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ENVIRONMENTAL AUDIT REPORT

PREPARED

BY

DEPARTMENT OF BOTANY

SCHOOL OF BIOSCIENCES AND BIOTECHNOLOGY

BABA GHULAM SHAH BADSHAH UNIVERSITY

ENVIRONMENTAL AUDIT REPORT

of

BABA GHULAM SHAH BADSHAH UNIVERSITY, RAJOURI

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of

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Executive Summary

The rapid environmental degradation at local, regional and global level is leading us to global "Environmental poverty". Stabilization of human population, adoption of environmentally sound and sustainable technologies, reforestation and ecological restoration are crucial elements in creating an equitable and sustainable future for all humans in harmony with nature and natural resources.

Thus, academic leaders must initiate and support mobilization of internal and external resources and knowledge so that their institutions respond to environmental challenges. As an Institution of higher learning and research, BGSBU is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and reverse the trends of environment degradation.

We deeply subscribe to the fact that humans should be stewards of Mother Nature and that we all have a profound responsibility to protect the earth's resources in perpetuity. Being a premier institution of higher learning, BGSBU is aware of its responsibilities towards environmental issues and therefore has resolved to play a major role in the education, research, policy formation and information exchange necessary for a sustained environmental campaign.

This report is based on the approaches and interventions done on part of the University to address the environmental concerns of the BGSBU campus. The current environmental audit represents the first stage in our efforts to build environmental sustainability on the campus.

The audit was conducted by a team of faculty and students with support from various stake holders of BGSBU. It is indeed the reflection of BGSBU's endeavour to exercise leadership in promoting sustainability and an institutional obligation to instill among all students and each of us, and those in the broader community a sense of environmental stewardship.

This commitment of BGSBU has lead to actions whose reflection is visible remarkably on ground. This environmental audit conducted is not only significant for the institution, but also for the other institutions to emulate and adopt as a model and therefore contribute regionally as well as nationally in this endeavour of sustainable environment for all.

Introduction

1.1 Introduction to environmental audit

Environmental audit or Green audit is a general term that reflects various kinds of evaluations intended to identify environmental compliance and management system, implementation gaps, along with related corrective actions. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. Green audit is a useful tool to determine how and where the most energy or water resources are being used; and can then considerations be given on how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It imparts a better understanding of Green impact on campus to staff and students.

1.2 Need for environmental audit

If self enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self enquiry is a natural and necessary outgrowth of a quality educational institution. Thus, it is imperative that BGSBU evaluates its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background, it becomes imperative to adopt the system of the "**Green Campus**" for the Institutes which will lead to sustainable development and at the same time reduces a sizable amount of atmospheric carbon dioxide from the environment.

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

1.3 Objectives of environmental audit

Concern about environmental degradation and realization of values of environment are logical consequences of scholarly research, teaching and learning process. In its pursuit for improving environmental quality and to maintain a pristine environment for the future generations of students, BGSB University has made a self-inquiry on environmental quality of the campus with the following objectives to achieve:

i. Establishing a baseline of existing environmental conditions with focus on natural and physical environment;

ii. Understanding the current practices of sustainability with regard to the use of water and energy, generation of wastes, purchase of goods, transportation, etc;

iii. Awareness generation among students concerning real issues of environment and its sustainability

iv. Promotion of environmental awareness through participatory auditing process; and

v. To create a report that document baseline data of good practices and provide strategies and action plans towards improving environmental quality for future.

1.4 About the University

BGSBU has come into existence by the act of Jammu and Kashmir State Legislative Assembly called as Jammu and Kashmir Baba Ghulam Shah Badshah University Act No XVI of 2002. The University is nurtured by the Jammu Kashmir Wakf Council. The motto of the University is "*Iqra bismi rabbik aladi khalaq"*which means read in the name of God who has created all that exists. It reflects the vision and idealism for which the University stands. The objective identified for the university in the Act is to impart quality education and undertake research in basic and job oriented fields.

Accordingly, the University has launched Postgraduate teaching Programmes in Business Management, Financial Management, Computer Sciences, Information Technology, Arabic, Applied Mathematics, Botany, Biotechnology, Microbiology, Zoology, Physics and B.Tech in Electronics and Communication, Computer Sciences & Engineering and Information Technology.

