

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY AND SCIENCES
GREEN AUDIT REPORT 2019 TO 2020



Audit Team

Dr. Vinay Sagar

(Chief Environmental Consultant)

K. Srinija Aparna

(Environmental Consultant)

Sanchari Biswas ***(Associate consultant)***

P.V.R Sravya

(Assistant Professor, Civil Department)

#	Contents	Pages
I	Preamble	3
II	Green Audit Initiatives	5
III	Scope & Objectives	5
IV	Green Audit	9
V	Audit Recommendations	22

I. PREAMBLE

Anil Neerukonda Institute of Technology and Sciences (ANITS), with the approval of the All India Council for Technology Education, New Delhi and the Govt. of Andhra Pradesh, was established in the Academic Year 2001–02 to provide quality educational services in the fields of Technology and Sciences. The institute is affiliated to one of the oldest universities of India, Andhra University, Visakhapatnam.

1. Vision and Mission Statements of the College:

VISION

ANITS envisions emerging as a world-class technical institution whose products represent a good blend of technological excellence and the best of human values.

MISSION

To train young men and women into competent and confident engineers with excellent communicational skills, to face the challenges of future technology changes, by imparting holistic technical education using the best of infrastructure, outstanding technical and teaching expertise and an exemplary work culture, besides molding them into good citizens..

2. Campus and Physical Infra:

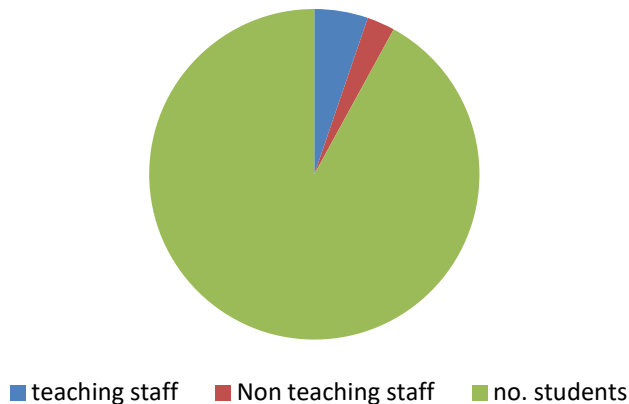
ANITS has a campus of 4.31 hectares, managed with green development concepts. As per the land management documents of the Institution, an area of 7978.60 m² is under built up area, while the remaining area is under Open category, either under Play fields or under parks and green belt.

	Land use type	Extent (m ²)
1	Total Area	45484.00
2	Built up Ground Area	7978.60

Campus Population:

The campus has a population of around 4,766 of which, 4636 are only day users. Of the total population, 92.02% are Students, while teaching and supporting staff account for 5.24 % and 2.72 %, respectively.

ANITS Population Strata



II Green Campus & Green Audit Initiative

ANITS, as a lead institute of the region, is committed to educate its students and employees on environmental concerns and sustainability and to make the campus **Carbon Neutral Campus** within 5 years from the year 2019 – 2020. Towards this, Green Audit of the institution is initiated along with several Sustainability Initiatives beyond the recommendations of the AICTE, so as to ensure that the campus complies with the **Sustainable Development Goals** (SDGs) and will be a role model to all other Institutions.

Based on the Decision of the Management, the Institute Principal has entrusted the work to M/s ENVIRO KAMKAR (LLP), Visakhapatnam for assisting the institute in the conduct of the Green Audit (GA).

III. SCOPE, OBJECTIVES & STRATEGY FOR ANITS GREEN AUDIT

Green audit enables to identify and provide opportunities to promote sustainable development practices, enhance environmental quality, improve health, hygiene and safety, save resources and achieve values of virtue. Green Audits are a sub-set of Environmental audits, and can be a highly valuable tool

for educational institutions in a wide range of ways to improve their environmental and economic performance and thereby their reputations.

