

Municipal Solid Waste Characterisation and Quantification as A Measure towards Effective Waste Management in Bolpur Municipality, West Bengal

Aparesh Mondal

Assistant Professor, Dept of Geography, Swarnamoyee Jogendranath Mahavidyalaya, Purba Medinipur- 721650, India

Abstract

Municipal Solid Waste (MSW) and its management is now becoming a matter of headache as well as challenges for the civil bodies. Growing urbanisation promotes the generation of solid waste and its unscientific handling causes health hazard and degrades the quality of urban environment. This is because, urbanisation in most of the cities and towns of India are not well associated with rapid improvement of urban amenities and their governance. Being an emergent urban centre, urbanisation in Bolpur town is marching at rapid strides. As per 2011 census, its population almost touches one lakh but increasing population does not always mean increasing level of urban development. Rather high population promotes waste generation as it is an intrinsic part of human existence. According to a report from Bolpur municipality, the solid waste generated in this town is around 95 metric tonnes per day which can be a serious threat to the environment as well as urban life if it cannot be disposed or managed properly. In this paper, an attempt has been made to evaluate the major parameters of MSW, in addition to a comprehensive review of solid waste generation, its characterization, collection and disposal as a measure towards effective waste management.

KEYWORDS- Municipal Solid Waste (MSW), urbanisation, governance, waste management etc.

Introduction

India is an agriculture based developing country. But in the last few decades, India is shifting from agro-based country to an industry and service-oriented country and these industrial and service sectors are basically concentrating in the urban areas. As a result, population is rapidly increasing in the urban areas. As per the 2011 census, almost 31.2% of total population is living in the urban areas. In developing countries like India, and other South-Asian countries, the shift of population from rural to urban area is a very rapid phenomenon in present globalised society. The unscientific and haphazard process of urbanization generates various serious challenges to towns and cities and generation of different kinds of solid waste is one of those challenges. Municipal solid waste includes commercial and domestic wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes. Exponential growth of population as well as urbanization and the development of socio-economic condition, coupled with the improvement of living standard, have resulted in an increase in the amount of MSW generation throughout the world, mostly in developing countries. On average the developed countries typically generate 521.95–759.2 Kg/Capita-year and 109.5–525.6 Kg/Capita-year typically by developing countries. Recent estimates suggest that the generation of MSW globally exceeds 2 billion tons per year, which is a potential threat to environmental degradation. Therefore, MSW management (MSWM) seems to be one of the key topics for environmental protection in present days and also in the future. In this paper also, a concise discussion on waste

generation and composition, collection and segregation of waste of Bolpur municipal town with proper facts and figures has been discussed.

1. Significance of the study

The twenty-first century has been called the urban century where more than half of the world's population is living in towns and cities. Urbanisation is the physical growth of urban areas as a result of rural migration and even suburban concentration into cities. But such urbanisation sometime creates different problems in waste management, sanitation, sewage etc. as the town grows in an unplanned way. Bolpur is such a town which is growing in all aspects as it possesses an international importance due to Visva Bharati, Santiniketan. On the other hand, this town is well connected with railways and roadways. Educational, medical and other administrative facilities are also available here. So, it means there is ample reasons behind the growth of this town. But as an emergent town, Bolpur suffers from lots of waste generation with their poor management which deteriorates the urban quality. This study will help to identify the major issues related to solid waste generation, collection, disposal in the Bolpur municipal area and at the same time, the measures and strategies for effective waste management.

2. Objective of the study

The present study is concerned with the following objectives -

1. To identify the different types and sources of solid waste.
2. To figure out the amount of solid waste generation, their collection pattern and disposal system.
3. To highlight the problems associated with prevailing solid waste management system.
4. To focus an overview on current waste management practices.
5. To give some recommendation and suggestion for the improvement of Solid Waste Management system.
6. To highlight the scope for future development.

3. About the study area

Bolpur is now a well-known town with the international importance was merely a tiny village under Supur Porgana some 150 years ago. The name 'bolpur' comes from the word 'boli-pur'. In Bengali 'boli' means slaughter and 'pur' means town or city. The town is situated in Birbhum district, in the state of West Bengal, India and it is 145 km. north of Kolkata. Bolpur sub-division is located at south border of Birbhum district. The Bolpur sub-division consists of Bolpur- Sriniketan, Nanoor, Labpur and Ilambazar blocks.

