

DR. HARISINGH GOUR VISHWAVIDYALAYA

**AN OBSERVATORY REPORT ON UNIVERSITY
WASTE MANAGEMENT**



**Dr. Harisingh Gour Vishwavidyalaya,
Sagar (M.P.)
(A Central University)**

Minutes of 31st Meeting of Academic Program Committee (APC)

1:31:(16): With the permission of the Chair, Prof. H. Thomas, Director, Research and Development (DoRD) presented the following policy documents for consideration by APC:-

1. Policy on Internal Complaints Committee.
2. Policy on Environment and Sustainable Development.
3. Policy on Academic Audit.
4. Policy on Advance Learners and Slow Learners.
5. Innovations & Start-Up Policy (GISP)
6. University IT Policy.
7. Policy for Maintaining and Utilization Physical, Academic and Support Facilities.
8. Library Policy.
9. Scholarship Policy.
10. HR Policy.
11. E-Governance Policy.
12. Group Health Insurance Policy.
13. In-Campus House/Flat Allotment Policy.
14. TA & DA Policy.
15. Non-Teaching Staff Appraisal Policy.
16. Finance Policy.
17. Code of Conduct and Ethics Policy.
18. NCC Policy.
19. NSS Policy.
20. Health Care Facilities and Sanitation Policy.
21. Outreach Program Policy.
22. Student Cultural Policy.
23. Water Conservation Policy.
24. NEP-2020 Implementation Policy.
25. Sports Policy.
26. Anti Ragging Policy.
27. Rajbhasha Policy.
28. Credit Bank Transfer Policy.
29. Examination Policy.
30. Training and Placement Policy.

Resolution:- The APC after due deliberations resolved to approve the aforesaid policies.

(Action: DoAA, DoRD, CoF, FO, All the Deans of Schools & HoDs)

The Meeting ended with vote of thanks to the Chair.



संचालक (अनु. एवं विकास)
Director (R & D)
डॉ. हरीसिंह गौर केन्द्रीय विश्वविद्यालय, सागर
Dr. H.S. Gour Central University, Sagar

Satish Kumar
Deputy Registrar
Academic Affairs &
Secretary, APC

Acknowledgement

All praise to almighty god who created nature in a cyclic manner, where all mass are convertible to energy and energy grows the mass. Who suggested there is no waste in the Universe, we just need to know how to treat them.

It gives us immense pleasure in expressing my sincere gratitude and reverence towards our honourable Vice-Chancellor madam, Prof. Nilima Gupta, who initiated this holy and extremely important work for the University. Her sincerity and understanding of the work and timely advices boosted us to incorporate all the important issues lying with the University (regarding waste management) in this report.

We express our sincere thanks to all Deans of Schools and Head of the departments for providing all needed and time bounded support. We are extremely thankful to all wardens of girls' hostel (Prof. J.D. Ahi, Prof. Vandana Soni, Dr. Vandana Rajauriya and Dr. Navjot Kaur Kanwal) and to boys' hostel (Prof. Rajesh Kumar Gautam, Prof. Utsav Anand, Dr. RP Singh, Dr. Anil Kumar Kashyap, Dr. Sanjay Kumar, Dr. Rakesh Soni and Dr. Ashutosh Mishra) for providing the necessary data for the preparation of the project report. Special thanks and gratitude to Mr. Pankaj Tiwari (Director, EMMRC), Mr. Govind Surviah (photographer) and Mr. Madhav Chandra for their support, in terms of survey of entire campus and provision of important photographs.

We owe our cordial thanks to all our colleagues especially to Dr. Pushpal Ghosh, Dr. Milind Deshmukh and Dr. Kalpataru Das, whose suggestion boosted the report in all manners. We are also thankful to technical and non-technical staffs of the university, whose support was always there in this work.