The University campus is located at the foothills of the great Himalayan Pir Panjal range in Rajouri, 154 km from Jammu, the Winter capital of Jammu and Kashmir State. Regular bus service, video-coaches and shared taxies meandering their way by the sparkling streams through the thick-pine forests make the 3 and half hours journey between Jammu & Kashmir a mesmerizing experience.The region in which the University is located has rich geographic, climatic and cultural diversity. The climate varies from subtropical in the southern parts to temperate in montane northern fringes. The average temperature varies from 7ºC during winters to 37ºC during summers. The average annual rainfall is 500 mm. The snow-capped peaks of the mighty Himalaya, rich biodiversity and valuable agri-diversity make the entire Rajouri-Poonch region a nature lover's paradise. The teaching programmes designed by various Academic bodies of the university are interactive, flexible

and hands on; directed towards helping learners to gain the ability to confidence and effectively answer real life challenges. The vision of the University is ***"Steady onward march for human development through science and technology on one hand and our national ethos on the other"*** **and the mission is** ***"Work towards preparing men and women who are intellectual adventurers and not camp followers; who are architects of the future and not curators of the past"***.

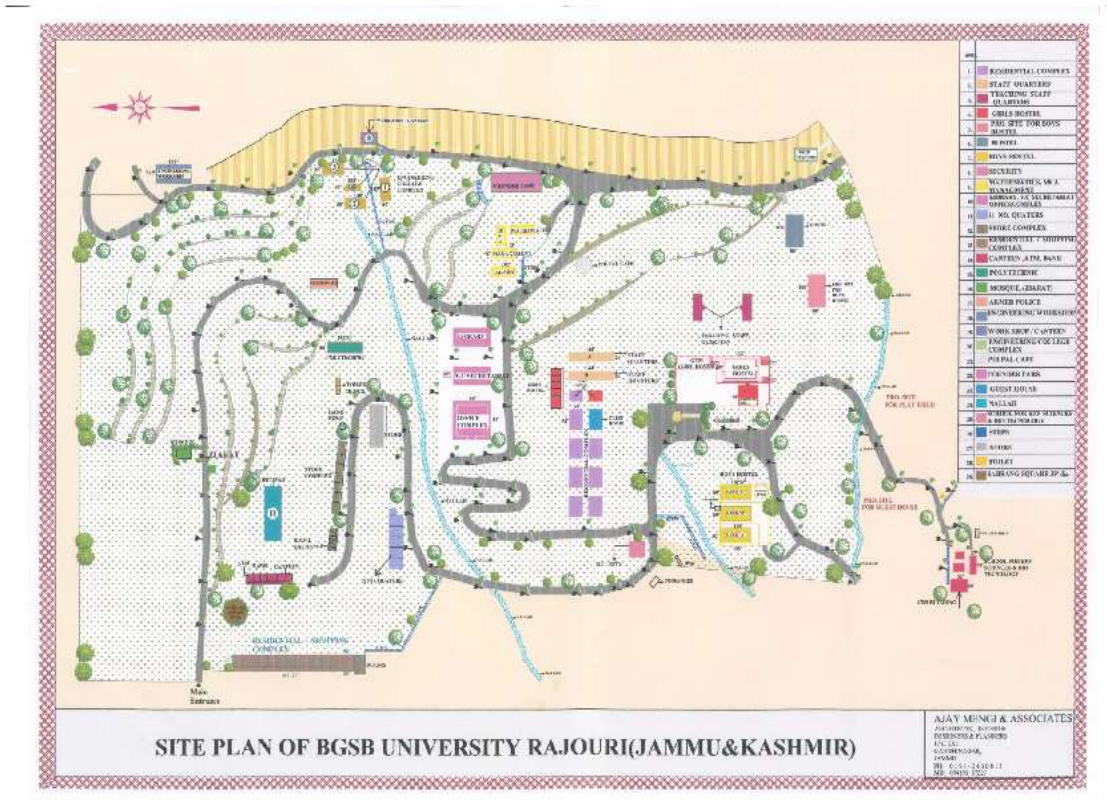

Fig 1. Layout map of BGSB University

Baba Ghulam Shah Badshah is a Technical University offering Academic and Research facilities to about 1846 students including research scholars in various Departments and Centres. There are 9 Schools, 26 Academic Departments and Centres in the University. A total of 164 full time teaching faculty and 315 (out of total, 105 are contractual) non-teaching staff are effectively working for the smooth functioning in the University.

