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Dal Bahadur Gurung¹, Harsha Patil², Nimananda Rijal³, Dipesh Sharma Niraula¹

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Abstract

Birendranagar Municipality is located in Surkhet district of Karnali Province of Nepal. Waste management in developing countries have been a problem in every sector including school, private and public sectors, small industries and industries. There are public and private schools, in private school students found better to control waste in comparison to public schools students. These school generate 1.5 tons of waste including the waste of kitchen, green waste, plastics, papers and some broken pieces of construction materials and legs of chairs, desks and waste of training materials. The schools have been using red and blue colors of dustbins but they do not have proper planning on to use of 3Rs. The school should prepare waste control plan and execute it properly. Students are the source of change they should be made habitual to protect environment for preparing better world to live in.

Keywords: Management, School, Waste, Waste generation

Declaration: There is no conflict of interest and study was carried out without breaching the research ethics.

Introduction. Waste management in developing countries have been a problem in every sector including school, private and public sectors, small industries and industries. "Birendranagar Municipality is located in Surkhet district of Karnali Province of Nepal. It covers an area of 245.06 sq. km. it is located in the Siwalik physiographic (Chure) region of Nepal and lies 665 m above the mean sea level. (Nepal, 2022)". According to the population census of 2021 the total population of the municipality is '154866 among these male population is 75991 and female 78961, and these people are residing in 31847 houses' (NSO, 2020). "The current practice of the illegal dumping of solid waste on the river banks has created a serious environmental and public health problem" (D. Pokhrel, 2005). "The world generates 2.01 billion tons of municipal solid waste annually, with at least 33 percent of that—extremely conservatively—not managed in an environmentally safe manner. Worldwide, waste generated per person per day averages 0.74 kilogram but ranges widely, from 0.11 to 4.54 kilograms. tons, of the world's waste" (WB, 2023).

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Though they only account for 16 percent of the world's population, high-income countries generate about 34 percent, or 683 million tons, of the world's waste" (WB, 2023). What could be the best way to protect the generating unwanted waste and management? This is the talk of Nepal almost every now and then. "To encourage the widespread adoption of sustainable practice, the educational system in Mexico needs to become pro-active and develop a range of suitable programs for students at all levels" (Carolina Armijo; de Vega, Sara Ojeda & Ben tez et.al., 2003)¹

Significance of the Study.

Waste control and management is getting worse day by day as the population has been increasing in the cities. Educating to the children is the best source to prepare healthy and clean environment, since the students will teach to the family. It creates the society, it is said school is the representation of the society and it will prepare the future generation as well. Therefore School have the responsibility to teach children in waste management. School should have a 'strong waste management plan in place (Business waste, 2023)'. There are 137 total schools in Birendranagar municipalities (Karki, 2019), among them 45 are secondary schools. These schools also generate significant of waste. The study will find out how the schools have been managing their waste in Birendranagar municipality of Surkhet district?

Problem Statement.

The municipality has been collecting waste from the school, even though the waste management in the city is getting worse, littering the river banks, empty space has been increasing, inside the schools, they are trying to keep clean but outside of the school, plastic bags are thrown in the canal and the canals are chocked. Thelon term plan to control such litters should be in place.

Objective of the research: Identify the school based practices in waste management in the public and private secondary school of Birendra Nagar Municipality and identify the base to estimate how much waste being generated each school days.

Study Design.

This is based on case studies and observations of school's waste management practices and estimation of waste generation in the school system of Nepal.



