

Assessment of the Solid Waste Dumping of Jahangirnagar University Campus in Bangladesh

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Abstract— Solid waste management is a burning issue all over Bangladesh. Jahangirnagar University campus is also facing serious problems; especially, open waste dumping. In Jahangirnagar University open solid waste dumping sites are increasing which is illegal and contradictory to the environmental protection act. Solid waste created a toxicant environment which could be affected to the natural environment. In this circumstance, to protect the natural environment modern waste management strategy “clean and green” concept has been accepted in many renowned Universities for the higher education of the world. This research is based on primary surveys and literature reviews were also conducted to accomplish this instead of the research. GPS and ArcGIS tools were used for the collection of open waste dumping sites. Solid waste dumping sites listed and represented by using different geographic tools in the study area. This study suggested a “clean and green” concept for the healthier, pleasant, and sustaining environment of the study area.

Index Terms—Open Waste Dumping, Toxic, Solid Waste Management, Environmental Degradation, Clean and Green Concept.

1 BACKGROUND

Waste management is a crucial issue all over Bangladesh. Jahangirnagar University campus also is facing the same problem by waste management. Jahangirnagar University is one of the most beautiful campus in Bangladesh and a renowned University for scholars to take higher degrees (Saleheen, 2012). Jahangirnagar University is called the realm of natural beauty. There are a lot of beautiful places that enhance the Jahangirnagar University beauty and make the suitable places for standard education. Students do their home task and group study within the campus premises, often in open air. To take a fresh breath and to see the natural campus, thousands of people visit this university every year (Humublog, 2016). With Increasing visitors and students open waste dumping sites are also increasing which is before alarming for the natural beauty of Jahangirnagar University campus. Solid waste dumping all over the campus under the open sky destroys the peaceful environment of Jahangirnagar University campus. In order to reduce waste at Jahangirnagar University, recycling efforts must be improved, and organic recycling services must be provided (Trenberth, 2008). Additionally, students, faculty, and staff must be properly educated on proper waste management practices. The constant production of new products and packaging means knowledge of recyclable and compostable materials has become a complex and confusing topic for many people (Challenger, 2007). In a campus that values convenience, the current “throw away” lifestyle encourages a linear approach to the production and disposal of products, rather than a circular approach that regards waste as simply another resource (Kaefer, 2016). University students, staff, and faculty often lead busy lives and value convenience; as they go about their day rushing between activities and classes, the purchase of single-use products is often the most convenient choice (Fong and Paula, 2016). The consequence of this convenience comes in the form of high quantities of waste. In an era where societies around the world are becoming more conscious of the issues surrounding waste, Jahangirnagar University can greatly improve its image by increasing the diversion rate.

In this age of environmental concern individuals are outwardly interested in the healthy state of their surroundings. Our desire for a clean environment represents a powerful sense of destiny and hope for the future (Everitt, 2009). For a better future, nowadays many universities in the world accept the concept of “clean and green” into higher education for waste management. This study also suggested this concept for better waste management of the study area.

2 AIM AND OBJECTIVES

The broad aim of this research is to assess the waste dumping sites and relate with the clean and green concept for waste management of Jahangirnagar University campus. To fulfill this aim researchers selected the following objectives:

1. To find out the open solid waste dumping sites of Study area;
2. To show the map of open dumping sites of Study area;
3. To suggest “clean and green” concept of Jahangirnagar University campus for sustainable environment.