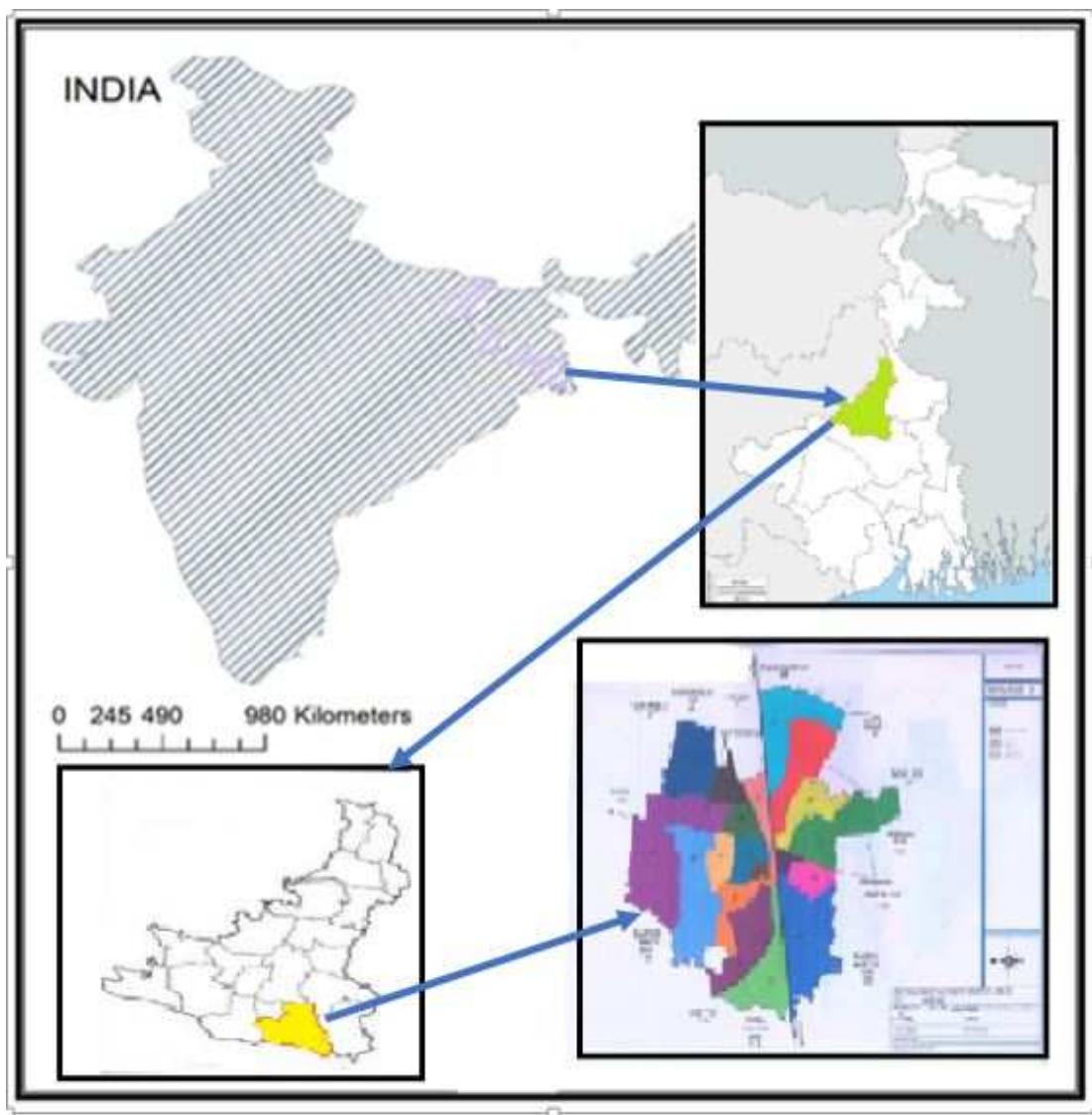


Figure 1: Location map of the study area
Table 1: Location of the Study Area

Country	India
State	West Bengal
District	Birbhum
Sub-division	Bolpur
Police Station	Bolpur
Latitudinal extension	23°38'30"N. - 23°40'55"N.
Longitudinal extension	87°40'30"E. - 87°43'E.

The study area (Bolpur and its adjoining areas) is located in the interflaves of Ajay and Kopai River. Physiographically this region is characterized by more or less plain surface with smaller undulating topography. The elevation of the area ranges between 46 metres to 62 metres. The Soil type is red sandy soil. But the northern part of this region is characterized by highly undulating (smaller scale) bad land topography locally known as 'Khowai'.

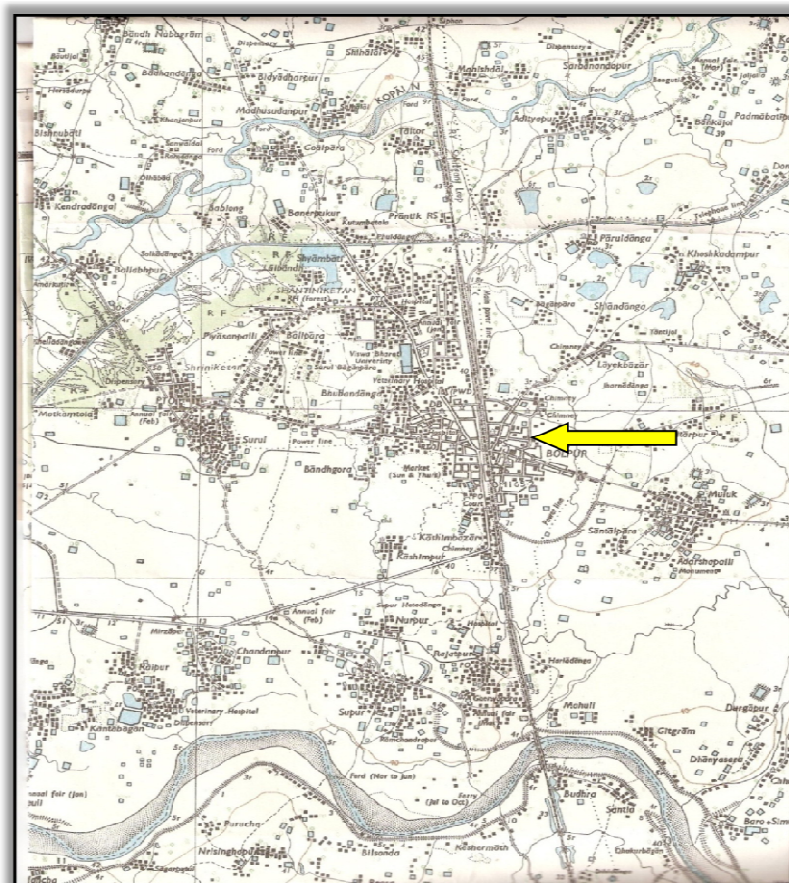


Fig 2: Topo-sheet extract (73M/10) showing the location of BolpurTown (R.F.- 1:50,000)

4. Materials and Methods

This study is mainly based on secondary data and to some extent primary data. Primary data has been collected from the field through questionnaire survey and interviews and secondary data has been collected from Bolpur Municipality Office. Due to the unavailability of adequate secondary data, as researcher I have to rely mainly upon the primary data. With the help of primary data, the direct contact to the respondents become possible, whereas the secondary data provides various information like demographic information, physical infrastructure, services etc.

Table 2: Data base

Types of data	Sources of data	Data collected from	Remark
Data on waste generation, collection, segregation	Secondary Data	Bolpur Municipality Office	Quantitative justification and analysis
Census data	Secondary Data	Census of India	Demographic information
Topographical map	Secondary Data	Survey of India, NATMO	Locational information
Data on status of public responses	Primary Data	Field survey	Qualitative analysis

5. Results and Discussion

6.1 Waste Generation

The area of Bolpur Municipality is 13.13 sq. km. According to 2001 census, the total population of this town was 65,693. But in 2011 census, the total population of Bolpur has increased to 80,882. So around 15 thousand population has increased within ten years. As the population increases, the generation of solid waste also increases at a rapid stride. The solid waste generation in the Bolpur Municipality area is around 95 metric tonne per day. These solid waste materials include plastic bags, bottles, medical waste etc. But out of the entire solid waste, plastic bags cover a major portion with different sizes like small, medium, large plastic bag etc. It can be said that plastic bag is the major source waste generation. So, here emphasis is given more on the generation of plastic bags.