University also offers accommodation to about 920 students including scholars. A total of 10 Hostels have been built to accommodate the students, among which 5 are meant for boys under Sir Syed Hall and 5 for girls under Fatima Zahra Hall.

Table 1. Total intake capacity of the hostels under Sir Syed Hall in the University

Name of the Hostel	Total Number of Rooms	Total Intake Capacity
APJ Kalam	32	104
Babu Jagjivan Ram Chatarvas	32	100
Maulana Azad	37	111
Dr. Zakir Hussain	26	78
Allama Iqbal	37	132
Total	**164**	**525**

Table 2. Total intake capacity of the hostels under Fatima Zahra Hall in the University

Name of the Hostel	Total Number of Rooms	Total Intake Capacity
A Block	18	107
B Block	16	32
C Block	60	138
D Block	11	55
Nursing Hostel	13	63
Total	**118**	**395**

Methodology

This compilation is based on the Survey by Questionnaire. The survey was done in the whole campus by dividing it into six sections. On the basis of data requirement, set of questionnaires about electricity consumption, water consumption, waste generation, solid waste collection and transport were prepared.

2.1 Survey by questionnaire

The committee brainstormed and evolved a questionnaire. Questionnaire survey was conducted in the University Campus. The different questionnaire formats were restructured also with different combinations and modifications. The final sets of questionnaires were prepared based on solid waste, energy, fuel, water, hazardous wastes

and e wastes. The framed questionnaires were distributed among students, scholars and staff of the University to fetch the information pertaining to the Environmental audit.

The questionnaires contained the general information of the concerned section, including name of the section, total number of students and employees, number of buildings along with the area under build up. The maintaining of records for handling of solid and hazardous wastes holds much importance in green audit. It is quite possible that the loss of water and energy resources can occur due to improper maintenances and therefore their assessment holds importance as far as green audit is concerned.

2.2 Data evaluation

The information gathered during the surveys was compiled for the further analysis. It consists of the audit protocol, documentation supplied by the University administration, the auditor's own recordings, results of the sampling and monitoring photographs, records, plans, maps, audit findings and reviewing documentation against standards, policies and action plans and gathering support to the answers of the questions.

2.3 Analysis and reporting

The completed questionnaires were tabulated as per their modules in excel spreadsheets. This tabulated data was used for further analysis. Average and percentage values were determined to avoid complications. With the help of student volunteers, the major part of the data was compiled, which the committee analysed. The data regarding the plantation was assessed by the Department of Botany and Centre for Biodiversity Studies. Built up map was made by the Engineering Department. Data on energy and water was assessed by the Department of ERE and CE, SoET where assessment of data on solid waste generation was carried out by the Department of Botany. The results are depicted graphically to have a quick glance of the status and interpretation of the results of the audit.

Data Analysis

3.1 Land use

BGSBU is using land for diverse purposes so that facilities are provided to all concerned for the smooth functioning and working. The University covers an area of 6000 Kanals. After digital image processing of the area, the information about the area occupied by the various land uses from the map is gathered. The data is reflected in Table 3.

Table 3. Area under various land uses in the BGSB University Campus

Landuse	**Area (in Kanals)**
Built up	99.18
Green Spaces	5697.37
Parks	100
Playground	87.95
Road	8.0
Vehicle Parking Spaces	5
Water Tank	2.5
Total Area	**6000**

3.2 Energy audit

Energy audit is the key to systematic approach for decision making in the sphere of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies the energy usage according to its discrete functions. The energy is utilized in the Campus for lighting, space heating and cooling, running of laboratory instruments, appliances, water heating, ground water pumping, cooking and transportation.

The data regarding the energy consumption in the BGSBU is as following:

Table 4. Total energy consumption of the BGSB University

S. No	Energy Sources		Consumption (annual)
1	Electricity	Hydropower	1193 KW
		Solar	182 KW
2	Fuel	LPG	1044 cylinders
3	Fuel Oil	Petrol	3600 litres
		Diesel	24000 litres

The data in Table 4 indicated that the University utilizes renewable as well as non renewable energy sources to meet its energy needs. In terms of monetary value, University spends approximately 104.24 lakhs INR on energy requirement per annum.