The scope of the Green Audit for ANITS is so designed that the process and audit outcome should not only define the state of various environmental components, but also help the institution to compare its own programmes and activities over different years and to compare with other peer institutions. Other benefits should include, educating the students and employees on the environmental issues; identify areas for improvement and prioritize the implementation of future projects.

An effective and systematic scheme was designed and adopted to establish the baseline data for various environmental conditions. The aim of green auditing is to help the institution to adopt sustainable development practices and to inculcate these concepts in the minds of young engineers, and through them to the nation.

1. General and Specific Objectives of Green Auditing

The general objective of green audit is to prepare a baseline report on the status of (i) biodiversity and other resources, (ii) wastes generated and to mitigate resource wastage and improve resource quality and sustainable practices by involving the campus community and through them to reach the public.

The specific objectives are:

- To prepare a checklist of flora and fauna diversity in and around the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To monitor the energy consumption pattern of the college.

- To assess the water usage and its quality, within the college campus.
- To suggest sustainable energy usage and water conservation practices.
- To find out various sources for generation and mitigation of different wastes.

2. Strategy for Green Audit at ANITS:

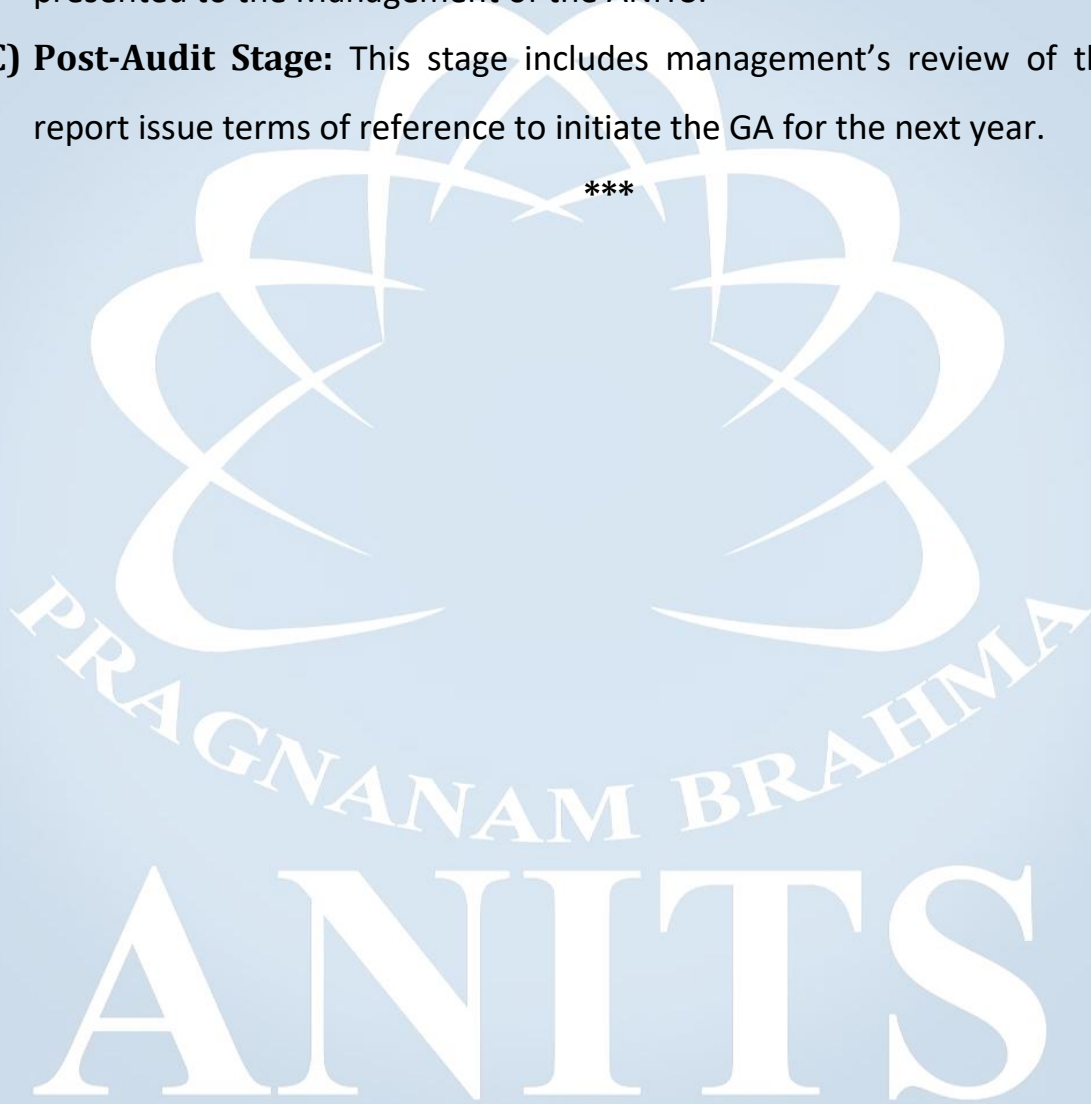
This being for the first time for the ANITS of conducting a Green Audit, the audit programme was developed after detailed deliberations initiated by the management, staff and the external auditors, M/s. EKR. The GA period was synchronized with the academic year (June 2019 to May 2020). The whole process was divided into three stages:

A) Pre-Audit Stage: During this stage, with the Principal of the Institution on Chair, the GA Team was constituted with five Core Members (Three from the Institution and the remaining two from the third party consultant organization, EKR. The Institutional members, have involved all the department and other unit heads of the ANITS, comprising the teaching, administrative and other allied units of the institution and the GA protocols, requirements for collecting the audit evidences and the implementation schedules were prepared.

B) Audit Stage: During this stage, collection and validation of the audit evidences are the main activities which are on day-to-day basis and require systematic book keeping and data base development. This being the first ever audit for the ANITS, the procedures and methods were reviewed on monthly basis by the core team and validation of GA evidences were streamlined for the primary sectors of Landuse, Water, Air Quality,

Greenery, wastes generated and safe disposal of wastes. Along with these, training and awareness programmes for the Students, Teaching staff and supporting staff are conducted by the EKR. At the end of this stage, during May 2020, the audit results were analyzed and the audit report was presented to the Management of the ANITS.

C) Post-Audit Stage: This stage includes management's review of the GA report issue terms of reference to initiate the GA for the next year.



IV, GREEN AUDIT SUMMARY RESULTS

The Green audit of 2019-2020 covers the period between June 2019 to May 2020. However, the last two months of this period (March 20th 2020 to May 31st 2020) being the Covid19 lockdown period, those two months information on the resources consumption and conservation do not reflect the true status. Hence, the effective period for the Audit is only 10 months.

1. LAND USE:

The Green status of the land use in the ANITS, with nearly 32% of the area under open uses, can be considered as very good land use planning. The per capita open area is around 3.624 m², which is fairly very good and among similar level institutions under private sector, the status is **High healthy**.

#	Land Use	Extent (m ²)	Extent (ha)	% of Land Area
1	Built-up Ground Coverage	7978.60	0.80	17.54
2	Total Parking Area	8974.74	0.90	19.73
3	Tot-Lot + Play Ground Areas	5306.16	0.53	11.67
4	Roads and Tracks	5951.80	0.59	13.08
5	Vacant Site Area	17272.70	1.72	37.98
	TOTAL AREA	45484.00	4.54	

The land use can be considered as highly balanced as per the norms for institutions of higher learning. Though the vacant site area, was marked for greening, the total open area (areas under roads and Tracks; Play ground areas and more than 80% of the Parking areas are left open to sky, thereby enabling free wind flow, good harvesting of rain waters through natural percolation.

GREENERY:

The present one being the 1st ever GA for this institute, the audit for the greening was limited to the **Tree Cover** only, while the other vegetation strata was not considered as most of them are either annuals or ornamental exotics. results indicate that about 80% of the Open Areas in the campus are covered with vegetation.