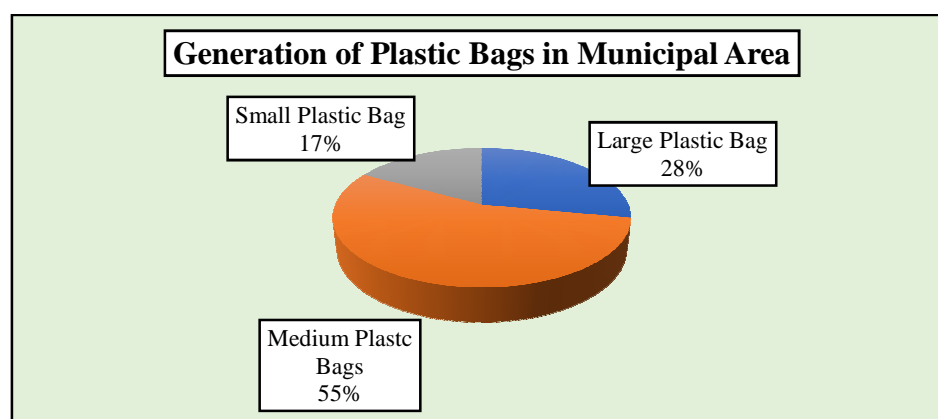


Figure 3: Generation of Plastic Bags (in %) in Municipal Area. (Source: Bolpur Municipality, 2011)

The above diagram indicates the generation of waste materials (mainly plastic bag) by the households of Bolpur town. Every household is the frequently user of plastic bags. It is very much common to all places. From grocery shop to shopping mall, now all peoples are very much dependent on it. But after using, it is thrown to the outside from their houses. As plastic is a non-biodegradable element, therefore it can never mix up with the soil. As a result, it is adversely affected to the open environment. As for example, drainage lines are choked up, increases infertility of soil, toxicity level of soil is raised up also etc. In case of Bolpur town, about 55 percent of households generates medium plastic bag, 28 percent generates large plastic bag and 17 percent households generates small plastic bag to the total municipal level.

Few sources of solid waste in Bolpur town:

- Waste from households (human and animal faeces, plastic packets, vegetable and fruit peels, silage etc.)
- Wastes from hotels and restaurants.
- Industrial or commercial waste.
- Bio-medical waste, originated from hospitals or health centres.



Figure 4: Heap of garbage along the road (Bolpur Municipality, 2011)

The following multiple bar graph shows ward wise various types waste generation of households of Bolpur town:

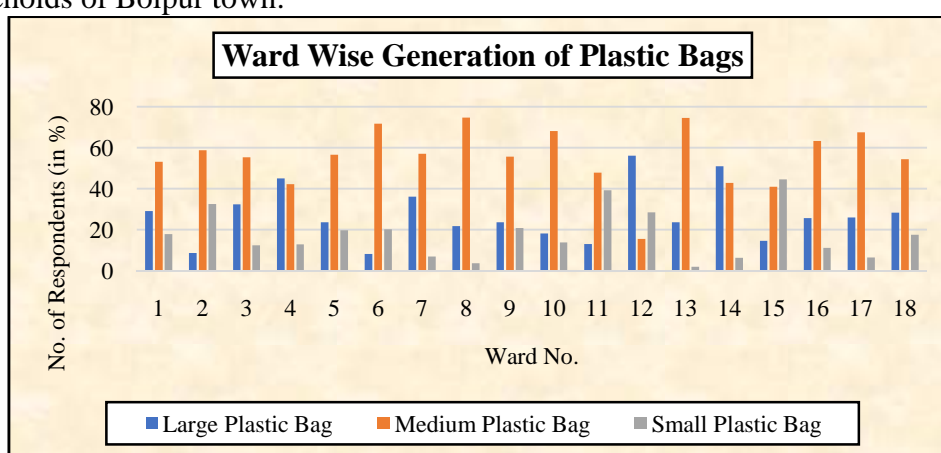


Figure 5: Ward wise generation of plastic bags. (Source: Bolpur Municipality, 2011)

The above diagram indicates percentage of households and their waste generation in different wards of Bolpur town. Plastic bags are taken into consideration as a waste material mainly, with various sizes. Here one thing should be mentioned that households from all wards generate medium plastic bags as waste materials than the large and small plastic bags. If we further analyse the municipal survey report to each and individual ward, then it will provide a better scenario for waste generation of the households. The percentages of households, who generates waste mainly medium plastic bag, are more in case of ward no. 6, 8, 10, 13 & 17. But the percentages of households are less in ward no. 12. Large plastic bag generates more in ward no. 4, 12, & 14, but it is low in case of ward no. 2, 6, 8, 9, 10, 11 & 15. The percentages of households in regard to small plastic bag are more in ward no. 2, 11, 12 & 15 and it is less in ward no. 3, 4, 7, 8, 13, 14, 16 & 17. But if we can generalize the all results then it is cleared that, in ward no. 6, 8, 10, 13, 16 & 17 where the percentage of households generates waste in a large volume. Other municipal wards also generate various types of waste materials daily in a regular manner.

6.2 Collection of Waste

Man power and vehicles are mainly used for collection of solid waste. Generally, wastes those are generated by the households and other institutions, deposited either in the municipal dustbin or any particular place. Sometimes heap of wastes are found

to be deposited along the road. Now a days such practices become very much common to all urban centres.



Figure 6: Garbage collection and disposal vehicles.

In Bolpur town, clearance of garbage is done by Bolpur Municipality. The amount of solid waste collection is around 40 metric tonne per day. Every morning municipal sweepers are engaged for collection of waste as their routine work. For proper collection of garbage, municipality incorporated some vehicles (mainly tri-cycle van and tractor). These garbage clearing vehicles or tractors are assisted the sweepers. They collected garbage from different places and put them into the vehicles. This system is being conducted in all the municipal wards. The process is very much dynamic. The major advantage of this process is clearance of large amount of garbage for a larger area is possible within a short time. After collecting the garbage, usually dumped outside the town. As the waste management is concerned, these wastes need a treatment to make it eco-friendly. But the municipality has no such kind of treatment plant. Therefore, requirement of a treatment plant is necessary.

The following pie diagram shows the status of waste collection of Bolpur town:



Fig 7: Waste Collection Status in Total Municipal Area. (Source: Bolpur Municipality, 2011)

The above diagram indicates nature of waste collection in the total municipal area of Bolpur town. Here we can divide the nature of waste collection in the following three ways:

Regular: Clearing of garbage takes place every day by the municipality.

Irregular: In this case, the municipal sweepers used to clear the garbage not a regular manner but very much occasionally.

Uncollected: Clearing of garbage is never done by the municipality in some places.

According to socio-economic survey, around 40 percent people said that garbage is regularly cleared by the municipality. Around 30 percent people think, it is cleared very irregularly and rest 30 percent people said that waste is never collected. Such kind of practices are not expected from municipal authority. Any types of uncollected garbage cause diseases, emits odour, clogs the drain and above all deteriorates the urban quality and life style. Garbage free town always enrich the environmental quality.

6.3 Status of Waste Collection

If we give emphasize on more detailed study of the municipal survey report, then it will clearly showing the nature of waste collection and its percentage over all the municipal wards each and individually of Bolpur town.