Table 5. Monetary resources spend annually in the year 2017 – 2018 on energy requirement

S. No	Energy sources	Monetary Value (annual) INR
1	Electricity	77.23 lacs
2	Fuel oil	18.61 lacs
3	LPG*	8.4 lacs
Total expenditures on energy consumption		**104.24 lacs**

* Calculations are made on basis on number of LPG cylinders utilized by Hostels, Faculty Quarters, Departments and other administrative wings of BGSBU

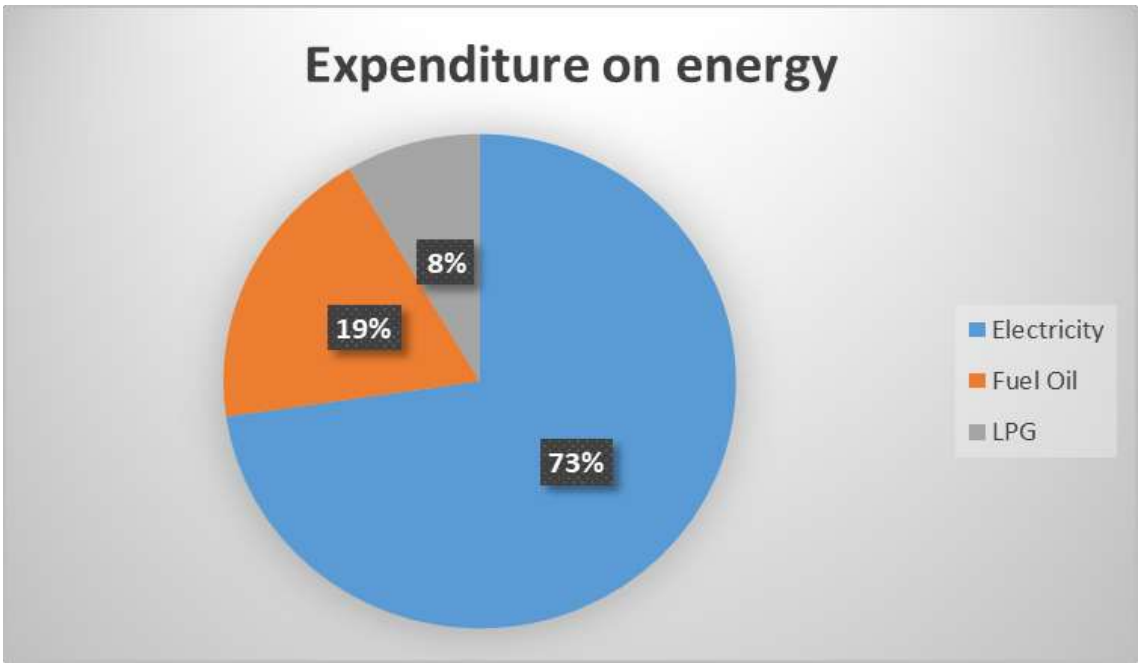

Fig 2. Percentage wise expenditure on energy consumption in terms of monetary values of BGSB University

Most of the energy requirement of the University is met by hydropower generated electricity supplied by the State Government. Some amount of energy requirement is met out of the power generated by the Solar Power Plant commissioned in the University.

Plate 1. Solar Power Plant, BGSBU

A 100 KW Grid connected Solar Power Plant in the BGSBU Campus is capable of generating 182500 units of electricity a year and it serves as a model for using nonconventional energy sources for future. In addition to the solarpower and hydropower, diesel generators are also installed as backup in case of power cuts.

Plate 2. Hydroelectric power transformer installed near Lead Garden/New Library building

Transportation is an important part of any institution relying on the energy consumption. BGSB University provides transport facility to both students and staff. So Far University owns 12 Operational vehicles of different capabilities which are being used for pick and drop services to distant areas, field surveys and other purposes. University staff members use personal vehicles and their approximate number goes to 150. Students use public transport, indicating lesser carbon foot print of the student community.

Plate 3. A diesel generator installed near School of Biosciences and Biotechnology

3.3 Water audit

Water audit is conducted periodically to determine water supplied in the distribution system as well as water lost and/or used within a distribution system. It aims to establish the water consumption pattern in individual sections, so as to realise the consumption levels with respect to exploring various pollution prevention and waste water minimisation opportunities. Water audit also helps to establish the existing water distribution system as well as waste water collection and recycling, if any. The water is supplied in the University by municipal supply as well as by the ground water supply. The storage capacity of water in the University is shown in Table 6.