The general pattern of the vegetation is more **peripheral** to the individual blocks than to the campus boundary. The campus has a boundary length of around 1200 m, while 42% of the length has matured tree cover. Similarly, the areas between different building blocks also have dense tree cover (Fig. 1).



In terms of species diversity, number of trees and biomass quantities, the assessment was made and the results indicate that, the diversity of the tree cover and biological productivity from the available land has good scope for improvement. However, the present state of the tree species diversity and their enumeration are reported.

A total of 634 individual trees belonging to 17 tree species were recorded in the ANITS campus (Table T). Their composition indicates that most of them are native species of economic importance. The distribution of the trees into different girth classes (Table G) indicate that 70% of the trees are aged less than 20 years old, revealing that most of them were planted after the campus is initiated.

Table T: Tree Populations of ANITS campus:

No.	Family	Scientific Name	Vernacular Name	No.
1	ANACARDIACEAE	<i>Mangifera indica</i>	Mango	46
2	APOCYNACEAE	<i>Cascabela thevetia</i>	Pachha Ganneru	56
3	ARECACEAE	<i>Borrasus flabellifer</i>	Thati	58
4	ARECACEAE	<i>Cocos nucifera</i>	Coconut	47
5	ARECACEAE	<i>Dypsis lutescens</i>	Areca Palm	37
6	COMBRETACEAE	<i>Terminalia catappa</i>	Badam	40
7	FABACEAE	<i>Delonix regia</i>	Thurai	48
8	FABACEAE	<i>Caesalpinia pulcherrima</i>	Pamidi Thangedu	22
9	FABACEAE	<i>Dalbergia sissoo</i>	Indian Rosewood	1
10	FABACEAE	<i>Millettia pinnata</i>	Kanuga	42
11	FABACEAE	<i>Peltophorum pterocarpum</i>	Konda Chinta	6
12	FABACEAE	<i>Saraca asoca</i>	Ashoka	62
13	MELIACEAE	<i>Azadirachta indica</i>	Neem	49
14	MORACEAE	<i>Ficus religiosa</i>	Ravi	6
15	MYRTACEAE	<i>Psidium guajava</i>	Guava	52
16	MYRTACEAE	<i>Syzygium cumini</i>	Neredu	3
17	RUBIACEAE	<i>Neolamarcia cadamba</i>	Kadamba	42
18	SAPINDACEAE	<i>Sapindus emarginatus</i>	Kunkudu	17
TOTAL				634

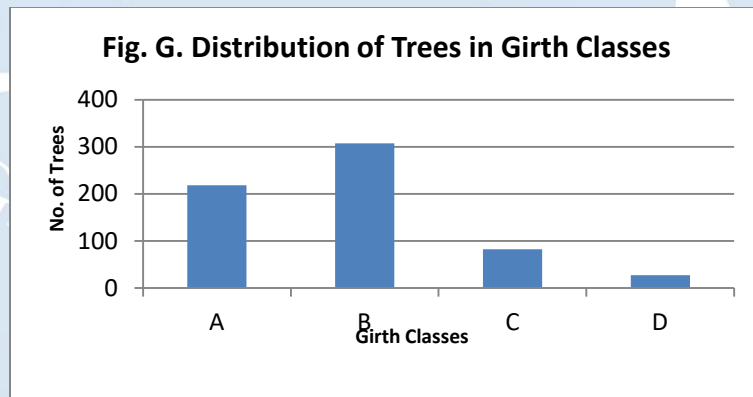
Table G. Distribution of Tree populations in to different Girth Classes.

