



SOLID WASTE MANAGEMENT



**Guru Nanak Dev University
Amritsar**



राष्ट्रीय मूल्यांकन एवं प्रत्यायन परिषद

विश्वविद्यालय अनुदान आयोग का स्वायत्त संस्थान

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

An Autonomous Institution of the University Grants Commission

Certificate of Accreditation

*The Executive Committee of the
National Assessment and Accreditation Council
on the recommendation of the duly appointed
Peer Team is pleased to declare the
Guru Nanak Dev University
Amritsar, Punjab as
Accredited
with CGPA of 3.51 on four point scale
at A grade
valid up to December 09, 2021*

Date : December 10, 2014



D. Singh
Director

Preserve

Protect
Environment

Save

Er. S.K.Goyal
M.E. (Env.), FIE (India)
Sr. Env. Engineer(Retd.)
Punjab Pollution Control Board(PPCB)



EIA Co-ordinator (QCI)
Chartered Engineer,PPCB

Certificate

Certified that a team of faculty members & students, under the leadership of **Prof. Ashwani Luthra, Director IQAC** of Guru Nanak Dev University, Amritsar has conducted a detailed **Environmental Green Audit of various Green Initiatives taken by the university** covering different aspects such as Green Cover, Green Mobility, Air Quality Monitoring, Water and Wastewater Management, Green Energy Initiatives, Solid Waste Management, Bio-Medical Waste Management, and E-Waste Management, for the preservation and protection of environment in its campus. Data and credentials in the report have been scrutinised and are found **Satisfactory**.

Efforts made by the leadership, faculty and students of the University towards environment and sustainability are commendable and worth appreciating.

Dated: NOV.25,2021


(Er. Samarjit K. Goyal)
Chartered Engineer
Pb Pollution Control Board

CENTRE FOR SCIENCE AND ENVIRONMENT

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LEAVES
OF
IMPORTANT
SURVIVAL
TREES
IN
INDIA —
MAHUA,
KHEJDI,
ALDER,
PALMYRA
AND
OAK

November 29, 2021

The Coordinator
Centre for Sustainable Habitat
Guru Nanak Dev University
Amritsar

Subject: Certification for different Audits under Green Campus Initiatives

Dear Sir,

From the past six years, Centre for Science and Environment (CSE) and Guru Nanak Dev University (GNDU) Amritsar have been working together on CSE's Green Campus Initiative and audit programme. Under this engagement, CSE has supervised multiple environmental audits and trained the faculty, staff and students at GNDU as well as other universities and colleges across India. The results and outcomes of this engagement have been published by CSE in multiple reports such as 'A Green Campus Compendium: Incubation, Experimentation and Demonstration of a Green Future' and 'Green Campus Movement'. Appreciation letters have also been shared at the various stages of this programme. CSE appreciates that the faculty at GNDU has prepared the following audit reports:

1. Green Cover of GNDU
2. Green Mobility Initiatives
3. Air Quality Monitoring
4. Liquid Waste Management
5. Green Energy Initiatives
6. Solid Waste Management
7. Bio-Medical Waste Management
8. E-Waste Management

CSE commends GNDU's efforts towards realising Sustainable Development Goals and extends its full support and expertise in its future endeavours.

Yours' cordially,

Rajneesh Sareen
Programme Director
Sustainable Buildings and Habitat Programme
Centre for Science and Environment

Preface

Guru Nanak Dev University Campus is tempts to be a zero waste campus in its region. Its solid waste is collected, segregated, and treated from its internal resources. The solid waste management concerns are reported for Internal Quality Assurance Cell, GNDU jointly by Dr. D. S. Sogi, Professor, Food Science Department and Dr. Kiran Sandhu, Associate Professor of Guru Ramdas School of Planning, GNDU. The report showcases the initiatives of the university with the aim to make the university a net zero waste campus.