The following multiple bar graph shows the mode of waste collection in percentage in individual wards:

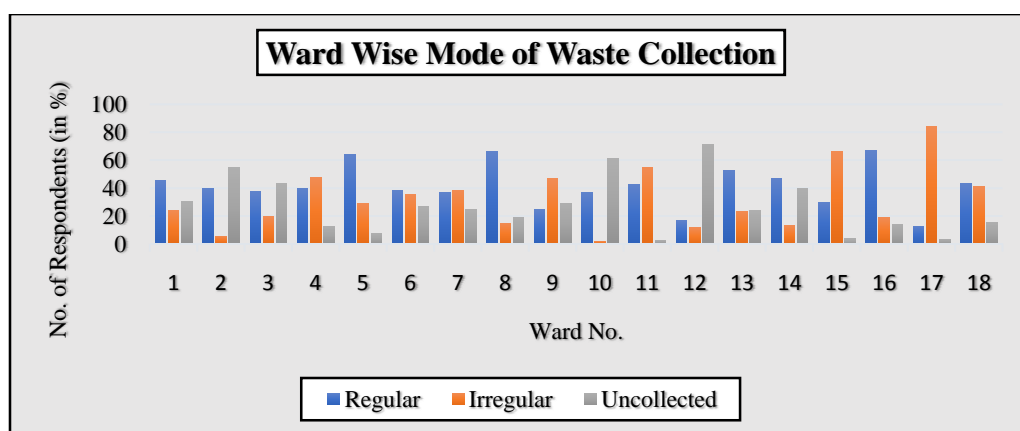


Figure 8: Ward wise mode of waste collection (Source: Bolpur Municipality, 2011)

The above diagram indicates nature or mode of waste collection in different municipal wards of Bolpur town. Here the mode of collection means either garbage is cleared regularly or irregularly or remains uncollected. In ward no. 5, 8 and 16 more than 60 percent people said, garbage is cleared regularly. But in case of ward no. 15 and 17 more than 60 percent people thinks that it is not cleared regularly that means it is very much irregular. In ward no. 17, where 85 percent people said that waste collection is totally irregular. But in ward no. 2, 10 and 12 more than 50 percent people said, garbage remains uncollected. If only ward no. 12 is taking into consideration, then it is found that the uncollected garbage is in a maximum level and the respondents were more than 70 percent against regular collection (based on socio-economic survey). So municipality should give more emphasis to those areas where garbage is uncollected as well as irregularly cleared.

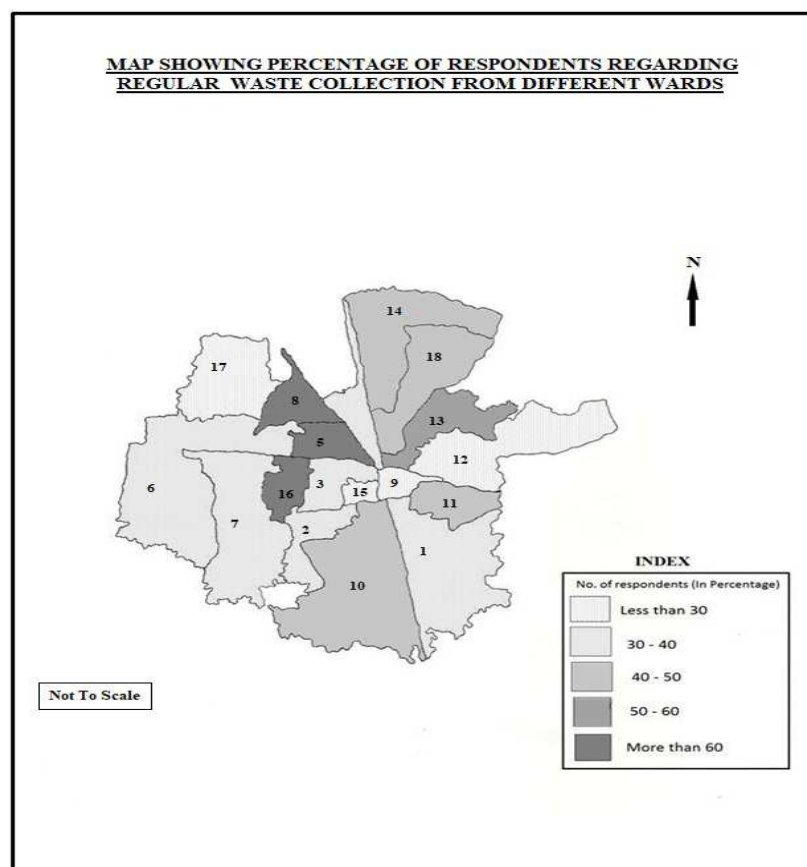


Figure 9: Choropleth map showing percentage of respondents regarding waste collection

A choropleth map is drawn on percentage of respondents regarding regular waste collection in different wards. It is shown in the map that ward no. 8,5,16 has the maximum respondents regarding regular waste collection. In the ward no. 10, 14, 18 has moderate response and in ward no. 15, 3, 17 has a meagre response regarding regular waste collection. It should be remembered that the heaps of garbage are much unhygienic and unhealthy for human health. Sometimes it is also seen that the domestic wastes are overflowing the bins and spread over the roads. Therefore, the municipality authority should very regular about the collection of wastes from dustbin and store them at a definite place like outside the town area at a far distance.

5.4 Time of Waste Collection

5.5 Under the following we can get an idea about time wise waste collection in the municipal area. In general, the municipal sweepers use to clear the garbage during morning. But in some municipal areas like Gurupally, Professor Colonyetc. (ward no. 6, 7, 8) which are considered as high-class residential wards, the clearance is conducted during afternoon and evening also. Rest of the areas are facilitated ones a day basically at morning. Sometimes few zones like bus stand area, bazar areas are ignored in case of waste collection.

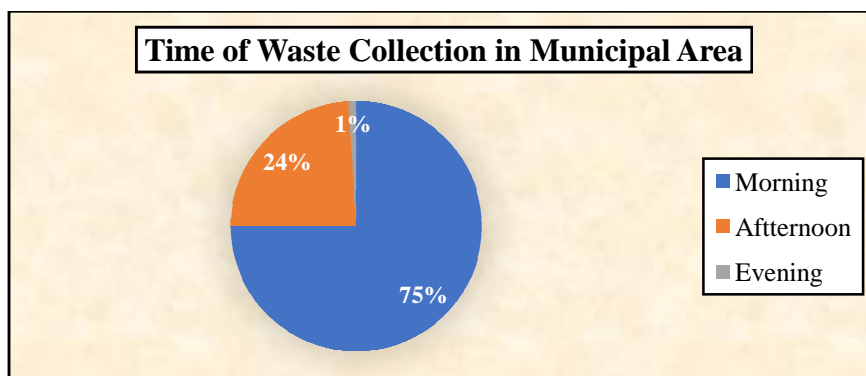


Figure 10: Time of waste collection in municipal area (Source: Bolpur Municipality, 2011)

Above diagram indicates waste collection in different time period. Generally, it is seen that most of the respondents i.e. more than 75 percent people said that garbage is cleared during morning. Where around 24 percent people responded that it is cleared in afternoon and a very little amount of garbage that is less than 1 percent people think waste is cleared in evening. Sanitation department of municipality should take an effective role to collect the garbage at the morning. Such kind of practice will help to keep the town clean, healthy and hygienic.