No.	Scientific Name	Vernacular Name	Girth Classes				No.
			A	B	C	D	
1	<i>Mangifera indica</i>	Mango	-	36	7	3	46
2	<i>Cascabela thevetia</i>	Pachha Ganneru	29	27	-	-	56
3	<i>Borrasus flabellifer</i>	Thati	-	12	37	9	58
4	<i>Cocos nucifera</i>	Coconut	-	29	12	6	47
5	<i>Dypsis lutescens</i>	Areca Palm	-	27	7	3	37
6	<i>Terminalia catappa</i>	Badam	18	20	2	-	40
7	<i>Delonix regia</i>	Thurai	21	24	3	-	48
8	<i>Caesalpinia pulcherrima</i>	Pamidi Thangedu	3	19	-	-	22
9	<i>Dalbergia sissoo</i>	Rosewood	-	1	-	-	1
10	<i>Millettia pinnata</i>	Kanuga	31	11	-	-	42
11	<i>Peltophorum pterocarpum</i>	Konda Chinta	2	4	-	-	6
12	<i>Saraca asoca</i>	Ashoka	5	44	9	4	62
13	<i>Azadirachta indica</i>	Neem	13	30	4	2	49
14	<i>Ficus religiosa</i>	Ravi	4	2	-	-	6
15	<i>Psidium guajava</i>	Guava	52	-	-	-	52
16	<i>Syzygium cumini</i>	Neredu	-	2	1	-	3
17	<i>Neolamarcia cadamba</i>	Kadamba	26	16	-	-	42
18	<i>Sapindus emarginatus</i>	Kunkudu	34	3	-	-	17
TOTAL			218	307	82	27	634
A = <40 cm; B = 41 – 90 cm; C = 91 – 140 cm; D = > 140							

The two interesting native species are (1) *Neolamarcia cadamba*, a sacred tree species popularly called as Kadamba; and (2) *Dalbergia sissoo*, called Rose wood tree, a highly commercial wood species. Of these two species, the former is in good numbers, while the second one is a lone individual.

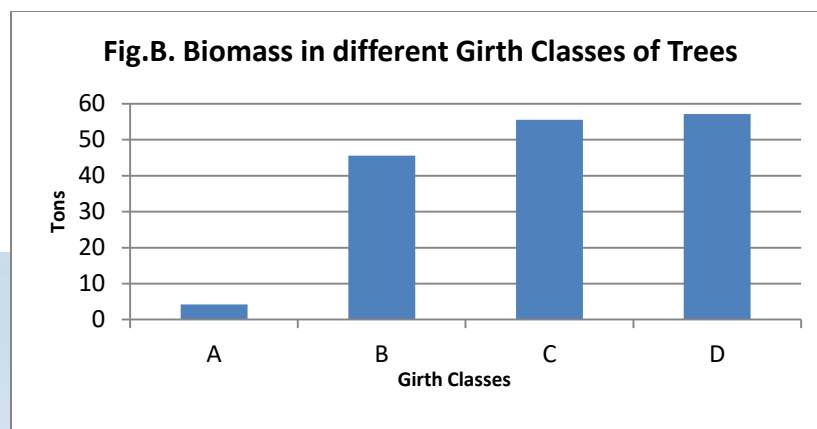
Trees Enumeration:

The tree species were enumerated and the results are presented in Annexure – F2. The results indicated that there are nearly 634 trees. Of six are fruit bearing trees and account for 32.33% of the trees. Among the remaining lot, palm species dominate and account for 22.4% of the trees. By age distribution as was estimated from the Girth classes (Fig. G), majority were in the two lower age classes (A and B).



a) Biomass of Trees:

Woody biomass was estimated through ecological methods, and the top nine species which were high in numbers have contributed significantly to the biomass. On the whole, all the tree strata together have contributed 162.35 tons of biomass, with a mean of 0.256 t/tree. The stocks in different girth classes of the trees are shown in Fig. B.



b) Carbon Stocks:

With the tree biomass, the Carbon stocks in the ANITS campus lands was estimated using standard stock assessment methods based on the formula of C in the Above Ground Biomass (AGC) + C in Below Ground Biomass (BGC)+ Soil Organic Carbon (SOC). In case of SOC, only the “*Vacant Land Site*” of 17272 m² of area was taken in to consideration, as this area only can sequester the SOC in future. The Carbon stock in the AGC was estimated at 82.8 tons C; while the stocks in the BGC and SOC were estimated at 21.5 tons C and 323.8 tons C, respectively. ***The scope for improvement is significant.***

Associated Fauna:

A good number of animal species associated with the ANITS campus greenery indicate that the greenery is provisioning biodiversity services. Some of the Avian (Bird) species, and other animals observed and identified by the students are presented in this report and these mostly include 16 species of Birds; 5 species of Butterflies; and one squirrel species. Only such species, which are very frequently observed in the campus are included in this.