Table 6. Total water storage capacity in the University

S. No.	Storage Resources	Number	Storage Capacity (in litres)
1	Water Tanks	55	2000
		10	1000
2	Underground water tanks	01	54553
TOTAL STORAGE CAPACITY			**174553**

Plate 4. Water tanks in the University and Borewell near Sabrang Square

The total water consumption in the Campus is 1.7 lac litres per day. The per capita utilization of the University is 110 Litres per capita per day. The utilizations of such a huge resource of water include usage for drinking, cleaning, laboratory use, garden use, leakages and overflows sometimes. The waste water generated is disposed off into the underground sewage tanks through waste water drainage to municipal server.

Besides water tanks the University is sustained by perennial springs dispersed all over in the Campus. 24 ponds of varying dimensions are also laid at the foot of hill slopes in the Campus. These water bodies have contributed to greening the neighborhood and attracting

bird and amphibian life. Water of these ponds is used for irrigation, develop-mental works etc. Moreover, Construction of bunds, terraces and drains has led to collection the run off and thus conserving the rainwater as well.

Plate 5. Natural Spring and Pond in the University

3.4 Solid waste audit

The solid waste management is in order with the installation of dust bins and their daily cleaning. The University has its own collection facility that collects the solid wastes daily from Residential complex, Hostels and Departments. This helps in maintaining the cleanliness by providing an efficient, safe and regulated management of solid wastes in the Campus.

However, no segregation of the waste takes place during collection and Land filling is the general waste management strategy adopted by the University. However, there is no management plan for managing inorganic waste, especially plastics. Studies were carried to assess the composition of the waste generated in the University. The data showed that the total generation of solid waste in the Campus is 650 kg per day. Out of which non biodegradable is 65 kg per day while the biodegradable is 585 kg per day. It is noteworthy

that BGSBU has adopted an environmentally sound practice of converting biodegradable waste into vermicompost which is a useful resource. The vermicompost produced is used in the nurseries and the gardens of the University.

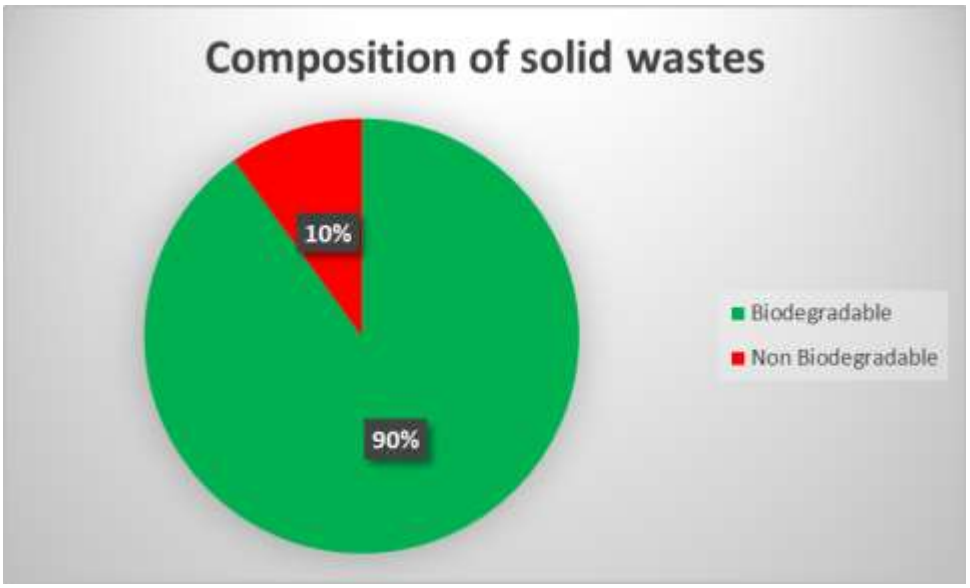

Fig 3. Percentage composition of generated waste in BGSBU

Plate 6. Solid waste collection service and dustbins provided by BGSBU

The study showed that biodegradable waste constitutes significant component of solid waste in the University. The non biodegradable component of solid waste is recyclable. Among the recyclable materials, paper constitutes the maximum share while glass, cardboard and plastics also make a significant share.