The following multiple bar graph shows time wise of waste collection in different wards of Bolpur town:

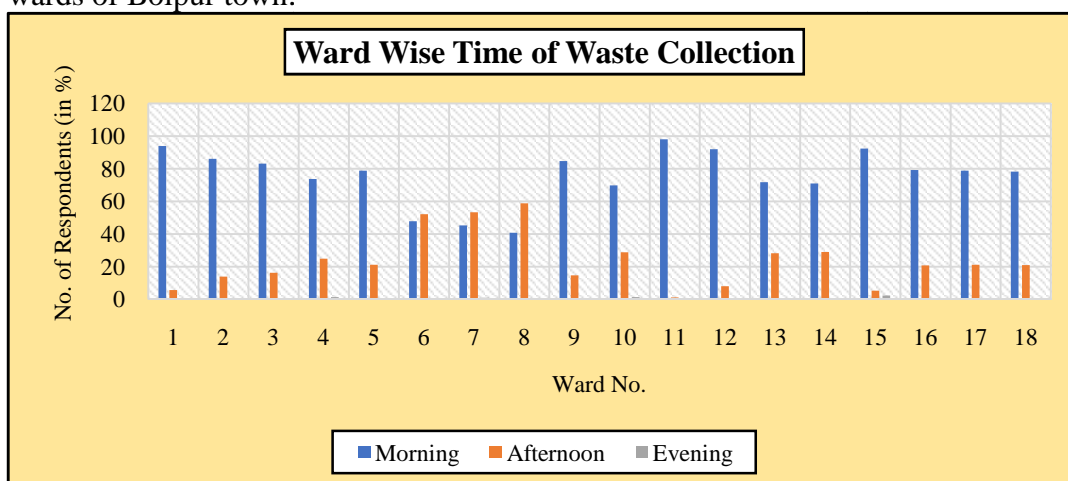


Figure 11: Ward wise time of waste collection

One thing is very much prominent from above diagram that is most of the waste is cleared in the morning from all the wards. At an average 75 percent people think garbage is collected during morning. In case of ward no. 11 where the success is highest and 98 percent people responds in favour of morning waste collection. But in ward no. 6, 7 & 8, where more than 50 percent people think garbage is cleared during afternoon. Only a very little percent of people think garbage is collected in evening (based on socio-economic survey). So municipal authority will give priority to those areas where garbage is not cleared during morning. They should assure to the citizens that 100 percent collection of waste in morning from all the municipal wards.

6.5 Doorstep Waste Collection

Doorstep collection means house to house collection of waste. It is an important parameter for waste management. To make the city clean and garbage free doorstep collection of waste from each household is necessary.

The following pie diagram shows doorstep waste collection in municipal level:

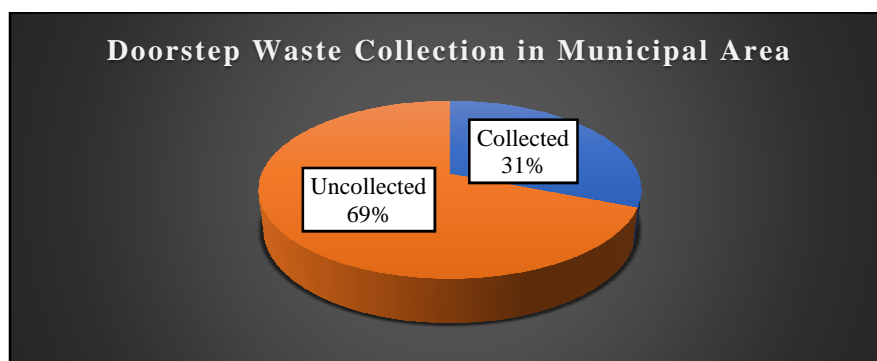


Figure 12: Doorstep waste collection in municipal area (Source: Bolpur Municipality, 2011)

The following multiple bar graph shows doorstep waste collection in different wards of Bolpur Municipality:

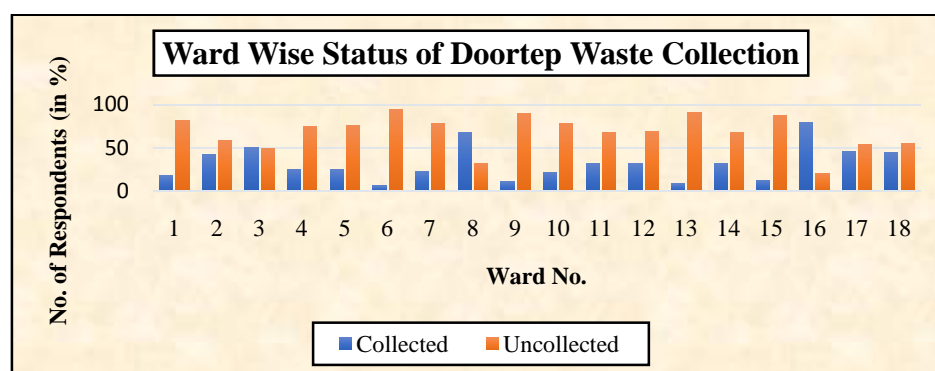


Figure 13: Ward wise status of doorstep waste collection

From above diagram it is cleared that doorstep waste collection is conducted in a low rate. It is not organized in an efficient manner. So, the rate of collection is least. In case of ward no. 1, 6, 9, 13 and 15 where less than 20 percent people think garbage is collected from door to door. In ward no. 6, response is disappointing where only 5.51 percent people gave positive response. Only in ward no. 16 where about 80 percent people think waste is collected from the households (based on socio-economic survey). Therefore, it is necessary to increase the level of efficiency of doorstep waste collection of the municipal sweepers. In this regard, it is worth to be mentioned that municipal authority had decided to provide a container to each household to store the domestic waste and then hand it over to municipal garbage collector. But this scheme has not got that much of success because of lack of people’s participation.

6.6 Segregation of Municipal Waste at Source

Segregation of waste is the key principle of waste management and to reduce the quantity of waste at the source. Only 19 percent of total generation get segregate at source.

