolus indicus</i> (L.) R.Br. var. <i>diander</i> (Retz.) Jovet & Guedes	Bena	Poaceae
91.	<i>Thysanolaena maxima</i> (Roxb.) Kuntze.	Maka	Poaceae
92.	<i>Vetiveria zizaiodes</i> (L.) Nash.		Poaceae
93.	<i>Zea mays</i> L.		Poaceae

**HYDROPHYTES**

1.	<i>Blyxa echinosperma</i> (C.B.Cl.) Hook.f.	Bilatidala	Hydrocharitaceae
2.	<i>Eichhornia crassipes</i> (Mart.) Solms	Chingudiadala	Pontedericeae
3.	<i>Hydrilla verticillata</i> (L.) Vahl.	Nilatara	Hydrocharitaceae
4.	<i>Hydrolea zeylanica</i> (L.) Vahl.	Kalama saga	Hydrophyllaceae
5.	<i>Ipomoea aquatic</i> Forssk.	Batakaghasa	Convolvulaceae
6.	<i>Lemna perpusilla</i> Torrey	Kajalapati	Lemnaceae
7.	<i>Monochoria hasata</i> Solms-Laub.	Padma	Pontedericeae
8.	<i>Nelumbo nucifera</i> Gaertn.	Nilakain	Nymphaeaceae
9.	<i>Nymphaea nouchali</i> Burm.f.	Dhalakain	Nymphaeaceae
10.	<i>Nymphaea pubescens</i> Willd.	Panisiuli	Nymphaeaceae
11.	<i>Nymphoides hydrophylla</i> (Lour.) Kuntze.	Panisiuli	Menyanthaceae
12.	<i>Nymphoides indica</i> (L.) Kuntze.	Borojanjhi	Gentianaceae
13.	<i>Pistia stratiotes</i> L.	Bihagni	Araceae
14.	<i>Polygonum glabrum</i> Willd.		Polygonaceae
15.	<i>Spirodela polyrhiza</i> (L.) Sch.	Khainchiadala	Lemanaceae
16.	<i>Utricularia stellaris</i> L.f.		Utriculariaceae

**PTERIDOPHYTES**

1.	<i>Adiantum pedatum</i> Forssk.		Pteridiaceae
2.	<i>Arachniodes aristata</i> (Forst.f.) Tindale		Dryopteridaceae
3.	<i>Azolla pinnata</i> R.Br.		Azollaceae
4.	<i>Ceratopteris thalicterooides</i> (L.) Brongn.		Parkeriaceae
5.	<i>Dryopteris filix-mas</i> (D.Don) C.	Common male fern	Dryopteridaceae
6.	<i>Huperzia squarrosa</i> (Forst.) Trev.		Lycopodiaceae
7.	<i>Lygodium flexuosum</i> (L.) Sw.		Lygodiaceae
8.	<i>Lygodium microphyllum</i> R.Br.		Lygodiaceae
9.	<i>Lygodium palmatum</i> (Bernh.) Swartz.		Lygodiaceae
10.	<i>Marsilea minuta</i> L.		Marseliaceae
11.	<i>Nephrolepis cordifolia</i> (L.) Presl.		Nephrolepidiaceae
12.	<i>Nephrolepis exaltata</i> (L.) Schott.		Nephrolepidiaceae

13.	<i>Polypodium ursipes</i> Det Robbin-Moran		Polypodiaceae
14.	<i>Pteridium aquilinum</i> (L.) Kuhn.		Pteridiaceae
15.	<i>Pteris cretica</i> L.		Pteridiaceae
16.	<i>Salvinia cuculata</i> Roxb.		Salviniaceae
17.	<i>Selaginella bryopteris</i> (L.) Baker.	Kala-mahajala	Selaginellaceae
18.	<i>Selaginella indica</i> (Milde) Trayon.	Mrutyusanjivani	Selaginellaceae
<b>BRYOPHYTES</b>			
1.	<i>Riccia huebeneriana</i> L.		Ricciaceae
2.	<i>Tortulam rularis</i> (Hedw.) Gaertn.		Pottiaceae
<b>EPIPHYTES</b>			
1.	<i>Vanda tessellate</i> (Roxb.) Hook ex G.Don	Rasna	Orchidaceae
<b>PARASITES</b>			
1.	<i>Cassytha filiformis</i> L.	Nirmuli lata	Lauraceae
2.	<i>Cuscuta reflexa</i> Roxb.	Malanga	Cuscutaceae
3.	<i>Viscum articulatum</i> Burn.f.		Loranthaceae

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***“Prime Minister of India introduced the concept of ‘Lifestyle’ for the Environmental (LIFE) at COP26 in Glasgow on 1<sup>st</sup> November 2021, calling upon the Global Community of Individuals and institutions to drive LIFE as an international mass movement towards “mindful and deliberate utilization, instead of mindless and destructive consumption” to protect and preserve the environment.”***

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विद्यया ऽ मृतमश्नुते



एन सी ई आर टी  
NCERT



यस्यां समुद्र उत सिन्धुरापो यस्यामन्नं कृष्टयः सम्बभूवुः ।  
यस्यामिदं जिन्वति प्राणदेजत्सा नो भूमिः पूर्वपेये दधातु ॥ 3 ॥

"In whom the sea, canals, lakes, wells, tanks, in whom our food and cornfields had their being, in whom this all that breathes and moves is active may this Earth (bhumi) grant us all excellent eatable and drinkable objects like milk, fruits, water and cereals."

**Atharva Veda (A.V.) 12.1.3**