Plate 7. Vermicompost preparation out of Organic Waste on BGSBU Campus

3.5 Plantation audit

Many departments of the University maintain their own small gardens. Due to extensive plantation drives the campus is turned into a lush green spot with fair magnitude of biodiversity. More than 2 lac saplings planted in the University have assumed a full canopy now and have attracted a lot of faunal diversity including birds, reptiles and small mammals. More the 75% area of the campus is green having different species including pines, broad leaved trees, shrubs, and perennial herbs.

Plate 8. Green Spaces and Parks in BGSBU

University has established Lead Botanic Garden, Herbal Garden and fernery with the financial support from different funding agencies of Govt. of India. The topography and altitudinal gradient of 700 – 1400m amsl of the BGSBU campus helps it support diverse vegetation of the tropical and temperate types. Lead Botanic Garden is the conservatory of more than 400 species of angiosperms belonging to families Poaceae, Asteraceae, Fabaceae, Solanaceae, Lamiaceae, Ranunculaceae, Malvaceae, Menispermaceae, Companulaceae, Zingiberaceae, Liliaceae, etc. 12 species of Gymnosperms including *Gingko biloba, Zamia sp., Podocarpus sp., Agathis sp., Araucaria sp., Pinus rouxburghii, P. wallichiana, Cedrus deodara, Juniparus prostata, Thuja orientalis, Cupressus* sp, *Cycas revoluta* are also grown in the Lead Garden.

However, Shrubs such as *Carissa ophaca, Zanthoxylum armatum, Pittospermum eriocarpum, Rauvolfia serpentine, Hypericum perforatum, Berberis lycium, Berberis asatica, Berberis aristata* etc. Besides Climbers namely *Gloriosa superba, Asparagus racemosus, Dioscorea deltoidea, Dioscorea bulbifera, Smilax aspera, Rosa moschata, different species of Clematis, Tinospora cordifolia* etc are also grown in the Garden of the Campus.


Plate 9. Glimpses of Lead Botanic Garden in the Campus


Plate 10. Plantation drives carried out in BGSBU

Table 7. Number of species of different types of vegetation

S. No	Flora	Number of Species
1.	Trees	45
2.	Shrubs	61
3.	Climbers	31
4.	Pteridophytes	63
5.	Bryophytes	10
6.	Grasses	40
7	Herbs	160

Recommendations

The committee has made short term and long term suggestions to take environment protection to higher levels and it is hoped that this will receive due attention of University authorities and also all stake-holders of the University.

1. Environmental auditing may be conducted by the University in every two years. The University can also offer consultancy projects on environmental auditing for other academic and research institutions.

2. Rainwater harvesting facilities may be established at both administrative and academic campuses, foreseeing future needs of water. Further, rainwater pits can be prepared at appropriate places identified and restoration activities may be initiated to sustain the health of ponds and wetlands in and around the campus.

3. Specific waste management plans should be adopted to manage solid waste in the campus, with the assistance of State Swachhta Mission and use of plastic carry bags, thermocol cup, plate and flex boards should be banned inside the University.

4. Propose a system for collection and disposal of waste sorted out as organic and others on a daily basis, managed by the campus administration. For managing organic wastes, biogas plants may be commissioned at the hostels, canteens, and staff quarters. The wastes generated can be used for promoting organic farming activities within the campus and the products can be used in hostels and canteens, with a plan to ensure the availability of organic food in the canteen and hostels for future. There should be a system for the management of hazardous wastes.

5. The public lights within the campus may be run with solar panels and the replacement of existing lights should be done with LED lamps.

6. Frame a holistic campus development plan to foresee the future developmental needs in tune with green charter adopted by the University.

7. All the blocks in the Campus should develop a garden in front of the building and the expenditure for the same may be met from the Department Development Fund.

8. Green habitat concept should be adopted for all the building construction activities of the University in future, which may help a long way in reducing energy usage, increasing aesthetic appeal of the buildings and class rooms, besides reducing carbon foot print. Further, more green spaces should be established all around the campus around larger trees and shades for the benefit of the students.

9. Fire safety instruments should be installed in all the buildings.

10. More public toilets/e-toilets may be established in the campus and in hostels; separate toilets are required for differently abled students.

11. Vehicle pooling should be promoted among both students and faculty and use of bicycles should be promoted as a policy of university.

12. Irrespective of the subjects, environmental education should be part of curriculum and for the post-graduate programmes at least one credit on environmental should be made compulsory. Alternatively, one credit may be given to students participating in environmental conservation/awareness activities.

Plate 11. Glimpses of Green BGSBU Campus