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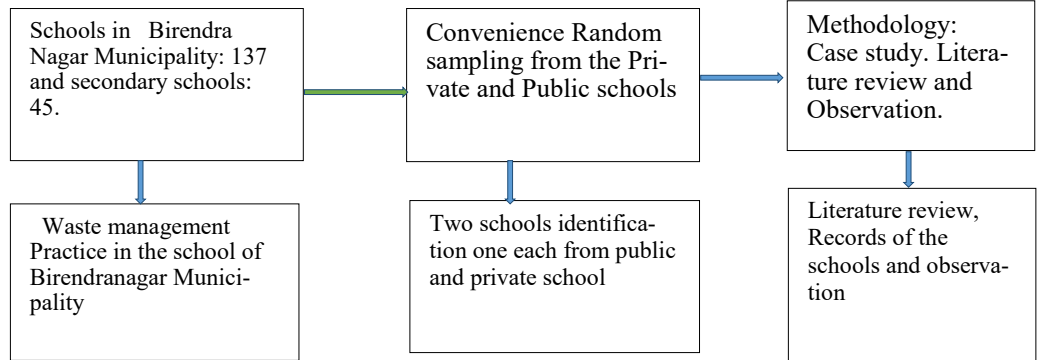
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Literature review: Literature review was carried out on the school based waste management and records of the schools on waste management.

The waste defined with its impact as “Any non-liquid waste created by individuals, households, small businesses, or institutions outside of the waste generated within cities is referred to as solid waste (SW) and the uncontrolled disposal of SW may affect public health and the environment” (Baawain, Mahad; Abdullah Al-Mamun; Hamid Omidvarborna; Wala Al-Amri;, 2017)”. Schools have been playing vital role in developing new skill, knowledge and attitude in the communities also. “Research in social sciences has shown that knowledge on a topic may increase, people may even change attitudes, but that the step to improved behaviors and practices is depending on a complex set of social and psychological factors” (Asmawati Desa; Nor Ba’yah Abd Kadir; & Fatimah Yusooiff ;, 2012). Students, teachers, and staff of the school are responsible to manage waste generated by the school, case study helps to identify their attitude and behavior.

A study was conducted by Ayodeji Ifegbesan (2009) to identify the ‘secondary school students’ understanding and practices of waste management in Ogun State, Nigeria, the study was carried out on 650 students from six secondary schools. The outcome revealed that secondary school students from the sampled zones were aware of waste problems on their school compounds, but possessed poor waste management practices. The study showed that propensity for waste management practices differ by sex, class and age of students’ (Ifegbesan, 2010).

Disposing approach of School generated wastage.

There are different approaches to dispose the waste, first they have to segregate in the source, and therefore the kitchen people have three different garbage collecting bins. These are separated as reduce, reuse and recycle, this is known as 3R concept in waste management (ROUGE, 2018). These dustbins are used for different purpose so that the maximum wastes will have segregated in the source, and the source itself can use it also



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If the organic materials are collected, these could be used in compost manure and vermilion production; both of these are useful in farming.

Comparison among three dust bins²: These dust bins have different purpose to segregate garbage in the source, it will help to limit the garbage to manage and the people could use it by modifying some of the materials. “Color coding is essential because it will make people aware of the type of wastes. Each dustbin will have specific colors. You need to deposit the wastes as per the colors of the dustbins. To do this, you must have a clear idea of the dustbins”. (Khan, 2021) She further explained on the importance of color code as “It is used for peaceful division of the wastes. Every year a lot of people lose their lives because of pollution (Khan, 2021)”.



Figure 1 : Source: [www. World Blaze.com](http://www.worldblaze.com) (retrieved from Hina khan’s article) Labelling is done by the author.

Blue dustbin	Green dustbin	Red dustbin
This is for collecting dry and recyclable wastes.	This is for collecting organic and wet wastes.	This is for collecting biomedical wastes.
These wastes are recyclable and non-biodegradable.	These wastes are recyclable and biodegradable.	These wastes are non-recyclable and non-biodegradable.
These wastes are recycled and reused.	These wastes are used for composting.	These wastes are incinerated.

Case studies.

The case study was carried out by conveniently sampled one from public and another from privately conducted secondary schools of Birendnagar Municipalities of Surkhet district of Nepal. These were respectively given as 1) Nepal Rastriya Secondary school and, 2) Suryodaya Secondary school.



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Nepal Rastriya Madhayamik Vidhalaya. (Nepal National Secondary School)

This is a secondary School where the classes have been running from 1-12, the school is situated in ward no -8, Khajura of Birendra municipality. Nepal Rastriya Secondary School, Birendranagar was established in 1969 AD (2026 BS) as a publicly owned academic institute located in Birendranagar, Surkhet, Karnali Pradesh of Nepal. This school is also known as Danda School, which is affiliated to National Examinations Board (NEB) and approved by Ministry of Education. 'It offers educational programs from ECD to grade 10 and plus two (10+2) in the Education and Management streams. It also offers a Diploma in Computer Engineering Program with the affiliation from CTEVT (collegenp, 2023)'.