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GURU NANAK DEV UNIVERSITY



With the glorious history of past fifty years, Guru Nanak Dev University was established at Amritsar on November 24, 1969 to mark the Birth Quincentenary of Sri Guru Nanak Dev Ji, the apostle of universal brotherhood, truthfulness, non-violence, compassion, tolerance, harmony, humanity, strict observance of moral & ethical values in daily life, who is also revered as the founder of Sikhism. It won't be an exaggeration to state that His teachings and preaching & His own personal life are perfect examples to be emulated by the entire mankind even after about four and half a centuries and will remain so eternally. Ever since its foundation the endeavour of the university has always been to meet the objectives enshrined in the Guru Nanak Dev University Act 1969, which emphasized that the new University would make provision for imparting education and promoting research in the humanities, learned professions, sciences, especially of applied nature and technology. Studies and research on the life and teachings of Guru Nanak, in addition to working towards the promotion of Punjabi language and spreading education among educationally backward classes and communities are the other commitments. In consonance with these expectations, the university in its eventful history of 50 years has taken long strides in spreading the message of Guru Nanak Dev ji and promoting education in such fields as Science, Arts, Management, Information Technology, Industrial Technology, Environment, Planning and Architecture. To fulfil its commitment, the tuition fee charged from the students of the departments of Guru Nanak Studies and the School of Punjabi Studies has been waived. The UGC conferred this University with status of “University with Potential for Excellence” in 2012. The National Assessment and Accreditation Council (NAAC), Bangalore in November 2014 reaccredited the university in 3rd cycle with CGPA of 3.51 out of 4 point scale at “A++” grade, the highest in the region.

Guru Nanak Dev University is a high performing state public university as it has improved its ranking from 80 in 2017 to 51 in 2020 among all Central, Public and Private Universities in the country (NIRF, MHRD, GoI). It is reckoned among top 9% universities of the world and top 10 state public universities of India by Centre for World University Ranking (CWUR), a leading international agency engaged in grading the top ranking universities world-wide since 2012. QS I-GAUGE Rating System has rated the university in the Diamond Category in the field of ‘research, faculty quality and infrastructure’ by the. It was also shortlisted for the University of the Year Award in the 16th FICCI Higher Education Summit 2021 organized by FICCI jointly with the Ministry of Education and Ministry of Commerce & Industry, Government of India. High quality research has improved the H-index of the university from 64 to 119 with top 10 percent highly cited papers in Scopus. The university is placed among the top 4 Institutions in Punjab and 10 Institutions in North India by Nature Index,

The University today boasts of 43 teaching departments at the Campus and 149 affiliated colleges, 16 Constituent & University Colleges and 53 Associate Institutes, many of which are located in the rural areas. The university has always strived hard to make the benefits of higher education accessible to the rural masses. More than twenty thousand students, an overwhelming majority of them being women, are enrolled in various Departments at University Campus and Constituent Colleges. On-line

admission, on-line counselling, on-line re-evaluation, introduction of Credit Based Continuous Evaluation Grading System etc. are a few hallmarks of the university. All the results have been computerized and OMR (Optical Magnetic Recognition) system is being used to bring in more efficiency and transparency. This is the first University in the region to have computerized its examination and registration system. The students now have an all-time access to their results through SMS service. It acts as a model higher education institution for digital initiatives like e-office management system, digital library, Wi-Fi enabled campus, high speed online teaching modules, and smart classrooms to name a few.

Academically also, the university has carved a niche for itself in the field of Higher Education in the country. Our University is recognized as one of the leading institutions in North India in the domain of Science and Technology. Many coveted projects from the apex bodies like the DST, CSIR, BARC and other organizations worth crores of rupees have been awarded to our faculty members. One of the four Nodal Calibration Centres established by Bhabha Atomic Research Centre is set up at our campus. The Centre of Emerging Life Sciences equipped with the state-of-the-art scientific instruments worth crores of rupees, well-maintained Botanical Garden, Department of Sports Medicine & Physiotherapy are a few of the jewels in the crown of the university. To more strengthen the university infrastructure and to prepare students for employments, computer lab with the help of TCS is also established. Further, the UGC has granted the University the Centre with Potential for Excellence in Life Sciences and Centre for Advanced Study in Chemistry.

