

# **Executive Summary**

**OF** 

# GREEN CAMPUS INITIATIVES

**JANUARY 2018** 

# B.S.ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE & TECHNOLOGY

# **ESTATE OFFICE**

#### **VISION**

BSAC Institute of Science and Technology is committed to ensure that the built infrastructure of the institute has sustainability as a core principle, both in construction and maintenance management of the campus.

Estate office aspires to follow a range of sustainable design features and practices implemented to build and maintain the institute as a complete green and sustainable campus continuously.

#### **MISSION**

- Establish on campus renewable energy sources like Roof-Top Solar Power Plants, Bio –Gas plants
- Energy and Water Conservation Measures
- Green Belt Development
- Solid Waste Management program to separate recyclable waste and dispose all waste in non-polluting, responsible manner.
- Getting all buildings certified as Green buildings (Gold rating) under USGBC-LEED / GBCI-EDGE / IGBC rating systems.
- Follow Sustainable Construction practices.

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#### 1. GREEN CAMPUS INITIATIVES - FACT FILE

- ✓ Roof-top Solar Power Plant I of 150kWp capacity commissioned in June 2014 at a cost of 1.32Cr. Return on Investment is 62.04Lacs till 31<sup>st</sup> December 2017.
- ✓ Roof-top Solar Power Plant II of 100kWp capacity commissioned in October 2014 at a cost of 62Lacs. Return on Investment is 39.62 Lacs till 31<sup>st</sup> December 2017.
- ✓ Total power generated through the Solar PV plants is 11,74,057 units till 31<sup>st</sup> December 2017, which is equal to 10% of our annual consumption.
- ✓ Avoided emission of greenhouse gases to the equivalent of 699,755kg CO2 due to generation of renewable energy by Solar PV power plants.
- ✓ LED fixtures of around 23KW capacity has been installed in our campus in the past 5 years. At least 30% of less power is consumed due to this.
- ✓ Air-conditioning split units of 5-star BEE rating is installed in various departments in the campus for a total of 203TR.
- ✓ All the 203 split AC units are free from ozone-depleting CFC.
- ✓ Solar Water heaters in Hostels and staff quarters installed capacity 42,500 litres.

  This is equivalent to 240 electric geysers of various capacities. The power saving is estimated to be around 17Lacs per annum.
- ✓ Sewage Treatment Plant (STP) 500KLD of water is treated and utilized for Landscaping and flushing purpose in the University and Hostels. One plant of 250KLD capacity for Men's Hostel and another 250KLD capacity plant for University are in operation.
- ✓ New Bio-gas plant of 50m3 capacity for Ladies Hostel is commissioned in June 2017.
  The gas generated is utilized in Ladies Hostel Mess Kitchen.
- ✓ All existing buildings are registered with Indian Green Building Council (IGBC) for green building certification under IGBC EB rating

#### **GREEN CAMPUS INITIATIVES – FACT FILE (Contd)**

- ✓ All New buildings constructed over the last six years and those under construction are registered with GBCI EDGE and USGBC LEED for green building certification for Gold rating.
- ✓ New Crescent School of Architecture block under construction is conceived as a Net Zero Energy building and registered under USGBC-LEED for Gold rating certification.
- ✓ Campus Solid Waste Management program is implemented to segregate and recycle organic waste, paper, cartons, paper cups, soft drink tins, plastic, pet bottles, e-waste, bio-waste, etc.
- ✓ Use of eco-friendly cleaning chemicals are mandatory in the campus
- ✓ Retreading of vehicle tires to extend the life of each tire is being implemented with an MOU with TVS Retread
- ✓ MOU with ITC-WOW is in place for recycling of waste paper
- ✓ To reduce pollution inside campus, 50 nos bicycles have been provided for students to commute between Men's Hostel and College Main gate.
- ✓ Organic vegetable garden farming is under way in Men's Hostel and Ladies Hostel.
- ✓ Sanitary napkin incinerator with wet scrubber (for pollution control) is installed for disposing the napkins. Wet scrubber is attached at the outlet of burner fumes where the fumes gets scrubbed in water and gets filtered to remove the harmful emissions.