- Dr. Niraj Upadhyay and Dr. Vimlesh Chandra
(Nodal Officers, University Waste Management)



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An
Observatory
Report on

University Waste Management



**Dr. Harisingh Gour Vishwavidyalaya
(A Central University), Sagar
Madhya Pradesh, Pin: 470003**

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1. Introduction

Dr. Harisingh Gour Vishwavidyalaya covers an area of 1312.89 acres over patahria hills connected to the Vindhya Range and surrounded by the forest area (around 100 acres) that contribute to preserve ecosystem and biodiversity in the campus. The University campus accommodate 11 Schools containing 36 academic departments, an administrative block, engineering section, A centre for Indira Gandhi National Open University, Human Resource Development Centre, Electronic & Multimedia Research Centre, Healthcare and sanitation department and a sports division. A reasonable area is devoted for the residence of faculties, staffs and students in the University campus. The campus itself contain around 180 faculty quarters, 55 staff quarters, four boys' hostel (residential capacity of around 850 students) and two girls' hostel (can accommodate around 600 students).

Due to large number of waste types (chemical, biological, electronic, degradable, non-degradable etc.), waste management in any University is a challenging task and Dr. Harisingh Gour Vishwavidyalaya, Sagar is not an exception. Increasing waste generation under inefficient management systems has become a major challenge in this University and situation is becoming pathetic day by day. The use of non-biodegradable items especially single used plastics and produced wastes has drastically increased in last three-four decades. They captured the market in such a way that their uses seem to be non-replaceable. In residential areas, the system of storage and transportation of wastes are not available; plastics and non-degradable wastes are burnt in open areas; departments that generate chemical/ bio-wastes neither reduce, nor recycle them; electronic wastes are thrown in open areas and many more challenges are needed to be addressed during making of waste management system of the University. In addition, the reusable materials (like furniture/ one side used paper etc.) have become waste due to general avoidance and lack of well trained staffs. Plastics, concretes, wooden items, dry leaves and cattle dung can be seen many places in the campus. The University does not have proper connectivity of the wastewater drainage system; their management is the next steps to be talked off. The university does not have proper storage system for laboratory waste. Swaksh Bharat Abhiyan was launched in October 2014 with an objective to bring about improvement in the cleanliness, hygiene and the general quality of life. In spite of complexity of the problem, University doesn't have proper policy for the waste management. At present, University does not have any method of collection, storage, transportation and treatment methods of the waste.

This report will provide the basic information about waste available in the University and their possible proper treatment. It helps us understanding the nature of the waste and action to manage those wastes. This report will fulfil the following objectives:

- To identify and classify the waste
- To segregate recyclable and reusable materials
- To reduce the waste
- To strategize collection and transportation of the waste
- To suggest possible treatment methods

2. Types of wastes in the campus: Due to different nature of the departments, centres, residential areas the types of waste generation are different and can be divided in four parts:

2.1 Waste from the academic departments: Among the different Departments, paper wastes, furniture and electronic wastes (Computers, printers etc.) are common. In lack of proper management, many reusable materials are thrown or stored as waste. The process of absorption has not been followed from many years. The unknown wastes are pile up in the rooms occupying the sitting places from long time and are considered a hazardous material until it is properly identified. The undergraduate, postgraduate and research laboratory are generating chemical and biological wastes. There is no clear policy framed by the University for recycling/discarding of these wastes by responsible person. Therefore, malpractices like discarding chemicals in water medium and throwing bottles carrying chemicals in open area is going on.



Figure 1: Chemical waste



Figure 2: waste Furniture

2.2 Waste from the non-academic departments: There are many supporting centres in the University, like University administrative block, Engineering section, Guest House, University Central Library, University Health Centre, Remedial Coaching Centre, Sports section, post office, two banks (State Bank of India and Central Bank of India), Indian Coffee House, SwarnaJayanti Auditorium, KendriyaVidyalaya, Electronic & Multimedia Research Centre, shopping complex etc. From most of these places only dry and wet wastes are found except from University Health Centre and from Electronic & Multimedia Research Centre. Because of the nature of the work, hospital generates some biowastes, which is not an issue of waste management for the University, as these bio wastes are collected from Sagar Medical College daily and are finally incinerated. Similarly, Electronic & Multimedia Research Centre produces electronic wastes, which is stored in rooms, waiting for absorption and may emit toxic gases when are stored for long time.