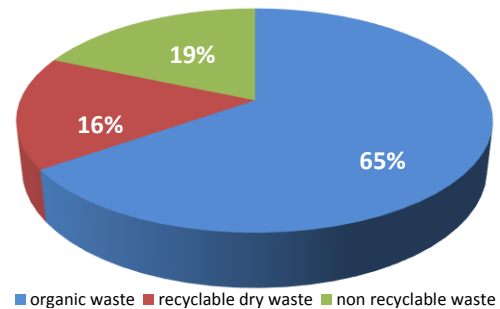
In the field of culture and sports also, the achievements of the university are noteworthy. The university has been national Champion for 10 times & the winner of the North-Zone-Inter-Varsity Cultural Championship for 13 times. The winning of the coveted Maulana Abul Kalam Azad Trophy, the highest sports award for a university in the country, for a record number of 23 times, speaks volumes about its supremacy in the field of sports. An Astro Turf for hockey, a swimming pool of international standards, a velodrome, a Gymnasium hall, shooting range & many other state-of-the art sports facilities are the prized possessions of the university. The Lifelong Learning Department of the university is successfully catering to the female folk of the region to make them self-dependent by offering various skill development programmes. The Track record of employment of our students by big business Houses and Multi-National Companies has been very satisfactory. Our students of engineering, management and commerce field are employed by companies in India and abroad. They are all contributing to the creditworthiness of the University by their hard work and diligence. In the last year alone, almost all our engineering and management students were recruited by various companies through campus placements. It goes without saying that all these achievements would not have been achieved, but for the heart and soul put in by the students, faculty members, and administration of the university. Undoubtedly, the university remains committed to achieve the lofty goals, for which it was founded after the name of Sri Guru Nanak Dev Ji.

The university is known for its GREEN CAMPUS initiatives in the field of energy, water, solid waste management, micro mobility and health and hygiene. Some of the key initiatives of the university are energy efficient buildings, rooftop solar energy plant, solar water heaters, sensor based urinals, toilets and wash basins, maintenance of lawns as water recharge systems, rooftop rainwater harvesting, on campus sewerage water treatment plant, organic waste management through bio-gas plant and vermi-compositing, natural processing to convert agro-waste into compost, involvement in recycling and reuse of paper, plastic, metal and other waste, efficient medical waste management, regular thickening of tree cover by planting tree each year, making the campus car free, facilitating the students, staff and the visitors by free of charge e-vehicle facility for micro mobility within the campus, developing lush green covered footpaths, regular sweeping of the roads and buildings at least twice a day and regular disinfectant spray to help the university bag the second cleanest State University in India awarded by the Ministry of Human Resource Development, Government of India under Swachh Campus Ranking for the last two years continuously.

1. The Context

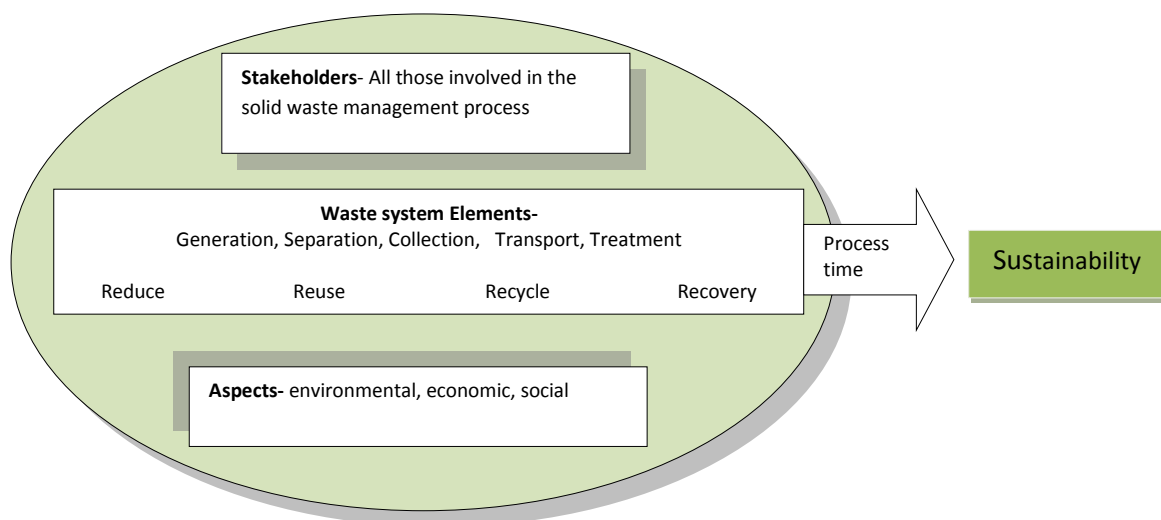
The University campus is spread over 500 acres land, divided into thirty seven academic departments, administrative, maintenance and commercial units and residential complexes comprising of University teaching and non-teaching staff and 5000 students. The solid waste generated from the campus amounts to about 400 Kgs daily. Prior to the launch of the initiative, the solid waste was collected and disposed off without segregation in an unsanitary landfill site about five kms from the University. The practice was unsustainable and non-resourceful to say the least.