Butterfly species	
Common Name	Scientific Name
Common tiger	<i>Danaus genutia</i>
Lime butterfly	<i>Papilio demoleus</i>
Common pierroot	<i>Castalius rosimon</i>
Common crow butterfly	<i>Euploea core</i>
Dark Blue Tiger	<i>Tirumala septentrionis</i>
Avian Species	
Common Name	Scientific Name
Indian roller	<i>Caoracias benghalensis</i>
Cattle egret	<i>Bubulcus ibis</i>
Green bee eater	<i>Merops orientalis</i>
Blue rock pigeon	<i>Columba livia</i>
Common Myna	<i>Acridotheres tristis</i>
Black Drongo	<i>Dicrurus macrocercus</i>
Black kite	<i>Milvus migrans</i>
House crow	<i>Corvus splendens</i>
Jungle crow	<i>Corvus macrorhynchos</i>
Alexandrine parakeet	<i>Psittacula eupatria</i>
Rose Ringed Parakeet	<i>Psittacula krameri</i>
Spotted Dove	<i>Streptopelia chinensis</i>
Common Myna	<i>Acridotheres tristis</i>
Common House sparrow	<i>Passer domesticus</i>
Common Koel	<i>Eudynamys scolopaceus</i>
Mammalian species	
Common Name	Scientific Name
Indian squirrel	<i>Funambulus palmarum</i>

2. WATER:

ANITS well aware of the importance of water and has a dedicated water management cell. Water is used for different purposes like, Drinking; Other domesticated uses; Laboratories; House Keeping and Greenery. For all the uses, ANITS depends upon ground water only as there was no public supply facility.

ANITS taps around 40 KLD of water from 6 bore wells, and has an installed capacity of 40 KLD above ground storage tanks. The mean distribution of the water for different uses is as follows:

No.	Purpose	Quantity (KLD)	(% Total)
1	Drinking	6	15
2	Other Domestic Uses	14	35
3	Laboratories & Other facilities	18	45
4	Greenery	2	5

On the whole, the drinking water availability is at 1.2 litres/head and 99 % of the campus population stays in the campus for less than 8 hours, the drinking water availability is reasonably good compared to the standard of 5 litres/head/24hrs. The ANITS has a R.O. Plant with an installed capacity of 6000 litres/day, and through which Reject water of 10000 litres/day will be generated. More than a half of which is used for floor washes and the remaining for the greenery. The RO plant water also is used by neighboring sister institution of the ANITS group.

3. ENERGY:

ANITS is one of the few institutions in India to have pioneered in the energy conservation and use of renewable energy sources. Basically it uses three types of Energy sources: (1) Electricity from the Public supply and (2) Electricity from the Own Solar plants and (3) Diesel (HSD).

The Institute during the audit year has consumed 2867/day units with a mean of 87194 units per month. However, the monthly variations were very high and ranged from a low of 43766 units in January to a high of 120240 units in September. From September to January, the consumption decreased gradually, despite the fact that the period may have peak academic activity. This indicates that the energy efficiency can be enhanced further in its use.

The declined power consumption from September to January indicates could be due to reduced use of Air conditioners. The Institution has a total of 332 air conditioners together have a cooling capacity of 500 tons. The illumination and air circulation in the facilities needed examination.

On the whole, the per capita electricity consumption in the institute is around **219 units/annum**, which is reasonably good in Educational Institutions.