2.3 Waste from the residential areas: At present, Dr. Harisingh Gour University does not have any resource to collect and transport the waste and there is no specified location for the waste disposal. Majority of residents dump their biodegradable waste and non-biodegradable waste in dustbins which is ultimately thrown in the open fields or burnt. Food waste is thrown on the road to feed cattle roaming in the campus. Cattle dung can be seen across the campus. Accumulation of waste at open spaces, street sides/drains are leading to environmental pollution. Unhygienic conditions prevailing in the area may lead to various health and sanitation related diseases.



Figure 3: Non degradable waste in residential areas

2.4 Waste of public places: All the public places, like canteens, shopping centres etc. generally generate wet and dry wastes for which methods of collection and treatment should be same as stated above.

2.5 Waste from drainage Water: At present, there is no drainage system available in the campus. All the households release waste water in the gardens. Due to flow of waste water into public areas, it has become a major source of bad odour, disease in the campus. Thus, there is an urgent need to bring in the improved, efficient and sustainable waste management system for clean and green campus as well as there is need to connect all the houses to the drainage and waste water management system.

3. Proposed waste management system: By definition, wastes are those materials that are not needed by the owner, producer and processor. In all processes of production and consumption, wastes are produced. But the apparent waste generated from one system may become an input to another system. It is the exponential growth in human consumption that increased the quantity of the wastes, and their consumption in that speed is becoming difficult day by day. After generation of the wastes, their management is based on three 'R's: Reduce recycle and reuse. To reduce the wastes we want to incorporate the fourth R here that is **repair**. University must need a work shop that may contain furniture repairing/ preparing section, Glass blowing section, e-repairing centre etc.

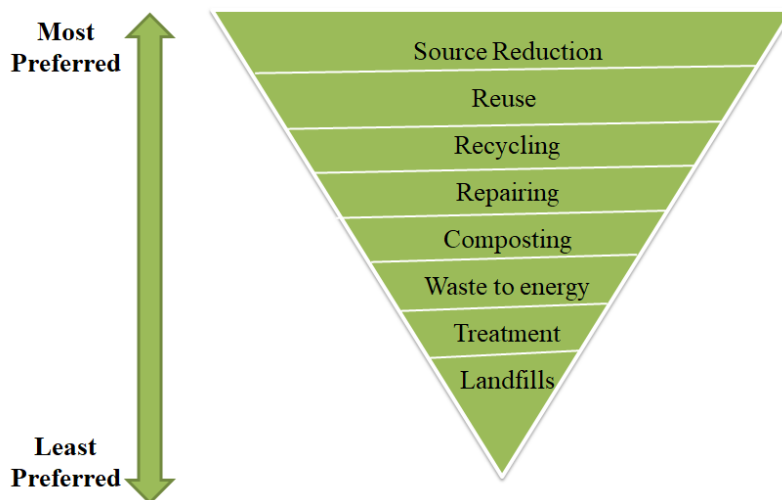


Figure 4: Scheme of the sustainable waste management

3.1. Source reduction of the waste: Any process of production or consumption generates waste. Getting waste itself is not a big problem, but the problem aggravate by greater quantity and faster generation of the waste than their recycling processes. It is therefore, before managing the waste; we should first try to reduce the waste. We recommend optimum utilization of the material bought for the University management processes. As an example, a

common waste that is generated from almost all the departments is the paper waste. Though, we strongly feel paper should not come under waste category and we should take all the necessary steps to maximize their utility and minimize waste generation by them. In this quest we recommend to reduce/ minimize paper wastes by strengthening the IUMS and web portal of the University. Copy of a notice, created for a single person is circulated many fold for putting those on record. We recommend a full-fledge system of e-files and e-notices. Also, we recommend accepting and appreciating use of one-side used papers for official purposes. At the end point of their maximum utilization, they may be collected once in a month from entire campus, recycled and reused for the University official purposes.