The adoption of the ISWM method has ensured a sea change wherein source segregation practices ensure that solid waste is collected in different types of the bins with colour code green, red and black. Green coloured bins are used to collect biodegradable waste, red bins are used to collect non-biodegradable waste whereas black bins are used for the collection of used masks.



2. Objective of the Practice

Guru Nanak Dev University is one of the pioneer higher education institutions in the country to have revolutionised and streamlined its waste management systems in accordance with the ideological principles of Integrated Sustainable Waste Management (ISWM) to move towards maximum landfill diversion and waste minimization at source. The concept of ISWM applied herein comprises of three dimensions, i.e. the stakeholders involved in waste management, such as the municipal workers, informal sector waste pickers, itinerant waste buyers, waste dealers, wholesalers, recycling enterprises and end user industries. The second dimension pertains to the practical and technical elements of the waste management system based on the underlying principles of industrial ecology and life cycle analysis, emphasising waste prevention, reuse and recycling. The third aspect consists of sustainability aspects reflecting the framework that underlines the assessment of the waste management system.



Integrated Sustainable Waste Management Model (ISWM)

3. The Practice

In 2017, the University established the *Solid Liquid Waste Management Centre* to manage its waste as a resource and also provide advisory services to Amritsar Municipal Corporation for managing the city's waste efficiently. Since then the University has established a system that incorporates the ISWM model as the hallmark of its waste management architecture. The following are the unique features of the practice.

3.1. Biodegradable Waste Utilization

The following practices have been ensuring that organic waste material is managed in a manner to lead to creation of usable products and therefore contribute minimal to the waste stream that reaches the landfill site.



Composting Site and Biogas Unit

- 3.1.a. Cooked Waste:** It is a biodegradable waste which is produced mainly in boys and girls hostels. The leftover food is collected in a plastic drum. Dairy farmers visit the mess every day in the early morning and take away the waste to feed the dairy animals.
- 3.1.b. Vermicomposting:** One vermicomposting unit is being run at the SLRM Centre in a shed. Cow dung is procured from the local vendors and used to rear the earthworms. Once the earth worms become active, the uncooked waste collected from the hostel messes, Canteens and residential area is crushed in a grinder to reduce the size. The ground waste is fed to the earth worms by opening the raw and transferring the waste into the row followed by covering with the composting material. The ground waste takes about 8-10 days in summer to get completely decomposed.
- 3.1.c. Microbial Composting:** The garden waste and uncooked waste are decomposed under aerobic condition following Bangalore Model. Three layer system is adopted in which the first layer was of leaves from garden waste, second layer of ground uncooked waste and the third layer is of cow dung. Two pits 10ft x 12ft x 4ft have been dug wherein the first pit is filled by utilizing the uncooked waste and leaves as mentioned earlier and then the compost is transferred to the second pit. The compost is allowed to decompose in second pit for one month and is kept moist by sprinkling water regularly all the time. The compost is of dark brown colour without any off odour.
- 3.1.d. Biogas Unit:** One biogas plant has been designed to utilize the uncooked waste to produce energy. The design has been developed by calculating the amount of biogas required by a family of four persons. Currently the biogas plant is working on trial basis and will be fully functional soon.

3.2. Non-Biodegradable or Dry Waste Utilization

The dry waste comprising of paper, plastic, metal, etc. is stored in separate red coloured bins and collected by one tractor trolley with one driver and one helper. These dust bins have been installed in the entire campus. The collected waste is taken

to SLRM Centre where it is segregated into white paper, Newspaper, corrugated fibre board boxes, glass bottles, plastic bottles, metal, plastic film, etc. These items are sent to the recycling industry through private contractors.