# 2. RENEWABLE ENERGY IN CAMPUS

# a) Roof-Top Solar Power Plants







150kWp Solar PV Power Plant I - Generation up to Dec 2017

	2014		201	5	201	6	2017	
		Amount		Amount		Amount		Amount
Month	Units Generated	Saved INR	Units Generated	Saved INR	Units Generated	Saved INR	Units Generated	Saved INR
Jan			14,696	124,916	18,112	153,952	15,386	134,012
Feb			19,880	168,980	20,059	170,502	18,325	144,218
Mar			18,117	153,995	16,617	141,245	15,558	129,909
Apr			21,706	184,501	12,111	111,542	20,269	168,233
May			18,557	157,735	17,072	172,427	18,425	159,376
Jun	4,392	37,332	18,425	156,613	18,470	154,225	16,551	137,704
Jul	17,654	150,059	20,211	171,794	17,343	157,128	16,117	146,504
Aug	18,238	155,023	20,105	170,893	20,380	172,619	17,027	153,243
Sep	19,058	161,993	19,823	168,496	17,302	151,566	17,188	154,520
Oct	15,763	133,986	18,121	154,029	18,870	171,340	14,346	120,937
Nov	15,446	131,291	11,235	95,498	16,520	135,629	12,242	100,874
Dec	12,697	107,931	14,061	119,519	12,518	149,966	12,478	108,434
Total	103,248	877,615	214,937	1,826,969	205,374	1,842,140	193,912	1,657,963

#### 100kWp Solar PV Power Plant II- Generation up to Dec 2017

	2014		201	5	201	6	201	7
Month	Units Generated	Amount Saved INR	Units Generated	Amount Saved INR	Units Generated	Amount Saved INR	Units Generated	Amount Saved INR
Jan			10,412	88,502	12,436	105,706	12,261	106,793
Feb			14,127	120,082	14,288	121,448	14,669	115,445
Mar			13,644	115,974	12,791	108,724	12,812	106980
Apr			14,378	122,213	14,643	134,862	12,325	102,298
May			12,071	102,604	11,668	117,847	12,938	111,914
Jun			12,360	105,060	12,398	103,523	11,883	98,867
Jul			13,019	110,662	12,070	109,354	11,658	105,968
Aug			13,211	112,294	13,442	113,850	12,101	108,908
Sep			13,376	113,696	11,673	102,256	12,057	108,392
Oct			12,459	105,902	13,333	121,062	10347.9	87,233
Nov	9,091	77,275	7,801	66,304	12,041	98,857	8956.6	73,802
Dec	8,367	71,123	10,082	85,697	9,948	119,177	9450.1	82121
Total	17,458	148,398	146,940	1,248,990	150,730	1,356,665	141,458	1,208,720

#### <u>Total Solar Power Generation - 250kWp</u> <u>From June 2014 to Dec 2017</u>

Plant	Units Generated	Amount recovered
150Kwp	717,471	6,204,687
100kWp	456,586	3,962,773
Total	1,174,057	10,167,460

The number of units generated through solar power plants constitute 10% of total electricity consumption since June 2014.

#### b) Bio-Gas Plant

A Biogas plant of 50m3 capacity for Ladies Hostel is commissioned in June 2017 to recycle the food waste generated from the Hostel mess and Canteen in the campus. The biogas generated is utilized in Ladies Hostel mess kitchen.



BIO GAS GENERATION FOR THE PERIOD OF JUNE 2017-DECEMBER 2017

Month	Total Gas consumed(cum)	Equalant to LPG (KG)	Cost Saved
Jun'17	0	0	-
July'17	0	0	-
Aug'17	0	0	-
Sep'17	94	42	2,601.00
Oct'17	180	81	5,280.00
Nov'17	366	164.7	12,062.00
Dec'17	277	124.65	9,178.00
Total	917	412.35	29,121.00

#### 3. ENERGY CONERVATION MEASURES

#### a) **LED Fixtures**

**LED Light fittings in BSAU Campus** 

SL NO	BUILDING	QTY	TOTAL WATTS
1	Auditorium	156	2059
2	Science Block	250	2829
3	Aero Block	458	5064
4	Main Block	34	482
5	MBA Block	11	165
6	First Year Block	7	105
7	Life Science Block	37	543
8	Staff Quarters	301	3685
9	Ladies Hostel	249	3474
10	Campus Street Light	77	1800
11	Medical Centre	21	309
12	Architecture Block	13	601
13	Estate Office	21	420
14	Canteen	12	312
15	VC Office	72	450
16	VC Villa	27	193
17	Guest Houses	17	280
	TOTAL	1763	22771

LED light fixtures are being extensively used for all new interior renovation works in the campus. So far, 22.7KW capacity of LED lights are fixed which provide around 30% energy saving compared to conventional lighting.