In a similar way single use plastic wastes can be reduced by designing a carry bag of carrying capacity of at least 40 Kg, which may itself contain three carry bags of 5 kg capacity, five carry bags of two kg capacity and 8-10 carry bags of one kg capacity. Their optimum utilization can be reached by involving and educating the stake holders by slogans, nukkad natak etc. Chemical wastes can be reduced by minimizing amount of chemicals used for performing experiments in UG and PG labs. In the same line, generation of other wastes may also be reduced.

3.2 Reduction of the waste: It is our strong opinion that waste generated from one site may be an important input or resource for the other site. So, wherever possible, we should reduce the waste by optimizing the waste. The important wastes should be placed on website through a link, if somebody needs that they may be allowed to take and reuse those. All the repairable items should be repaired and reused. For example, batteries from electronic waste may be a potential tool for further research in the said area. Therefore, the waste batteries can be allowed to provide to scholars of Physics department for any further innovation or possibility of reusability of those (if demanded). Sometime printers and computers are repairable. Only those electronic waste should be discarded whose technology is out of the date and should be sent directly to the companies which recycle these wastes. Similarly, paper should be used till its maximum usability and after that should be recycled and reused.

Repairing: There are many usable items in the University, which in absence of repairing or recycling looks waste. For example most of the wooden waste, which at present have taken lots of space in the University Engineering section and also in various Departments, are repairable and reusable. All the furniture demands of the University can be taken care from those unused wooden materials. Also the produced furniture from these woods are repairable in nature. By this way, University will not only minimize the waste but also may reduce the expenditure in bringing up the new furniture and will provide job to the local community.

3.3 On-site classification of the waste: Different types of wastes have different treatment methods. It is always better to segregate the waste at the site of waste generation. People should educate to come out from their comfort zone and put different wastes (biodegradable/ non-biodegradable/ chemical/ biological/ electronic wastes) in different containers.

3.4 Manual collection and to fix the responsibility: University should manage the segregation, collection and transportation of the waste. Their regular monitoring is also important. Two different types of the wastes should not be mixed in any circumstances. The person collecting the waste should allow denying collection of the waste, if not segregated or properly classified. The van collecting wastes should have two partitions i.e. for the wet degradable waste and for the dry non-biodegradable wastes. Throwing or burning the wastes in open area should be a punishable act.

There should be routine transport of the wastes from the waste generation site to waste treatment plant. Biodegradable and non-biodegradable waste should be collected every day; chemical wastes and glass wastes should be collected once in a week; electronic and paper wastes should be collected once in a month and transported to the treatment plants. For collection of biological waste an incinerator uses to come every morning from Sagar Medical College. We recommend continuing the process.

3.5. Site selection for the waste treatment: Waste treatment itself is a huge, challenging and cost demanding process. We recommend treatment of only those wastes, which are coming out in large excess to make the treatment process cost efficient and may produce usable items for the University at the end of the process. To the best of our opinion, treating degradable and chemical wastes in the campus is beneficial. Wherever possible, strategy of reusing waste in academic and research purposes should be done. Otherwise, non-biodegradable and electronic wastes should be directly sent to the concerned industry. For collecting bio-waste, an incinerator uses to come every morning in all the working days from Sagar Medical College. We recommend continuing the process. A chemical waste treatment plant can be installed right behind the Chemistry Department. Infrastructural and staff support should be provided for that.

Wet biodegradable wastes can be collected in two different locations of the University keeping a distance of a minimum of 250 meters from the population area. We suggest the collection areas around Boys' hostel and around Girls' hostel so that the produced gas can be transported to the hostel canteen/ hostel mess.

With high population in India, waste management is becoming a tedious task. For the process, management and monitoring demands dedicated staff and section. So, we

recommend starting a fresh department/section on waste management under School of Chemical Science and Technology or may act as sister division of Environmental Science Department (yet to start).

4. Treatment of the wastes: Before treatment of the waste all the repairable and reusable materials should be removed. Now different types of waste will be treated differently that we are discussing one by one.