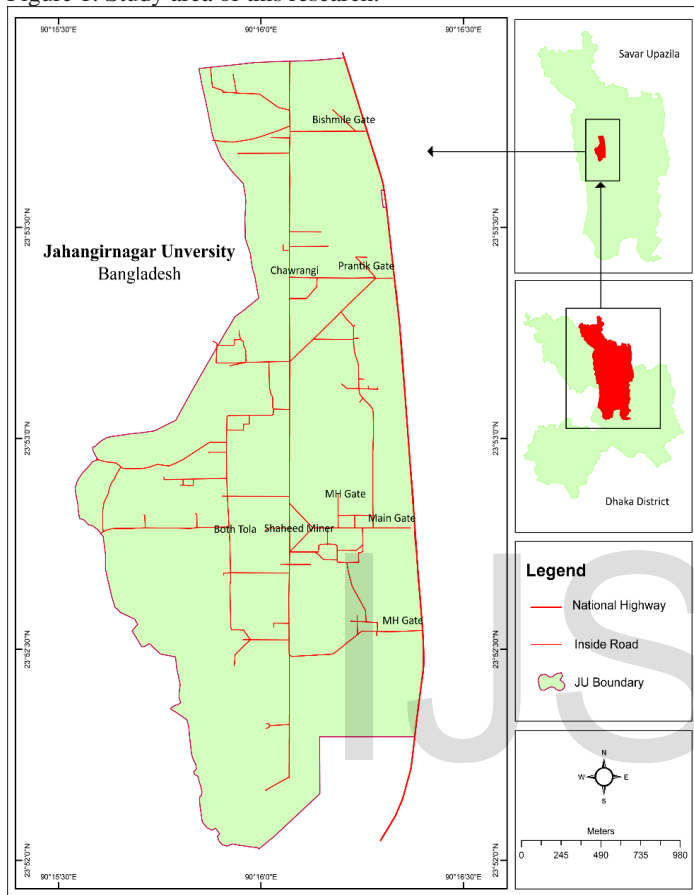
3 STUDY AREA

Jahangirnagar University is a public university in Bangladesh, based in Savar Upazila, Dhaka. It is one of the top and only fully residential university in Bangladesh (Saleheen, 2012). This research investigates the open solid waste dumping sites of 697.56 acre of Jahangirnagar University campus (Figure 1). The topography of the land with its gentle rise and plains is pleasing to the eyes. The water features sprawled around the campus make an excellent habitat for the winter birds that flock in every year in the thousands and consequently, it is a site frequented by many bird watchers (Faculties, 2013). This university could be described as ‘microcosms’ of environmental problems facing the larger society in numerous ways (Brown, 2012). Hazardous chemicals used in laboratories, in a society with increased environmental awareness, a ‘green attitude’ can also give a higher education institution a positive image to the outside world, and thereby be a recycling point. Higher Education institutions are “integral parts of the larger society’s economic, social, and physical landscape” (Brown, 2012). Their economic power, through the investments they make, the products they buy, and the

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companies they do business with, is extensive. By demanding environmentally friendly products and technologies, universities can therefore create or encourage markets for sustainable commodities. Given the clear benefits of ‘going green’, such as possibilities for saving money, demonstrating new and clean technologies, and increasing student learning.

Figure 1: Study area of this research.



Sources: Compiled by Authors, 2020.

4 DATA SOURCES AND METHODOLOGY

This study incorporates primary and secondary sources of data. The primary data sources method were GPS data collection, field observation, and photograph taking. The primary data were collected with Global Positioning System (GPS). After collecting data arc ArcGIS 10.4.1 used for identification, mapping, and representation of the study area. This research used different information e.g., Published books, journals, articles, and other published news about clean and green through waste management for sustainable development of higher studies. Finally, consider a development recommendation for sustainable waste management and convert it to resources.

Table-01: Log frame of this research.

Objectives	Required data	Data sources	Tools/techniques	Output
To find out the open solid waste dumping sites of Study area.	Open dumping sites	Primary data	GPS (Global Positioning System)	Identify the open dumping sites
To show the map of open dumping sites of Study area	Output of objective 1	Primary data	ARC GIS 10.4.1	Showing the map of open dumping sites
To suggest "clean and green" concept of JU campus for sustainable environment	About clean and green information	Secondary data	Literature review	Suggestion for clean and green environment of JU campus