General Findings of the school waste management.

These findings were derived from the note book of observation, and the observation list also prepared before going to the case studies which is also indicated in the separately.

From the observation, the school has kept dustbins outside of the class rooms and students are allowed to keep their dry waste paper and pencil created dust at the end of the class. At the end of the day the waste was collected and thrown in the big dustbins which are labelled for renewable, degradable and nonrenewable dry materials.



They have separate toilets and the girls are asked to dispose their sanitary pad in the dust bin kept inside the dustbins but the dust bins were not with the plastics, the plastics to pack the sanitary pads asked to the students themselves. At the end of the day these pads are also dumped in the dry dustbins.

Incinerator: The school do not have incinerator but prepared a small dumping pit to dump the greenery dumps created in the field. They generate more than 150 Kgs of green waste during monsoon season, the waste was burned, sometime if they also through the dry waste in the dumping pit and burned it



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Private School and its approach to waste management.

In 2059 B.S., Suryodaya Academy was established. With new administrative, managerial, and teaching staff and the motto "HOPE FOR YOUR BRIGHT FUTURE," the school has now been reopened. Situated in the central region of the Surkhet valley at Latikoili 9. The Suryodaya Academy's beautiful, active learning environment is free from stress and noise and reflects a welcoming, nurturing, and encouraging vibe that is typical of real features for an academic facility. Facilitate using a structured teaching approach and using the best physical tools available. SA continues to be a fantastic location where educational activities can be carried out easily and successfully. SA is committed to taking on the challenge of providing students with the chance to deal with any career-related issue.



Students in Suryodaya: At present '609 students are studying in the school, among them 290 boys and 319 girls' (Attendance R, 2023). Girls are more than the boys in the school, it is clear indication that the country has been educating both the gender without discrimination. The school also heading by the female, her dynamic leadership, the school has been progressing day by day.

Waste collecting practices in the school: In each class room there are dustbins for collecting the class room generated wastage, mostly papers, dusts generated while sharpening pencil and others. At the end of the class, those dustbins are made emptied in the dustbins kept outside. They have separated dustbins according to colors, those are mainly red and green.



Kitchen waste: The school has been running a canteen, the canteen generate different types of waste such , fruits as rotten vegetables, leafs and left over food, can tins, empty bottles and others thrown away sheaths of cupcakes and serviettes. These were throwing in the dustbins.



Disposing the waste: The municipality collects the waste of the school and it was dumped in the dumping site of the municipality.



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Outcome of the observation.

S.N	Areas of observation	Rastriya Ma. Vi.	Suryodaya Ma Vi	Remarks
1	Surrounding Neat and Clean	yes	yes	
2	Segregation of Waste materials	yes	yes	
3	Separate Toilets Male and female	yes	Yes	
4	Sanitary pad disposable Containers	Yes	Yes	
5	Kept Plastics in the container	yes	Yes	Students need to bring their plastics
6	3R followed	NO	No	Red and Green
7	Incinerators	No	No	
8	Small dumping pit	Yes	No	
9	Collection of wastage	Municipality	Municipality	
10	Reusable materials storage	Yes	Yes	
11	Students aware of waste and its impact	A little bit	yes	
12	Are the students are accustomed not to litter	A little bit	In great deal	

Source: Primary Observation.

In the table , it is clearly indicated that private schools students found better in waste management, they do not throw anything that need to be disposed they took it in the proper place, but the public schools students lacked this behavior. The students of private schools were more aware of pollution and its impact. The waste materials which are not biodegradable found one of the polluting agent in the environment.