## b) BEE 5-Star Rated Air Conditioner Detail

MODEL	QTY	TON
1.0 TON Split Inverter	17	17
1.5 Ton Split 5*	29	44
2.0 Ton Split 5*	71	142
TOTAL	117	203

With an emphasis to energy conservation, all split AC units purchased since the year 2012 are of BEE 5-star energy rating.

The AC units are free from ozone-depleting CFC.

## c) Solar Water Heaters



#### **Solar Water Heaters Installed In Residential Area**

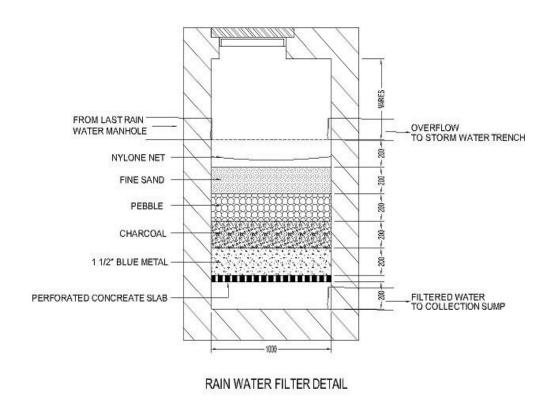
MEN'S HOSTEL						
Block	No. of tanks	Capacity in litres				
A Block	16	4000				
B Block	20	5000				
C Block	18	4500				
D Block	18	4500				
Main block	20	5000				
PG block	12	3000				
<u>L</u>	ADIES HOSTEL					
Main block	22	5500				
Annexe Block	22	3300				
New Block Phase 1	21	5250				
STAFF QUARTERS						
New Staff Quarters	23	5750				
Total Capacity	170	42,500 Litres				

Usage of electric geysers equivalent to 240 nos. are totally avoided in Hostels and New Staff Quarters. This saves energy to the tune of 17Lakhs per annum.

# 4. WATER CONSERVATION MEASURES AND WASTE WATER MANAGEMENT

#### a) Rain Water Harvesting

Rainwater harvesting facility is done in all blocks to collect rain water from the terrace. The harvested water is diverted to open wells in university campus Men's Hostel and ladies hostel. The rain water is also stored in Underground sumps of Life Science block and Mechanical Science Block. The rain water is stored after passing through the pre-filter is shown in figure.



**Rainwater Filtration Process** 

#### b) Sewage Treatment Plant - 500kld

2 nos. of Sewage treatment plants of 250KLD capacity are available, one for Men's Hostel and one for University campus. The STP is of Eco-Bio Block type. The treated water is used for landscaping and toilet flushing purpose.





#### c) Water Audit By Experts From IIT-Madras In September 2017

B.S. Abdur Rahman Crescent Institute of Science & Technology has approached IIT Madras to give expert professional advice/suggestions to improve our ground water table and also effective utilization of STP water in future in order to reduce the water procurement our complex and witness the real water usage. Based on our request the Prof. Ligy Philip and Prof. B.S Murty, Department of Civil Engineering, IIT Madras visited the campus on September 16, 2017.

The possible water management options and understands the existing systems, need and constraints were discussed with the experts, based on the inputs, and suggestions were given to improve the water management in the campus.

The total water consumption in the institute is 0.6 MLD,(i.e) 0.5 MLD is procured through tankers and 0.1 MLD is extracted from bore wells/tube wells in the campus. The institute has sewage treatment plants with a capacity of 250 KLD each. The treated wastewater is mainly used for horticulture purpose. In one of the blocks the treated water for flushing purpose through dual pipe line systems. The drinking water requirement is met by treating the tanker water using Reverse osmosis systems. The yields of these systems are about 45-50%. Campus has two underground sumps to store rain water. The recommendations given by the experts are taken into consideration such as,

- To improve the STP by increasing the biomass concentration
- To provide a complete dual piping systems in campus
- To store unused treated water in unlined ponds, etc.