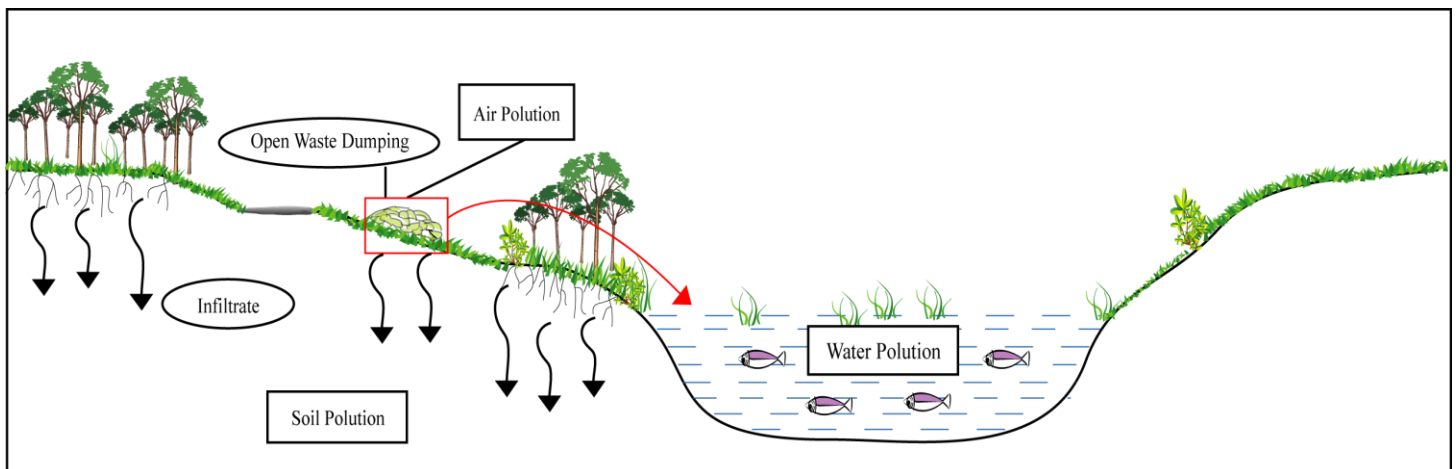
Sources: Compiled by Authors, 2020.

5 RESULT AND DISCUSSION

5.1 Open Burning

Just a little fire or more than a little fire also illegal like open dumping (Simkins and Nolan, 2004). Open burning of wastes presents many health and safety concerns for residents of Jahangirnagar University campus. Illegally burned items such as garbage, plastic, papers, food plastic bag waste release a myriad of pollutants into the air which not only look and smell bad, but also irritate the respiratory system, cause difficulty breathing, and can trigger asthma attacks (Kaefer, 2016). These wastes are considered trade waste and to open burn them is a violation of the Illinois Environmental Protection Act. Open waste dumping and open burning both are illegal which are against the Environmental Protection Law (Ward, 1982). It pollutes the whole Environment such as Air, Water, Soil, Flora & Fauna and man which shown below in schematic diagram (Figure 2).

Figure 2: Schematic representation of how environment is polluted because of open waste dumping.

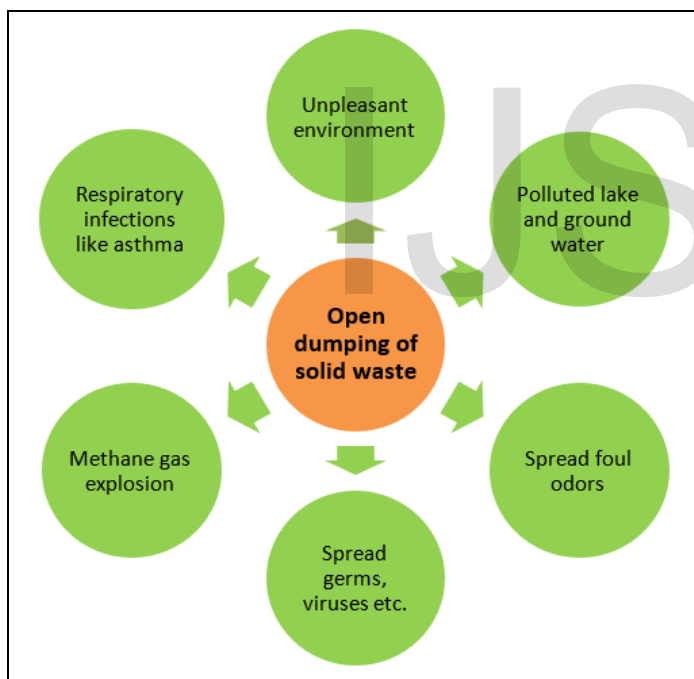


Sources: Compiled by Authors, 2020.