4.1. Non-biodegradable wastes: We received a proposal from alumni of this University, who wants to take all the transparent wastes like, plastic bottles, glass bottles etc. Though, we recommend restarting a glass blowing section in the University sophisticated instrumentation Centre. All remaining non-biodegradable waste can be send to the plastic/ glass industry that has the capacity to recycle them.

4.2. Dry but degradable wastes: There are many wastes which are dry and degradable in nature, like paper, wooden furniture, cartoons, jut ropes etc. Extents of some of such wastes are that much that it is always beneficial to repair/ recycle and reuse them. For example, paper that may come out as waste in our University is large enough that their recycling and reusability will be a better and cheaper source than purchasing paper rims for University academic divisions or answer scripts for examination. It's better to recycle such wastes either by making University own plant or by sending them to the industry which is involved in recycling of such wastes. Much wooden furniture can be seen near engineering section and in many other departments. All those furniture can be easily repaired and reused.



Figure 5: Dry and reusable items, need repairing

4.3. Electronic/ e-wastes: Electronic wastes should be minimized before starting of their treatment. Many such wastes are repairable and reusable. We recommend putting list of such waste on IUMS to see whether somebody may repair or reuse them. University may also open a centre for repairing of electronic items like for computers, printers, photocopier on outsource and on payment basis. We received an application from alumni of Physics Department (Mr. Jitendra Baghel), who is promising to convert the battery from AC to DC and may provide clean and eco friendly light for 24 hour utilization in University campus without taking any money from the University. This may act as a pilot project for his innovation. Finally, the electronic material that remain unutilized and that cannot be recycled or reused by University officials may be sent or sold to the industries which recycles these wastes.

4.4. Biodegradable (wet) wastes: Food wastes, cow dung etc. or any biodegradable items are coming in this category. All these collected and transported wastes can be used to make biogases and the wastes generated after that should be used to make good quality compost. The cost and dimension of the biogas plant can only be planned after getting exact data of wet wastes (University was running under online mode since last two years and therefore, the average amount of wet waste coming out is unavailable). Also, a good thing of our University is its natural beauty and greenness. Because of this a large number of leaf wastes are generated which can be used in making leaf compost.

4.5. Chemical wastes: Chemical wastes are defined as any waste that is generated by any reagent grade chemicals or product/ side product generated (unused or side product) from educational and experimental processes, chemicals inside batteries, household chemicals (like, oil, pesticides, finally divided powders, paint, dyes and resins, LEDs etc.) or anything contaminated by the chemicals. At present, University doesn't have any fixed protocol to use and manage chemical wastes. Also, there are many huddles in implementing chemical waste management, like laboratory staffs and to the some extent students and research scholars are not properly trend for environmental and human hazard by chemical wastes and importance of their management. We are therefore suggesting here the general protocols that should be followed for treatment of such wastes.

Chemical waste can be divided into two parts: hazardous and non-hazardous and both can be further subdivided into solid, liquid and gas wastes. In all the laboratories there should be a regular practice to ensure the nature of chemicals by reading there MSDS (Material Safety Data Sheet), which is easily available on web portals. We should ensure maximum utilization of chemicals and apparatus. All the stores and laboratories should provide list of chemicals/

equipments, which are not in use or possibilities of their uses are minimum. They should be shared across the department and the University should ensure their maximum usability.

The chemical waste generation depends on the amount and type of input chemicals we use. All the chemicals cannot be recycled or reused. So, there should be a practice to use minimum possible number and amount of chemicals. All the organic solvent should be tried to be reused after distillation (either in chemical reactions or in cleaning of the apparatus). If laboratory is not able to reuse those chemicals, they should be stored in a sealed high quality LDPE container. User should try not to mix many chemicals in a single container (and level the chemicals stored in the container). Most of the liquid chemicals used in our lab are compatible or non-reactive with LDPE container except carbon disulphide, nitrobenzene and thionyl chloride. The container should have 53B or 83B screw cap. Before disposal the chemicals in soil, to the possibility of maximum extent the chemicals should be converted to less toxic or non-hazardous. For examples cyanide is a potential poison, we can neither allow them to mix in soil or in water. But, by reacting them with Fe^{3+} , they can be converted into non-toxic ferri ferrocyanide complex. Some of the liquid wastes like organic solvents can be recycled by fraction distillation and the chemicals that are non-recyclable should be disposed off in soil after packing them in a triple layered LDPE container to avoid any type of leaking. Nature of these types of jobs is cyclic and need trend staffs. This again indicate requirement of an independent department of waste management.