Solid Liquid Resource Management Centre

4. Sanitary Napkins and Other Hospital Waste

The University Girls Hostels are equipped with sanitary pad dispensers and incinerators thereby completely eliminating this hazardous waste stream from the solid waste that can create immense health hazards at all levels of disposal from waste bins up to landfill sites. Currently two units of the dimensions 260x310x560 mm are installed per hostel with a capacity of 180 sanitary napkin burning/day. The incineration process is the most hygienic and safe methodology to handle this type of waste and University has earned the distinction of being the first institution in the region to have done so. Other hospital waste from the University's Health Centre and teaching departments is collected by a private bio-medical waste management company, Amritsar Envirocare Systems, Ibbankalan Village, Amritsar.



Sanitary Napkin Incinerators at Girls Hostels

5. Evidence of Success

It is a matter of immense pride to mention that the University campus stands at number one position among the most *Swachh Campus* out of the multispecialty public universities with large campuses and ranked second amongst all government universities as per the survey of Ministry of Human Resource Development, Government of India under the Swachh Campus Ranking in 2018 and 2019. The Solid Waste Management initiatives at the University intend to make it a zero waste campus besides serving as a model for other institutions and the city to emulate. As such, the initiatives have been highlighted in regional newspapers from time to time since 2017.

5.1. Environment Sustainability

At the heart of the solid waste management system in the University is environment sustainability underpinned by the initiatives to maximize the extraction of useful products from the waste. The biodegradable components are being effectively recycled into ecological products like organic manure and natural gas, both having a minimal environmental footprint and put to reuse, albeit in a different form. The dry non-biodegradables like paper, plastic and metals are sourced to specialized industrial units that convert them into usable products and bring them back as a part of the circular economy. Also the final disposables for land filling are minimal and the campus has achieved a substantial landfill diversion.

5.2. Economic Sustainability

Essentially, a system is economically sustainable if it is able to optimise costs, cover expenses and have a return on the investment or resources deployed. An income of Rs 1.15 lakh annually is generated through sale of dry recyclable waste with Rs 10.5 thousand/month generated through sale of plastics only. Biodegradable waste processing yields three quintals of organic manure per month which is utilized in the University's landscaping initiatives and leads to a cost saving of Rs 7 lakh annually which would otherwise be spent to buy fertilizers. The initial trial runs with the bio-gas plant have demonstrated that in the initial phase which starts in a month's time, ten families can be supplied with natural methane gas cylinders for kitchen utilization on a no profit no loss basis. The target is to produce 100 cylinders monthly thereafter. This shall be utilized in the hostel kitchens and is expected to significantly lower fuel costs. This model is totally zero waste and with minimal inputs in terms of investment and manpower, is generating viable results.

5.3. Social Sustainability

The system is proving to have immense social value by involving all stakeholders, i.e, the University authorities, the private contractor, the student and staff community, the waste workers involved in the Universities waste management process, thereby empowering and engaging them effectively. The participation of all these stakeholders actively has led to the University nearing its goal of zero waste campus in a short time span. In addition employment has been generated through the ISWM system wherein seven waste workers including two women have been given employment to sort, collect and transport waste. The salary of the employees is generated from the sale of dry recyclables, thus imposing no financial strain on the University's exchequer.

6. Problems Encountered and Resources Required

While it can be concluded that the ISWM model of waste management in the University has been successfully applied and bearing positive results on all fronts. Yet there are challenges that create bottlenecks towards achieving the zero waste targets. While composting units are functioning effectively, some technical obstacles have delayed the implementation of the bio gas plants. However the expert advice has been sought and it is envisaged that the system shall become fully operational in near future. Further, source segregation, despite the University's best efforts continues to pose a problem despite separate dustbins installed for the purpose. The University plans to launch a massive awareness campaign amongst its residents to engage the community with sensitization and awareness to get better results in waste segregation.

It is still the endeavour of the University to better the system to the extent that no waste leaves the campus and zero waste in the truest sense of the word becomes a reality and a model worthy of emulation.