5.2 Improper Waste Disposal is a Deadly Practice

Soil, water and air pollution can all be a result of improper waste disposal and occurs when either of them becomes contaminated with hazardous materials. Not only does this contribute to the creation of greenhouse gas effects but also causes significant harm to lake and wildlife (Sreenivasan et. al., 2012). Apart from this improper waste disposal can also have adverse health effects on humans as over the years it has been responsible for causing several diseases and in some cases even death. For instance, when water is contaminated with external substances, like harmful pathogens, toxic chemicals or medical waste its chemical composition changes making it harmful to use. Diseases like Cholera, Dysentery and leptospirosis are known to be spread through contaminated water and can cause serious health epidemics in a population (Brown, 2012). The dangerous effects of improper waste disposal are soil contamination which occurs when hazardous chemicals come into contact with the soil. These chemicals are absorbed by plants which are later utilized by other organisms including humans which as a result can cause disease or even death (Ejaz et. al., 2010). Improper waste disposal can also interfere with the food supply as plant growth is impaired reducing the amount of food produced. Adverse effects of open solid waste dumping shown in Figure 3.

Figure 3: Adverse effects of open dumping



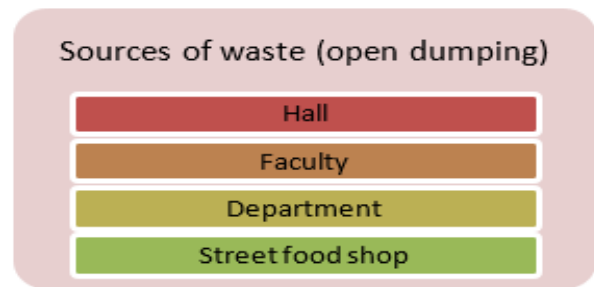
Sources: Compiled by Authors, 2020.

Open dumping affects the five environmental components e.g., air, water, land, flora and fauna and man. Air is polluted because open waste releases methane gas which is harmful to the human body. Now, Asthma is a common disease for air pollution (Manisalidis et. al., 2020). Unplanned open waste dumping also pollutes Jahangirnagar University Lake which is the beauty of this campus and big trees i.g. Mehgani, Jackfruit which are also affected for this reason. Overall, this study tried to focus on building initiative for development of a proper way for sustainable waste management which plays a vital role to protect and improve the natural environment and the natural beauty of Jahangirnagar University campus.

5.3 Sources of Solid Waste

Sources of solid wastes of study area are halls, faculty, department and street food shops. Every hall, faculty, department has its own cleaner. They collect waste from their institutions, then they dump these solid wastes under the open sky. It's a common practice of the study area. That's why this study identifies these sites of open dumping sites which are not pleasant environments for Jahangirnagar University campus. It may be destroying the heavenly environment of Jahangirnagar University campus (Figure 4).

Figure 4: Sources of solid waste in the study area.



Sources: Compiled by Authors, 2020.

Photographs 1: Open solid waste dumping and burning



Sources: Compiled by Authors, 2020.

6 IDENTIFICATION OF OPEND DUMPING SITES

This research tried to identify the open solid waste dumping sites of Jahangirnagar University campus where waste dumping under open sky which is not authorized by occurs without authorization. Basically, these open waste dumping sites are near the faculty or department

or street food stores. Without these dumping sites here and there lots of plastic or food materials, paper put down in Jahangirnagar University campus such as Central field, Shaheed Miner, Swimming pool, along the roadside etc. This study found 43 open dumping sites of the study area (Table: 2).