The following pie diagram shows the percentage of segregation of municipal waste at source in Bolpur town:

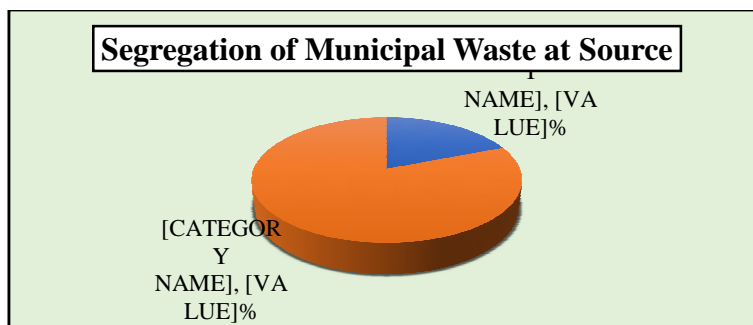


Figure 14: Segregation of municipal waste at source (Source: Bolpur Municipality, 2011)

The following table shows the quantity of segregation of waste at source by Bolpur Municipality:

Table 3: Gap between Waste Generation, Collection and Segregation

Waste Generation of Households	95 metric tonne/day
Waste Collection by Municipality	40 metric tonne/day
Waste Segregation at source	18.05 metric tonne/day (19% of total generation)

Source: Socio-Economic Survey and Analysis Report, BolpurMunicipality (2011)

In Bolpur Municipality 95 metric tonne waste generates every day. Where 40 metric tonne waste is collected daily that is around 42 percent of total generation. But only 19 percent waste is segregated at source regularly and the figure is about 18.05 metric tonne. So, it can be said that segregation of waste at source is very low in Bolpur town. But to reduce the quantity of waste at source it is essential to increase the level of segregation.

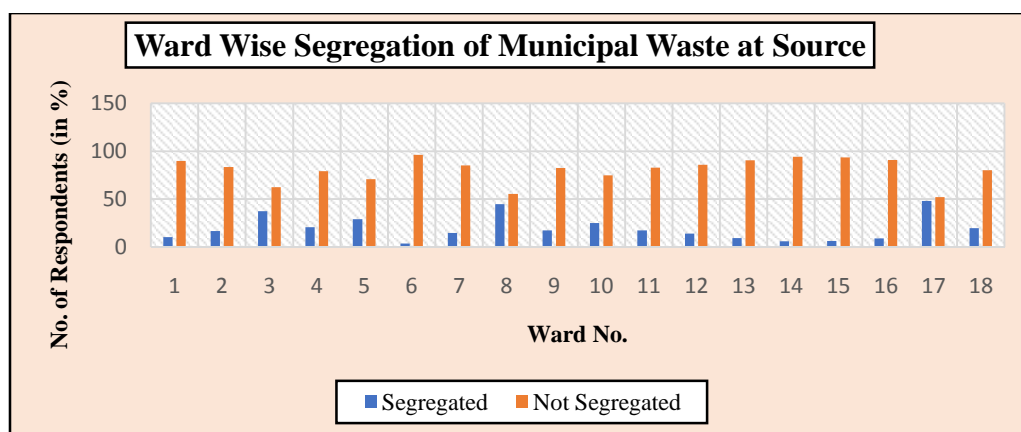


Figure 15: Ward wise segregation of municipal waste at source (Source: Bolpur Municipality, 2011)

From the above table, one thing is clear that the capacity of segregation of waste at source is very low. A very little portion of waste is segregated at source throughout the all municipal wards. Only in case of ward no. 8 & 17 the result is exceptional where more than 40 percent people think that waste is segregated at source. But in case of ward no. 6, 13, 14, 15 & 16 the respondent is below 10 percent. In these wards above 90 percent people said that waste is not segregated at source. So municipal

authority should give more importance regarding the capacity of waste segregation at source in different municipal wards.

6.7 Level of Satisfaction of Local People Regarding Waste Management

Questions were also put forward to the local residents of Bolpur town to know about their levels of satisfaction with the municipal services on waste collection.

Table 4: Satisfaction Index (Yen, Hall & Tan, 1975)

Level of Satisfaction	No. of satisfied respondents (<i>fs</i>)	No. of dissatisfied respondents (<i>fd</i>)	Do not know	Total no. of respondents (<i>N</i>)	Satisfaction Index (<i>Is</i>) $= (fs - fd) / N$
Waste collection	342	190	8	540	0.28
Municipal service	216	319	5	540	-0.19
Dustbin clearance	324	206	10	540	0.22

Sample Size: 540

The following bar diagram shows the index of satisfaction with some of available facilities:

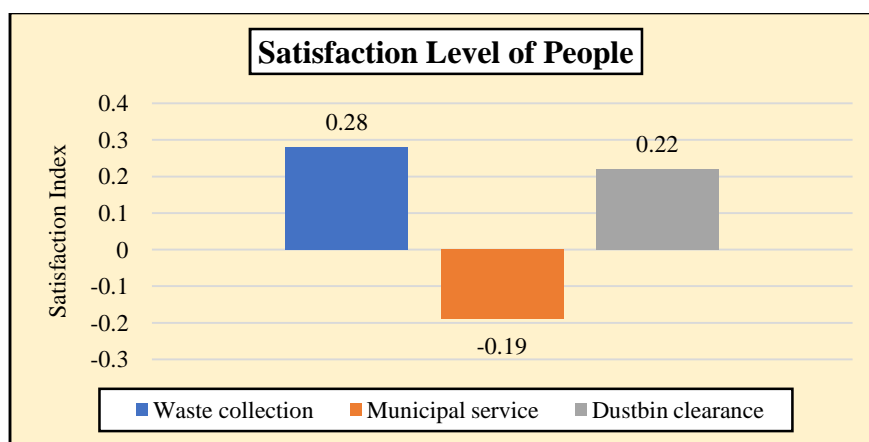


Figure 16: Level of Satisfaction (Source: Bolpur Municipality, 2011)

To evaluate the satisfaction level of the peoples, the index of satisfaction with some of available facilities has been calculated. This shows the strong and weak sides regarding some important and mandatory facilities. The value of this remains within +1 and -1.

As researcher I have selected some of the important facilities like, waste collection, municipal services and dustbin clearance. All of these activities are performed by Bolpur Municipality. In case of waste collection and dustbin clearance, the satisfaction index is 0.28 & 0.22 respectively. So, these two facilities are low to moderate which is provided by the municipality. Overall the local resident gives a positive response against these facilities. But if we consider the municipal services in terms of conservancy services, then the value of satisfaction index is -0.19 as for

majority of people shows a negative response. It is really a matter of concern. If we take the percentages then it is 59% people who are dissatisfied with municipal conservancy services. According to them, municipal services are not at a satisfactory level.