#### 5. GREEN BELT DEVELOPMENT:

#### a) Trees Plantation In Campus

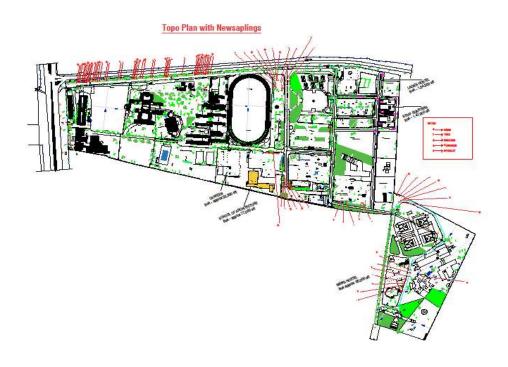
The campus had 909 trees before the cyclone in December 2016. A total of 341 were trees were uprooted in the cyclone. 180 trees are newly planted in the last eight months and are being maintained. Now the total number of trees in campus is 889Nos. List of trees available now in our campus are tabulated below in Table

#### **LIST OF TREES IN CAMPUS**

TREE NAMES	TOTAL
NEEM TREE	242
PORTIA	22
TAMARIND	22
MANGO TREE	33
BRACKEN TREE	241
COCONUT TREE	48
SPIKELET	120
ASH	28
ARECA	41
CASUARINA	28
SPASMA	6
ALMONDS	18
KING TREE	3
BANYAN TREE	4
PALMYRA	4
TEAK TREE	29
TOTAL	889



Planting of Trees



Plan showing location of new saplings planted in the last eight months.

#### b) Bicycles For Pollution-Free Environment

As a step towards complete pollution – free environment in campus, 50 no. bicycles are provided for use by Men's Hostel students to commute from Main gate to Hostel and avoid two-wheelers movement inside campus.



#### c) Organic Vegetable Garden

Organic Vegetable garden is formed in open land space in Men's Hostel area and the vegetables produced are being sold to the staff of the university on daily basis.





#### 6. CAMPUS SUSTAINABILITY MEASURES

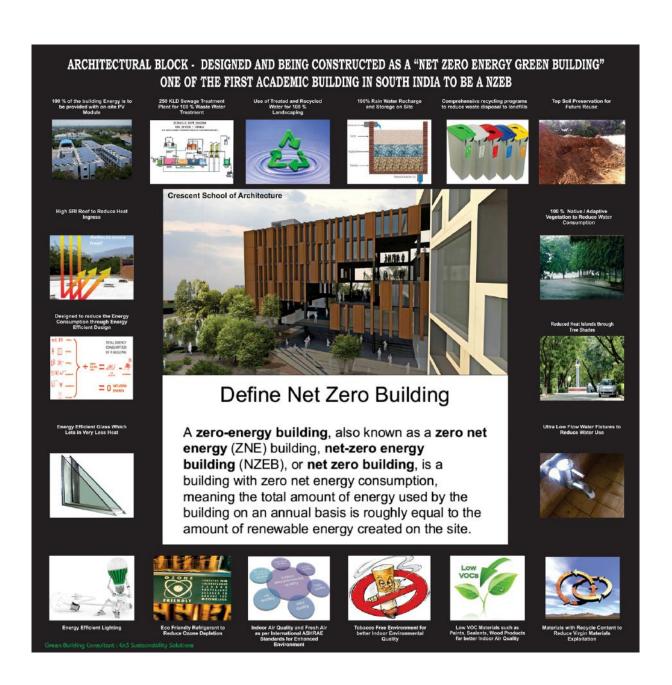
#### a) Green Building Certification

Buildings constructed in last 6 years are registered with USGBC/GBCI EDGE for Green Building Certification and are in document submission stage of certification for Gold rating

S.No	Name of the building	Plinth area	Covered area	Estimated cost	Date of completion	Certificate applied to
1	School of Life sciences Block	58,000.00	G+7 (RCC)	110,200,000	2013	USGBC
2	School of Mechanical science block	135,000.00	G+7 (RCC)	310,500,000	Dec 2014	USGBC
3	VC Villa	4,300.00	G+1 (RCC)	9,030,000	May 2014	GBCI EDGE
4	Staff Quarters - Phase 1	75,000.00	G+9 (RCC)	150,000,000	May' 2015	GBCI EDGE
5	New Ladies Hostel Block - Phase 1	50,000.00	G+8 (RCC)	100,000,000	Dec'2015	GBCI EDGE
6	New School of Architecture block	98,000.00	G+7 (RCC)	196,000,000	July 2017	USGBC

All old buildings have been applied for Green Building certification with IGBC under IGBC-Existing Buildings rating system

New Crescent School of Architecture block which is under construction, is designed as a Net Zero Energy building and registered under USGBC-LEED Gold certification.



#### b) Solid Waste Management

The solid waste management program is intended to safely dispose the waste generated at the campus by way of segregating the waste as organic waste, recyclable waste and inert waste and processing the waste. The objective is to minimize the waste generation and divert / avoid waste from being dumped at the dumping site.