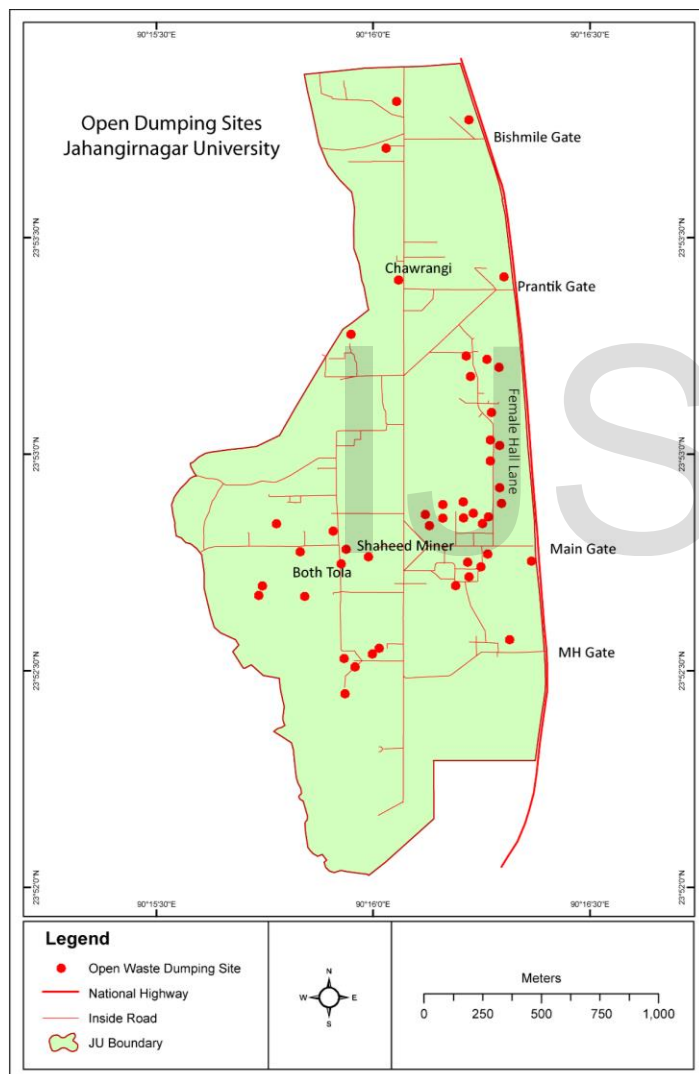
Table 2: Open solid waste dumping sites of the study area.