6. Major findings and problems associated with the Solid waste Management in Bolpur

- 1) The municipality garbage cleaning van does not come door to door for collecting the domestic wastes and the municipal workers like sweeper, garbage collector etc. are very much irregular in performing their duties.
- 2) The municipal workers those who are engaged with the waste management are not well trained. Most of the time, they have to rely on man power like tricycle van etc. There are lack of modern equipment and machineries regarding waste management.
- 3) The number of bins are not adequate for that much size of population. As a result, people used to through the garbage on the road, sometimes even into the drains.
- 4) Placement of bins is a serious issue in this town. People usually used to deny to install or place a bin around his house as it spreads odour. Sometimes allotment of bins driven by any political leader creates disparity.
- 5) As the urbanisation is marching in every nook of the town, therefore there is serious lack of sufficient area for open dump or landfill.
- 6) The number of people engaged with the waste collection and management and the allotted duty hours is not sufficient enough.
- 7) There is no scope for the segregation of waste at source as well as at dumping site. This is because of advanced equipment and trained workers.
- 8) Above all, the waste management system in Bolpur municipal town is not that much of updated regarding the modern and advanced society.

7. Suggestions and Recommendations

- 1) Urban local body should conduct awareness programmes and campaign among the peoples particularly in slum areas so that their perception towards waste management may change.
- 2) Training programme can be arranged for the municipal workers who are engaged with waste management so that they perform efficiently. Number of municipal workers regarding waste collection and management should also be made sufficient.
- 3) Mechanisation should be introduced in waste management. Advanced technology and machineries should be installed instead of tricycle van or other outdated vehicles.
- 4) Involvement of local community is another means to get rid off from poor practice of waste disposal. A collective participation with a common interest can make a better management.
- 5) Municipal authority should provide adequate bins, chemicals to the residents for keeping the environment clean and safe.
- 6) If sanitary landfill instead of open dumping, facility of segregation of waste, recycle of plastic and metallic waste etc. can be implemented properly, then Bolpur municipality will be a waste free healthy town.

8. Conclusion

We can stop neither urbanisation nor commercialisation as both the processes are the major driving force of an urban area. Therefore, waste generation is very much

natural as it is the inherent result of any human activity. Our ultimate aim should be like to minimise the ill effect of solid waste on human as well as on environment. Thus, waste management is required. From the above study, it is found that local Govt. i.e. Bolpur Municipal Authority is very much careless regarding waste management. On the other hand, population is also increasing day by day. To reach the goal of cent percent waste collection, their transportation and disposal, treatment municipal authority would first need to prepare a proper plan which will identify the quantity of waste generated in the whole area. Authority should demarcate few areas outside the town for dumping or landfill and invest more on waste management purpose. From the study, we have found that plastic is the major solid waste in Bolpur. If it can be recycled or used as resource, then a large percentage of waste can be managed. But above all, people's participation is most necessary. We should through the waste at the right place instead of on the road or into the drains. We can also utilise the ease of social media to make the people aware regarding impact of solid waste. So, from the above discussion, it can be conclude that though waste management is very poor here in true sense but a positive vibes with collective participation may change the situation.

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28.	PERISTROIKA AND GLASNOST	Dr. Sajeev Singh, M. K.	136
29.	EFFECT OF ITEM RESPONSE FORMAT AND TEXT TYPE ON READING TEST PERFORMANCE	Eman A. A. Al-Sharafi Dr. D. R. Sarvamangala	140
30.	A REVIEW ON GREEN CONSUMPTION BEHAVIOUR AND ITS COMPONENTS	Kavita Kamboj Prof. Nawal Kishor	146
31.	LIVING ARRANGEMENT PATTERN OF ELDERLY IN A MUNICIPAL TOWN OF NADIA DISTRICT, WEST BENGAL	Dr. Bigitendriya Debsharma	155
32.	A STUDY OF FAT-RELATED DIET HABITS AMONG FEMALE ADULT OF MONSANG TRIBE, CHANDEL DISTRICT, MANIPUR	Konthang Ngoruh Monsang Dr. Kh Rajen Singh	160
33.	A GEOGRAPHIC APPRAISAL ON URBAN SEWERAGE SYSTEMS FOR SUSTAINABLE MANAGEMENT OF WASTE WATER AND STORM WATER IN BOLPUR TOWN, WEST BENGAL	Aparesh Mondal	165
34.	DOES GENDER DIFFERENCE MODERATE THE IMPACT OF TRAINING ON PRODUCTIVITY OF EMPLOYEES? A META- ANALYSIS STUDY.	Dr. Mani Parti	170
35.	A STUDY OF SPIRITUAL INTELLIGENCE AMONG SECONDARY STUDENTS	Prof. Anand Kumar Preeti Rawat Negi	176
36.	DEATH SENTENCE AND CRIMINAL JUSTICE IN HUMAN RIGHTS PERSPECTIVE	Rajesh Kumar Tripathi	181
37.	KEATS AND THE IMPACT OF PANDEMIC ON HIS LIFE	Soumendu Kumar Dutta	186
38.	AN EXPRESSION TO REPRESSION : UN-SHADOWING FEMALE SEXUALITY IN GIRISH KARNAD'S SELECT PLAYS	Dr. Neelam Bhardwaj	191
39.	STUDY ON ICT USAGE IN SKILL DEVELOPMENT IN THE HIGHER EDUCATION INSTITUTIONS : A REVIEW OF LITERATURE	Dr. Nitin Kalla	196
40.	EXPLORING THE POSSIBILITIES OF SHRIMAD BHAGAVAD GITA FOR ACTIVE CITIZENSHIP EDUCATION : A QUALITATIVE ANALYSIS	Dr. P. K. Hemaletha	200



**A GEOGRAPHIC APPRAISAL ON URBAN SEWERAGE SYSTEMS FOR SUSTAINABLE
MANAGEMENT OF WASTE WATER AND
STORM WATER IN BOLPUR TOWN, WEST BENGAL**  **Aparesh Mondal***

ABSTRACT

Urban sewage and sanitation system in India faces many challenges. More than 55 million people in urban areas lack access to improved sanitation arrangements and almost two-thirds of wastewater is let out untreated into the environment which pollutes the land as well as water bodies. Now in India, urbanisation is marching at a rapid strides and Bolpur is not excluded from its impact. Growing urbanisation promotes the generation of wastewater which includes all types of domestic and commercial effluent as well as storm-water runoff during rainy season. This is because, urbanisation in most of the towns like Bolpur are not well associated with rapid improvement of urban amenities and their governance. Therefore to improve the quality of urban environment of Bolpur and for its sustainability, proper and scientific management of sewage is utmost necessary. In this paper, basically the drainage types, drainage quality, facility provided by the Bolpur municipality etc. are discussed. The paper further highlighted the problems associated with water logging and suggests an integrated and multi-disciplinary approach for sustainable drainage design.