4.6. Biological wastes: Biological wastes coming out from University Health Center, Department of Zoology, and Department of microbiology are sent to the Sagar Medical College daily and are finally incinerated.

5. General requirements:

S. N.	Particulars	Quantity
Solid Waste Management		
1.	Construction of waste collection centre	3
2	Construction of biogas plant	2
3	No. of dustbins	
3.1	Centre for collection of wastes (of 5 ton capacity)	03 (For dry wastes, electronic wastes and Green wastes)
3.2	Dustbins for offices green colour (20 litres)	400
3.3	Dustbins for offices red colour (20 litres)	50
3.4	Dustbins for offices blue colour (20 litres)	400
4.	Materials and instruments needed for solid waste management	
4.1	Kit for Workers: Uniforms, safety equipment; hand gloves, canvas shoes, first aid kits etc.	8
4.2	Tools required (Shovels, Brooms etc.)	2 set
4.3	Packing materials for a year recyclable garbage polybag	200
4.4	Waste Collection green Vehicles (Battery operated vehicles)	2
5	Other Activities, such as Landscaping and Beautification	
Sub Total for Solid Waste Management		
5.	Materials and instruments needed for Liquid waste management	
5.1	Connecting drainage and pipelines of individual building to main drainage of sagar municipality	To be confirmed
5.2	Laboratory liquid waste treatment plant (Fractional distillation assembly, detoxification Centre, disposable container)	Yet to be confirmed

6. Conclusion:

Dr. Harisingh Gour Vishwavidyalaya, Sagar contain 36 different academic departments, 15 supporting sections and large number of students (more than 8000) that generate wastes in huge amount and of different types (due to different nature of the work). In this quest University needs a separate and strong waste management section as well as policy. At present University doesn't have any system of on-site segregation, collection and transportation of wastes to a common storage and treatment place. The University does not have proper connectivity of the wastewater drainage system that must be established without

any delay. There is no clear policy for the management of chemical and electronic wastes. Many items are stored for long time and are waiting for absorption, which do not only occupy space of the University, but also may generate toxic gases. The use of non-biodegradable items especially single used plastics and produced wastes has drastically increased in last three-four decades. They are either burnt or are thrown in open spaces. We must need to control the situation by providing the alternative(s). The amount of generated wastes should be reduced, by optimization of the waste and therefore University must need a full fledged workshop that can repair wooden, electronic and glass items. IUMS system should be strengthened and the University should now move towards paperless culture in its governance. Also, single side used paper for all official purposes should be welcomed. The IUMS system can also help in minimizing the waste by increasing number of probable users. List of usable items may be placed on the IUMS and faculties/ staffs/ students can take those in no cost. The finally obtained non-reducible wastes should be sent for the proper treatment. Certainly, treatment of all types of the wastes by the University is not feasible. We recommend treatment of green wastes and chemical wastes. The wet/ green wastes can be utilized in production of biogas using a biogas plant. Cost of chemical treatment plant is large enough and therefore we first recommend fractional distillation of organic solvents and detoxification of hazardous chemicals. E-wastes and non-biodegradable wastes should be directly sent in regular intervals to the companies who treat these wastes. Biological wastes (coming out from University Health Center, Department of Zoology, and Department of microbiology) are collected from Sagar Medical College daily and are finally incinerated. We recommend continuing the process. Due to the recurring nature of the job and looking on to demand of the society, we strongly recommend opening of a dedicated department/section on waste management.