Site no.	Latitude	Longitude	Relative Location
1	23°52' 40.53" N	90°15' 44.287" E	South-East Part of Rabindranath Hall (beside store)
2	23°52' 41.69" N	90°15' 44.572" E	West side of Rabindranath hall (Shanti Nikaton)
3	23°52' 40.38" N	90°15' 50.532" E	South part Bangabandhu Hall
4	23°52' 31.84" N	90°15' 56.085" E	North part of Gymnasium
5	23°52' 30.53" N	90°15' 57.601" E	East part of Gymnasium
6	23°52' 26.92" N	90°15' 56.129" E	East side of Swimming Pool
7	23°52' 32.34" N	90°15' 59.930" E	West part of Pharmacy Building
8	23°52' 33.04" N	90°16' 0.917" E	In front of Pharmacy Building
9	23°52' 34.36" N	90°16' 18.841" E	Hotel side of MH Hall
10	23°52' 26.06" N	90°16' 18.57" E	East side of MH Hall
11	23°52' 31.68" N	90°16' 13.86" E	South side of MH Hall
12	23°52' 32.15" N	90°16' 18.75" E	West side of MH Hall
13	23°52' 42.82" N	90°16' 13.357" E	South-West part of TSC
14	23°52' 41.72" N	90°16' 11.467" E	South-West side of Muktamanch
15	23°52' 46.16" N	90°16' 15.922" E	North part of BNCC Building
16	23°52' 45.25" N	90°16' 22.052" E	West side of Dairy gate store
17	23°52' 50.37" N	90°16' 15.125" E	Eastside of Social Sciences Faculty
18	23°52' 51.39" N	90°16' 16.084" E	West side of Pritillata Hall
19	23°52' 53.17" N	90°16' 17.813" E	East side of Tarzan Point
20	23°52' 55.32" N	90°16' 17.523" E	North side of Tarzan point
21	23°52' 59.04" N	90°16' 16.249" E	Roadside of Nawab Faizunnessa Hall
22	23°53' 1.31" N	90°16' 17.320" E	South Part of Bangamata Hall
23	23°53' 1.93" N	90°16' 16.47" E	Roadside of Bangamata Hall
24	23°53' 13.09" N	90°16' 15.56" E	South side of Kkaleda Zia Hall
25	23°53' 12.03" N	90°16' 17.43" E	North side of Sheikh Hasina Hall
26	23°53' 13.84" N	90°16' 13.15" E	East side of Begum Khaleda Zia Hall
27	23°53' 24.65" N	90°16' 18.13" E	West part of Joy Bangla Gate
28	23°52' 51.24" N	90°16' 12.76" E	North side of Anthropology Department
29	23°52' 51.95" N	90°16' 13.77" E	North part of Social Science Building
30	23°52' 53.43" N	90°16' 12.49" E	North-East Side of Statistics Building
31	23°52' 53.08" N	90°16' 9.64" E	West side of Statistics Building
32	23°52' 51.31" N	90°16' 9.67" E	Lake side of Statistics Building
33	23°52' 50.27" N	90°16' 7.82" E	East Part of New Arts Building
34	23°52' 51.61" N	90°16' 7.24" E	North-east side of New Arts Building
35	23°52' 44.41" N	90°16' 14.98" E	West side of Cafeteria
36	23°52' 45.77" N	90°15' 59.40" E	South part of Library
37	23°52' 46.75" N	90°15' 56.36" E	Both Tola
38	23°52' 44.56" N	90°15' 55.73" E	Lower Both Tola
39	23°52' 49.28" N	90°15' 54.46" E	East side of Maulana Bhasani pond
40	23°52' 46.58" N	90°15' 49.92" E	Roadside of Maulana Bhasani Hall
41	23°52' 50.37" N	90°15' 46.69" E	West side of Maulana Bhasani Hall
42	23°53' 16.87" N	90°15' 56.94" E	North side of Old Arts Building
43	23°53' 5.72" N	90°16' 16.31" E	West Side of BegumSufia Kamal Hall
44	23°53' 46.49" N	90°16' 13.36" E	Backside of Bishmile Gate's Shops
45	23°53' 42.52" N	90°16' 1.88" E	Staff Quarter near Bishmile water storage
46	23°53' 24.21" N	90°16' 3.78" E	Near School and Collage JU
47	23°53' 49.07" N	90°16' 3.44" E	North side of Bishmile water storage

Sources: Compiled by Authors, 2020.

This Figure 5 illustrated the open dumping sites of the study area which shows the all-open dumping sites located near the institutions such as hall, faculty, department, and street food shop. This Figure 5 also reflects the origin of waste. This is contradictory to the “Clean and Green” concept. Now world many renowned universities accepted the “Clean and Green” concept which is essential for sustainable environment (Viebahn, 2002). If we follow the David Brower famous quote “We don’t inherit the earth from our ancestors, we borrow it from our children” which was the main theme of earth summit (2012), we have to accept the ‘Clean and Green’ concept. This research desires to introduce this concept which resolves the problem of waste for Jahangirnagar University campus.

Figure 5: Open solid waste dumping site of the study area.



Sources: Compiled by Authors, 2020.

7 CLEAN AND GREEN CONCEPT

The concept of clean and green has centered on preventing pollution, minimizing waste and recycling, all to prevent unwanted matter from harming the natural environment. Clean is a condition free of unwanted matter, with matter being any substance that has mass (Everitt, 2009). Unwanted matter is any substance that obstructs

human endeavors, poses a risk or causes an undesirable or adverse effect. Often this type of matter is referred to as pollution, although it goes by other names, such as wastes, soils, dirt, dust, trash and pathogenic microorganisms. Cleaning is the method used to achieve a clean environment which can be viewed as a fundamental environmental management process of putting unwanted matter in its proper place (krishnaputra, 2011). This ensures an environment that is sustainable and functioning. Environments must be cleaned regularly to keep them sanitary. Effective cleaning removes unwanted matter to the greatest or optimum extent possible. According to Bose (2012) believes that around 80% of a university’s carbon footprint is related to the behavior of staff and students how they use energy, travel, what they consume and so on (Li et. al., 2015). In addition, as Hazan points out, “behavior and values learnt at university have a long-lasting impact on graduates throughout their lives”.