#### Activities carried out on daily basis:

- Accumulated dry waste are cleared
- Dry leaves shredded and windrows formed.
- Compost Harvest at Resource recovery area
- Regularly feed the food waste to the bio gas plant at ladies hostel and left over food waste removed at boys hostel alternate days.
- Kitchen garden formed at waste processing area
- Deliver bio compost to garden use
- Scrap yard maintenance

#### Waste Quantification data – Jan to Dec 2017:

Total Waste Collected: 150,599Kgs.

Total Organic waste: 82,245Kgs.

Total Recyclable waste: 54,845Kgs.

Total Inert waste: 13,509Kgs.

# **Dry waste segregation**









Food waste Feeding to Bio gas plant



## Campus waste removal







**Windrow Formation** 











Dry waste Removal from the Yard



Napkin incinerator use

# Waste collection data since start of Solid Waste Management Program in 2016:

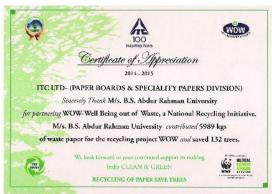
S.No	Month	Organic waste in Kg	Recycle waste Kg	Inert waste Kg	Total Waste in Kg	Sale Amount
1	Jan'16	5,977	1949	13429	21,355	12,750
2	Feb'16	5,635	1983	12700	20,318	28,616
3	March'16	5,800	2507	13736	22,043	29,194
4	April'16	5,477	2775	12898	21,150	20,076
5	May'16	4,544	2410	11457	18,411	14,438
6	June'16	5,252	2747	13150	21,149	20,738
7	July'16	3,676	3124	12409	19,209	58,926
8	Aug'16	5,330	4374	9217	18,921	46,540
9	Sep'16	4,917	2861	1830	9,608	7,490
10	Oct'16	7,956	3412	1225	12,593	8,550
11	Nov'16	10,966	4525	1025	16,516	12,660
12	Dec'16	8,394	2283	794	11,471	7,320
13	Jan'17	10,107	3043	909	14,059	44,956
14	Feb'17	10,426	3174	881	14,481	0

15	March'17	11,788	3980	1077	16,845	19,112
16	April'17	11,819	4423	1230	17,472	9,142
17	May'17	2,710	5608	3970	12,288	8,504
18	June'17	711	5305	591	6,607	-
19	July'17	885	4828	790	6,503	-
20	Aug'17	1,187	4477	708	6,372	39,762
21	Sept'17	1,393	5046	633	7,072	32,870
22	Oct'17	9,096	4252	689	14,037	107,953
23	Nov'17	10,677	4751	947	16,375	45,898
24	Dec'17	11,446	5958	1084	18,488	40,340
	Total	156,169	89,795	117,379	363,343	615,835

## c) Paper Recycling Certificates From 2013 To 2017

Papers are sold to ITC Limited for recycling:

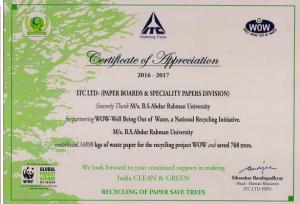




2013-2014

2014-2015



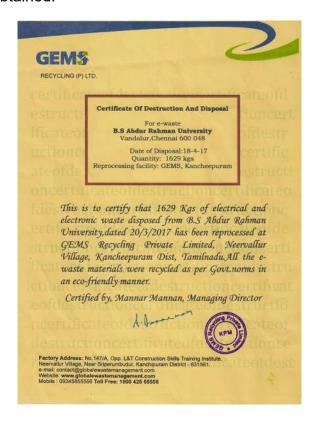


2015-2016

2016-2017

#### d) E-Waste Destruction Certificate

All obsolete electronic waste is disposed as e-waste to vendors for proper destruction without damaging the environment and certificate for such destruction and disposal are obtained.





#### e) Bio Waste Destruction Certificate

All biological waste generated from Life Science Department and Medical Centre is disposed as bio-waste to vendors for proper destruction without damaging the environment and certificate for such destruction and disposal are obtained.



# f) <u>Waste/Napkin Burner</u> (Attached With Wet Scrubber For Pollution Control)

Incinerator machine has been installed to dispose sanitary napkins.