The Institute has 450 KVA solar power generation systems with 1364 panels installed and is connected to the grid. Therefore, Energy units consumed from the public supply are exclusive of this power. Thus, addition of this power, accounts for a per capita production of 19 units/annum.

The second major use sector for energy is Transportation sector of the Institute. On all working days, the Institute's fleet of Buses and vehicles ply a part of the campus population. The audit results indicate, the Institute's transportation by buses covers a distance ranging from 28400 km/month to 65822 km/month, with a mean of 44946 km/month. The transportation consumption of oil ranges from 6600 litres/month to 15380 litres/month, with a mean of 11483 litres/month. Another 884 litres/month of HSD is consumed by administrative vehicles. Thus, the institution transportation covers around 35% of the campus population. The remaining 65% attend by various means, like, public transport (16%), private hired transport vehicles mostly 3 wheeler rickshaw (27%) vehicles, and about 8% of the population uses their own vehicles as was revealed from the rapid survey.

By maximizing the entropy of the transportation data, it is estimated that all the travel trips of the campus population had a per capita HSD consumption was arrived at 83.82 liters/annum.

ANITS also uses LPG fuel for its hostel messes and in some laboratories also. The evidences revealed that the annual consumption of LPG in all the facilities for the year 2019-2020 was 560 kg.

On the whole, during the year 2019-2020, the ANITS has CO₂ emission of 867 tons from use of electricity, and 356 tons from HSD Oil consumption, and 1.7 tons from LPG consumptions. Thus from the three major sources of energy, around 1224 tons of CO₂ emissions were released. However, by way of solar power generation of 93960 kWh, about 86 tons of CO₂-e could be saved or mitigated.

4. WASTES GENERATION:

The wastes generated from academic and administrative divisions only could be taken in to account, as the total institution could not be covered for certain limitations during this first audit. The wastes generated from the academic and administrative divisions are characterized into

- (a) Wet Waste;
- (b) Paper & Board waste;
- (c) Metallic waste;
- (d) Plastic Waste;
- (e) Battery waste
- (f) E-waste.

The waste generated from the two divisions, from a sampling of 1 month is presented below:

#	Waste Type	Sources	Qty	Disposal
	Wet Waste	Dining Halls & Messes	60 kg/day	Compost
	Paper & Board	Administrative & Academic	4.7 kg/day	Authorized Vendors
	Metallic	All	0.21 kg/day	Authorized Vendors
	Plastic	All	0.36 kg/day	Authorized Vendors
	E-waste	All	0.2 kg/day	Authorized Vendors

The waste management is one area where the institution is focusing on application 5 R's principle so as to enable the young learners for innovations. The Institution has initiated several good initiatives in the field of solid waste management. Within each building or facility, at all common places, at convenient points, semi-closed dust/waste bins were placed to dispose all types of dry wastes. However, for the disposal of Wet-waste, one large bin was placed near the major entries of the buildings. The wet wastes are cleared on daily basis and are transferred to the compost area. On the other hand, the dry wastes are cleared from their bins twice a week, and are transferred to the common place where they are segregated to different waste types and disposed to authorized vendors. All the students are encouraged to examine the dry waste and to take up team projects to develop innovative systems for the use of such wastes or their minimization.

5 ECOLOGICAL ACTIVITIES

Environmental and Sustainability Initiatives

ANITS, to realize its *Vision* of making its campus a **Carbon Neutral** campus and also to empower its students and employees in addressing the environmental and sustainability challenges of the nation, introduced several activities to create awareness and educational activities. These activities are generally taken up at the department level, while some activities on certain days of international or national importance, the activities are taken up at the Institutional level.

1. SWACH ANITS:

The programme was initiated at the Institutional level and coordinated by the NSS wing of the Institution. The programme aims at training the students in the **Participatory Management of the Campus** and also creates awareness among the students on the **Swachh missions** of the country. The programme for the year was launched in **August 2019**, and continued till the end of the academic year. About 120 students (10 to 12 volunteers from each department) have participated in this programme.