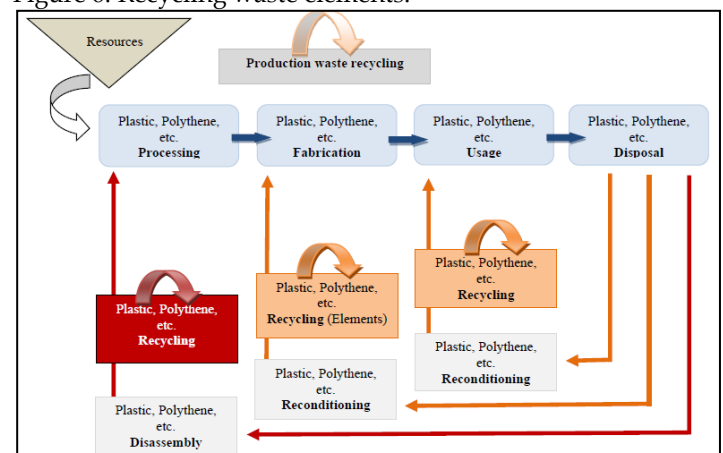
The Green Campus concept offers an institution the chance to take the lead in rethinking its environment and creating new standards for tackling issues that are local, national and global in nature (Alshuwaikhat, 2007). They can be approached through a manageable, stepwise process in which changes are built into the institutional planning and budgeting processes, with an eye toward continually improving the campus and implementing responsible recommendations. Greening initiatives are challenging and require determination and a long-term commitment on the part of the entire campus community. According to EPA (2000) these efforts, however, can yield significant paybacks. Such paybacks include:

- Environmental and economic sustainability,
- Reputation as a leader through example,
- “Real-life” work experience for the students, and
- Improved quality of life in campus.

8 INITATIVES FOR CLEAN AND GREEN ENVIRONMENT

The role of students in helping to establish more environment friendly universities cannot be underestimated. In many cases, students are the main drivers and developers. Their ideas and companies play a vital role in influencing the decisions made by university departments. So, if they are keen to make a difference to the world, there’s no need to wait they graduate (Figure 6).

Figure 6: Recycling waste elements.



Sources: Schlurchebot, 2020.

8.1 Campus Cleaning

The campus cleaning day is very much effective, since the students can collect almost the degradable and non-degradable waste from the campus. Teachers and office peons can charge these groups.

8.2 Composit Pit and Waste Bin

A compost pit (2.5*1.5 meters) can be made by the students for depositing biodegradable waste. Once in a week, the students sort out the plastic and it can be sold at local shops or taken by the Savar municipality.

8.3 Awareness Campaign

An awareness campaign is conducting a group of active members of students visit each class and department and speak a few words about the need to keep campus clean and green. The dangers caused by plastic are discussed and also can speak to the importance of clean and green campus.

8.4 Anti-Plastic Poster Making Competition

Two or more students can be select from each class and are permitted to prepare two posters each. The best poster can be awarded, and the prepared posters will be displayed on the walls. The posters ill remind the students often about the need to maintain the campus clean and green and beware of plastic.

8.5 Follow Waste Management Hierarchy and 3R

Waste prevention is the initial principle of the hierarchy and represents the most efficient and sustainable use of resources (Zeng, 2013). Re-use is an important part of this tenet which already started in Jahangirnagar University campus like Social sciences building “give if you have, take if you need”. This type of use will need to be extended. Next in the hierarchy, preparing for re-use’ contributes to the same purpose but deals with Products which have already been discarded by their last owner (Torretta, 2019).

Figure 7: European union waste hirerarchy



Sources: European Commision, 2012.