Identification of waste materials in the Schools

1: Paper: ‘The paper is the main source of the waste generating in the class rooms since the students have tendency of disposing papers what they do not need, tearing the pages . It generated in weekly basis 30 Kgs a week- but it is thrown in the dustbin. (Author, 2023)

2: Twigs and grass: School is having 12 Ropai of land, in the open filed twigs and grass grows, it is cut by the labor and dumped in the dumping. There is a dumping pit prepared by the school itself, this pit is only for the twigs and grasses, sometime class generated dust and few papers.



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3: Glasses: The school has a canteen, glasses broken, windows broken, laboratories glass broken are dumped in the dust bin which is labeled for non-decomposable materials.

4: Plastic bags and bottles : Students and school's general purchases carried in the plastic bags, these bags are disposed in the dustbin, eventhough sometime these fly-away with the wind and it scatters making litters in the school compound, if seen such materials should be disposed in proper containers, It is instructed to all students, they have changed their behavior slowly and picked such materials and duped in the dust bean.

-Plastic water bottles: These are common and the people are carrying by holding when they drink and finish the water, there has been increasing tendency among the mass, to throw away from the road, it has created land pollution. School, realized it and asked and instructed to the students, throwing such plastic creates land pollution, therefore, if thy found in the surroundings, the students have developed the tendency not to throw it everywhere and picking it and disposing in the certain designated places. These are also estimated being collected 10 kgs a week.

5: Mensuration disposal: All girls are taught on how to dispose their sanitary pads and in emergency, these pads are made available in the school by the lady teachers they knew who to contact in such a situation. They are given or asked a plastic bag from home in their bag and if there is emergency to change, change and dispose it properly in the dust bit kept in the girl's toilet. (Author, 2023)'

Estimation of Quantity of waste generation in the school.

Public School: The public school has generated nore waste of twigs, grasses and leafs since they have trees around and sports filed. It generate biodegradable materials, as per the question asked to the cleaner/ assistant, they said it generate more than 150 kgs a year. Papers, thrown by the students and staff per day 1-2 kgs are collected every day and dumped in the red dustbin.

Green grass: This is also collected during monsoon season. The grass was cut twice in the season, they have estimated it is should be more than 150 kgs at a time.

Private school: The private school generated almost 10 Kgs from the thrown away food from the students from their cafeteria or canteen. Papers were also collected 2-3 kgs a day from more than 690 students. These were rough copies, not wanted pages, napkins and plastic bottles, plastic.

Reusable materials: Broken doors panel, window panels and broken plumbing pipes, electrical wires and others were stored in the school. These materials if spotted picked and if repairable, repaired and reused from where it was fallen off. If some parts broken, taken away and another panel used to be changed.



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These type of waste also generated almost 80 to 100 kgs as per the estimation of the store room. The crafts person was taking some of the pieces from the store during observation period. After used some pieces which are not useable than thrown in the dust bin.

Major Findings of the study.

- ◆ Public school was having more land facilities than the private school and they have dug a hole to dispose some of the materials and burn in the pit. This facility was lacking in the private schools.
- ◆ During the time of observation wastage in the school per day at least 5 kgs of waste of generated every day.
- ◆ Grass also found as waste and dumped in the pit, later on burnt it around December.
- ◆ Schools are using only two types of dustbin to collect.
- ◆ They do not incinerator to burn hazardous materials.
- ◆ Waste management private schools students are found better than public schools students.
- ◆ Schools' waste has been collecting by the municipality.
- ◆ Almost 5 tons of waste generated in a year these two schools including green waste, it has given the base of calculation how much waste greatest by the secondary schools a year.

Recommendations:

- * Incinerator need to make in the schools, so that some of the hazardous materials will have managed in the source.
- * Students need to engage in the management of waste as a part of learning, it should be included in the social study from the small classes.
- * Waste management subject should be included with special reference to practical. Reduce, Reuse and Recycle process should have been taught properly. Kitchen waste and grass related waste should be used to prepare compost manure and vermin culture.

Conclusion: The study has given ample area to improve in the school system of Nepal. Preparation of Incinerator , building infrastructure to dump the materials. Schools should be able to control and manage their waste. The schools are producing at least 7 to 8 kgs of waste every year. It may increase if the subject areas such as agriculture, technical wing produces more waste than the general subjects.



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