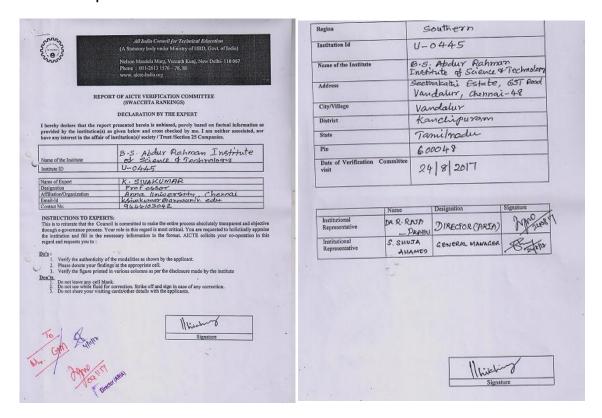
Separate bins are provided in all ladies toilets in university and in Ladies Hostel to separate the napkins from other waste.

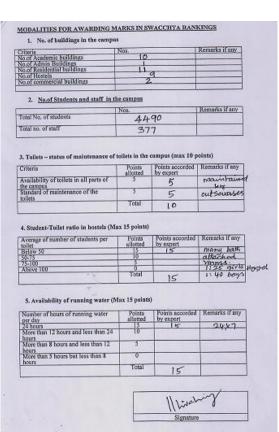
Wet scrubber is attached at the outlet of burner where the fumes gets scrubbed in water and gets filtered to remove the harmful emissions.



#### g) Participation In MHRD Swacchta Rankings 2017

Our Institute has participated in MHRD Swacchta Ranking 2017 for Higher Educational Institutions on 24.08.2017 and awarded by 96% marks by the AICTE expert verification committee





etail	Points allotted	Points accorded by expert	Remarks if any
arbage Bins present in all areas and aving a system of clearing atleast noe daily	10	10	persons cleant
Eaving garbage bins but no systems for clearance	5		regularto
	Total	10	
7. Garbage disposal (Max 10 po letail Ising technical solutions for garbage isposal July having traditional garbage	Points allotted 10	Points accorded by expert	Remarks if any Separate Pitpool
disposal systems	Total	10	solid walt a waste
Automated/semi automated kitchens in the mess	alliothed 5	4	
Detail	Points allotted	by expert	Remarks if any
n the mess		1000	
Overall hygiene in the Mess Status of cleanliness in hostels	- 3	4	
Solitis of Creatimons for Invalors	Total	13	
Greenery in campus (Max 15 po Detail  Coverage with greenery	Points allotted 10 5 Total	Points accorded by expert	Remarks if any morny trees lest due to cycline. Rehability is him in boung taken up
Maintenance of plantation.	1000	7/1-20	
10. Overall cleanliness (Max 10 p General upkeep of the campus :- Excellent Every Good Good Nor good	Points alloted 10 8 5 5	Points accorder by expert	d Remarks if any
10. Overall cleanliness (Max 10 p General upkeep of the campus :- Excellent Very Good	Points alloted	by expert	d Remarks if any
10. Overall cleanliness (Max 10 p General upkeep of the campus :- Excellent Very Good Good	Points alloted 10 8	by expert	d Remarks if any
10. Overall cleanliness (Max 10 p General upkeep of the campus :- Excellent Very Good Good	Points alloted 10 8 5 5	by expert	d Remarks if any

Detail	Points allotted	Points accorded by expert	Remarks if any	1
Extension work done in villages/ nearby areas for cleanliness	5	4	Through	
OVERALL OBSERVATIONS:			2-1/11/08	jes -
77		Alba Arad	head le	1
The campus by personnel	and v	regular cu	leaning	
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# 7. <u>FUTURE PLANS TO IMPROVE UPON THE GREEN CAMPUS</u> <u>INITIATIVES</u>

#### 1. Plans to improve Solid Waste Management program:

The following activities are planned in the near future to further improve the solid waste management in the campus.

- Color Coding System has to be introduced for dust bins in Class Rooms blocks, Canteens, pathways, hostels, quarters, etc.,
- All the non-ecofriendly products shall be banned
- Volunteers from staffs and students are to be identified for eco volunteering.
- A monitoring team shall be formed to focus on waste reduction and segregation,,
- Small size awareness flex card to be pasted in canteen and waste generating area
- Sapling new trees around college campus.
- 2. To formulate a Green Policy / Environment Policy for the campus that will guide all activities of the Institute to align with the sustainability initiatives.
- 3. To get the BS Abdur Rahman Crescent Institute of Science and Technology certified under ISO 14001 for Environmental Management System
- 4. To get the whole campus certified as Green Campus by competent certification authority like USGBC/GBCI.
- 5. Create ponds to save run-off rain water and utilize for routine use to reduce water procurement.
- 6. To add more Roof-Top Solar Power Plants