The board aim of a Waste Management Hierarchy is to minimize the amount of waste from entering the landfill/dump sites. Three top initiatives in the waste management hierarchy are the 3Rs initiative, i.e., Reduce, Reuse and Recycle. In order to promote the 3R culture in a society, training groups of people is essential by making an awareness program through applying 3Rs initiative (Yousuf, 2013). The hierarchy is an internationally accepted and practiced concept especially in developed countries since the ‘Waste hierarchy’ is being established to help the government of those countries to manage their waste according to a sustainable agenda (Challenger, 2007). Recycling is the process of collecting and processing materials that would

otherwise be thrown away as trash and turning them into new products (Zeng et. al., 2013). Recycling can benefit the whole study area and the environment. This study proposed the following steps for encouraging recycling activities in Jahangirnagar University campus:

8.5.1 Recycle Containers

The recycle containers are shown in Figure 8. However, a more proactive effort should be made to educate students and staff that there are different types of waste and every type has a different way of recycling or disposal, considering the number of the students that use these containers are fewer than the students who use the normal grey bins.

Figure 8: Proposed recycle containers for the study area



Sources: Collected and Compiled by Authors, 2020.

A neat and Green Campus is a place where environmentally responsible practice and education go as one and where environmentally responsible tenets are borne out by example. The Green Campus concept offers an institution the chance to take the lead in rethinking its environment and creating new standards for tackling issues that are local, national, and global in nature (Schmidheiny, 1992). A Green Campus is a cleaner, more secure and healthier place to live and work. To attract more people in using the recycling facilities, a more attractive design of recycle bins could also be adopted in different locations such near the hall, faculty, department, chouranghi, shaheed minar, library, tarjan pointe, bathtolla etc.

8.5.2 Gathering on-site Information

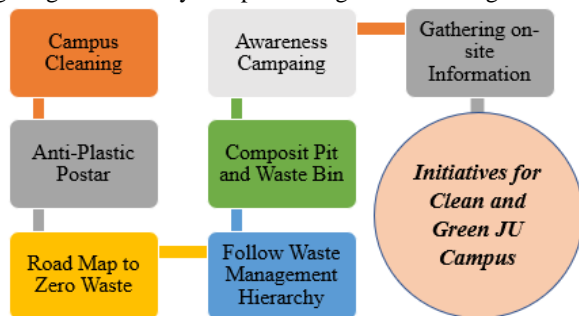
Gathering waste information on site can be carried out in a number of ways. The main way to find out exactly what waste activities are taking place and what is entering the waste stream.

8.5.3 Roadmap to Zero Waste

Based on Brown (2012) there is a Roadmap to Zero Waste in Arizona State University which consist of policies, planning, education and operations. Arizona State University is committed to achieving zero solid waste across all campus locations by 2015. The university will

reduce its landfill waste by 90 percent, averting some waste through reduced consumption and diverting the rest through recycling, composting, and reusing or repurposing. Jahangirnagar University authority also can take this type of step.

Figure 9: Proposed approach for Clean and Green Environment of Jahangirnagar University campus through waste management.



Sources: Compiled by Authors, 2020.

9 CONCLUSION

Waste Management is becoming one of the key problems of the modern world because the waste issue is intensified by the volume and complexity of domestic and industrial waste discarded by society. Clean and green concept is now an accepted method for sustainable environment through waste management in Higher Education Institute. Waste management is now a burning issue for all over the country, like Bangladesh Jahangirnagar University campus is also facing a serious problem. In Jahangirnagar University campus open waste dumping is a common phenomenon which is totally ambiguous in the pleasant and heavenly environment of the study area. This study proposed some initiatives for a clean and green environment which can be effective for sustainable waste management for Jahangirnagar University campus environment. Waste hierarchy refers to the "3 R" i.e., reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization. There are a number of concepts about waste management which vary in their usage between countries or regions. Education and awareness in the area of waste and waste management are becoming increasingly important from a global perspective of resource management. So, the open waste dumping authority should implement strict waste management regulations and heavy penalties to violators in order to enforce and promote safe waste disposal practices throughout the Jahangirnagar University campus.

ACKNOWLEDGMENT

The authors wish to thank Khandakar Hasan Mahmud who inspire us conditionless. Also wish to thank Imran Ahmed for helping data collection. The contribution makes us proud, and we are thankful to both of him.

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