2. ECO GANESHA CAMPAIGN:

Eco Ganesha Campaign is one of the regular public outreach programme of **ANITS** conducted every year with the aim of using eco-friendly idols of Ganesha, so as to protect the water bodies from pollution of hazardous chemicals.

Around the time of latter half of August 2019, prior to Ganesha Chathurdhi festival, the **Green Club (GC)** based at the Civil Engineering department, first conducts the ECO friendly Ganesh Idol Competition amongst students, and promote producing chemical free and easily water submersible idols of Ganesha in good numbers.

In the second step, these idols will be distributed among the students and employees of ANITS. Finally, the students will distribute the idols through a campaign for Eco-friendly Ganesha at the nearby village, Thagarapuvalasa; and also at different places where ANITS students are residing. Later, at the end of the event, Principal Prof T.V Hanumantha Rao, will participate and distribute the Best Idol Making Students as a token of appreciation.



3. SAVE THE BEACHES:

ANITS, as part of its environmental initiatives organizes *World Ozone Day* every year on September 16th, so as to educate the young engineers on the importance of use of Ozone Depleting Substances in various technologies and gadgets. The programme is conducted at the Institute level. As a part of the programme, a public outreach campaign also is conducted at a prominent public place in the

city. On 18th September, 2019, a campaign was undertaken for the Beach users or visitors of the city to make them aware of using the beaches in an environmental friendly way. In this context, ANITS students have organized a Beach Cleaning programme by collecting waste and debris for a stretch of 2 km length of beach stretch at Rushikonda beach, Visakhapatnam.

4. VANAM MANAM

VANAM MANAM is a plantation program conducted every year by ANITS supporting the state's mission of "**Vana Mahotsava**" during the 1st week of October. During this year (2019-2020) ANITS has designed the programme to plant fruit bearing trees and other species that attract birds and other lower animals to the campus. About 150 students from all the departments and faculty have participated in the programme and planted species like, Guava, pomegranate, Bur flower in and around the campus. The programme was led by Senior faculty members, Ms. P.V.R. Sravya, Mr. J. Harshavardhan Reddy and Mr. C.H. Srinivas.



Besides these special events, the students have several assignment models built in their curriculum modules, as was also recommended by the AICTE's

Environmental Policy, and were presented before the audit team. However, the audit team recommended the assessment of these in the next year's audit programme, as they need to be first approved by the concerned academic body.

V AUDIT RECOMMENDATIONS

- ANITS by the time the next Audit is initiated should review and revise its environmental policy, to incorporate updates of the nation's policies. The new policy will be the basis of the next green audit for the year 2020 - 2021.
- The audit team, appreciates the well designed layout planning of the institute, ensuring 38 % of the land area under open category uses. However, the utilization of the open category lands need to be further maximized and documented.
- Although the greenery is good in terms of the extent and numbers, effective planning can enhance, the diversity, productivity and sequester more carbon, so as to realize the objective of making the campus C-neutral.
- Water management is very good, and needs appreciation of using huge amounts of R.O reject water for greenery and floor washes. However, the audit team recommends for the focus on enhancing rain waters harvesting from roof tops and through percolation pits.
- The Auditors appreciate the Management for replacing most electrical lights with energy efficient (LED) systems; generation of Solar power and reduced use of air-conditioning systems. However, the energy use from transport system can be improved significantly. Focus is to be made that the Institute buses should achieve 5 km/l from the present mean of 4.27 km/l.
- The Institute can further enhance its Solar Power production. Presently, the

solar power accounts for around 10% of the total power consumption. Considering the present annual expenditure of Rs. 90 lakhs/annum, the institute can plan for a 1 MW solar power plant, and can not only realize the investment in 5 years, but also can make the campus Carbon neutral.

- Although the waste management is in places, it needs more documentation of wastes related to metal plastic, battery and E wastes generated and disposed.





Team

Dr. VINAY SAGAR

K.Srinija Aparna

SANCHARI BISVAS

Help us to assist you to develop green India.

ANITS