Keywords : Urban drainage, Sewage, Urbanisation, Stormwater management.

1. Introduction

Rapid urban growth in developing countries has resulted in the unplanned proliferation of both formal and informal settlements. But the sanitation plan with adequate sewerage system cannot meet with the pace of urban growth.

In developing countries like India and other South-Asian countries, the shift of population from rural to urban area is a very alarming phenomenon and therefore population is increasing rapidly in the urban areas. As per 2011 census, almost 31.2% of total population are living in the urban areas.

The unscientific and haphazard process of urbanization generates various serious challenges to towns and cities and promotes generation of waste water and its poor management is one of those challenges. Municipal wastewater refers the 'unwanted' water of a city, includes all types of domestic, commercial and

industrial effluent as well as stormwater runoff during times of rainfall. Exponential growth of population, coupled with the improvement of living standard, have resulted the increase in the amount of waste water generation throughout the world, mostly in developing countries.

In this paper, a concise discussion on waste water generation, types of drainage, drainage quality, municipal facility regarding stormwater management in Bolpur town with proper facts and figures has been discussed.

2. Significance of the study

The twenty-first century has been called the urban century where more than half of the world's population is living in towns and cities. Urbanisation is the physical growth of urban areas and a result of rural migration and even suburban concentration into cities. But such urbanisation sometime creates different problems in waste-water management, sanitation, sewage etc. as the

*Assistant Professor - Department of Geography, Swarnamoyee Jogendranath Mahavidyalaya, Purba Medinipur, West Bengal

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Authored by

Aparesh Mondal

Assistant Professor

Department of Geography

Swarnamoyee Jogendranath Mahavidyalaya, Purba Medinipur, West Bengal

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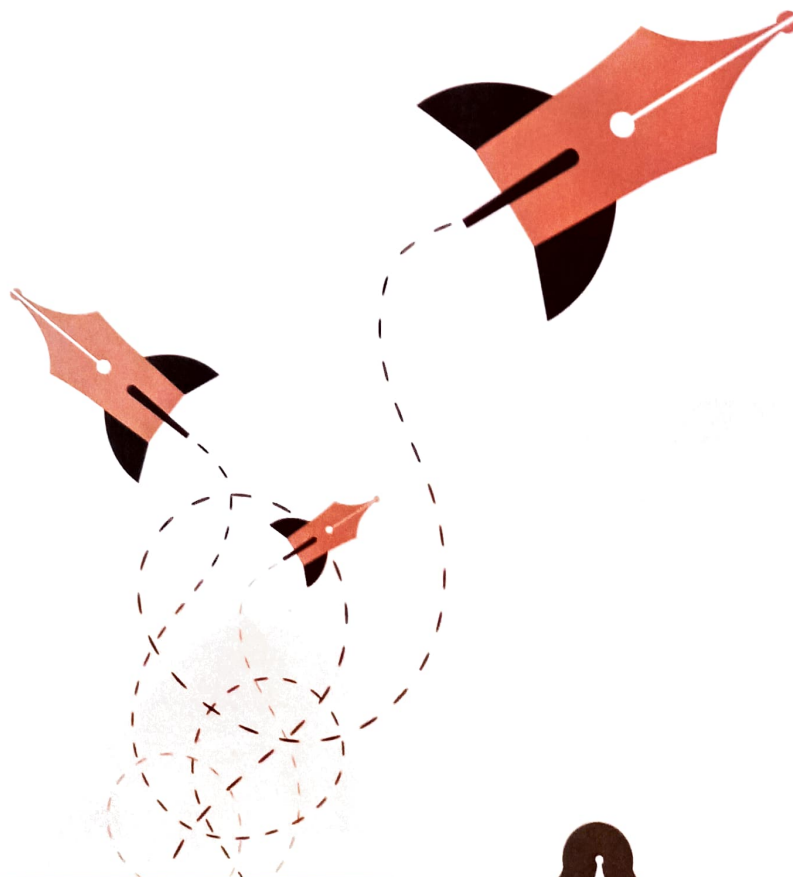
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42.	CHALLENGES AND CONCERNS OF THE 2-YEAR B.ED. PROGRAMME IN NAGALAND	T. Alemla Longkumer Dr. Anjali Karmakar	206
43.	EFFECT OF SUSTAINABILITY DRIVEN PRACTICES ON BRAND POSITIONING IN AUTOMOBILE INDUSTRY– A CASE STUDY IN LUCKNOW REGION FROM CUSTOMER'S PERSPECTIVE	Ankita Srivastava Dr. Himanshu Mohan	212
44.	CULTURAL SYMBOLISM, SPACE AND IDENTITY IN MEENA ALEXANDER'S MEMOIR <i>FAULT LINES</i> AND POETRY COLLECTION <i>RAW SILK</i>	Dr. Sandhya Tiwari	218
45.	BEHAVIOUR INTENT AND PERCEIVED BEHAVIOURAL CONTROL AS PREDICTOR OF ADHERENCE BEHAVIOUR	Sarita Gupta Dr. Mridula Sharma	223
46.	ROLE OF SCO IN FIGHTING THE THREE EVILS OF CENTRAL ASIAN REGION	Shweta	229
47.	A GEOGRAPHICAL STUDY ON SYMBIOTIC RELATIONSHIP BETWEEN FOREST RESOURCES AND LIVELIHOOD PRACTICES OF SANTAL AND LODHA-SABAR TRIBES OF PASCHIM MEDINIPUR DISTRICT, WEST BENGAL	Aparesh Mondal Prof. Uma Sankar Malik	234
48.	A SYSTEMATIC STUDY OF RESERVATION PROVISIONS IN INDIAN CONSTITUTION	Sarita Singh Dr. Tarak Nath Prasad	241
49.	AN ANALYTICAL STUDY OF CUSTOMER SATISFACTION IN ONLINE PURCHASING SYSTEM	Dr. Binod Pratap Singh Sunil Singh	247
50.	COMPARATIVE STUDY OF THE LACES KICK IN SOCCER BETWEEN BEGINNERS AND ADVANCE PLAYERS ON SELECTED BIOMECHANICAL VARIABLES	Dr. Ashish Kumar Singh	252
51.	EXPLOSIVE STRENGTH OF FEMALE VOLLEYBALL PLAYERS AT DIFFERENT LEVELS OF ACHIEVEMENTS	Dr. Rahul Singh	258
52.	CULTURE AND LIFESTYLE OF VALMIKIS : AN ETHNOGRAPHIC OBSERVATION ON HOW CASTE DETERMINES AND INFLUENCES THEIR DAY-TO-DAY LIFE.	Dr. Vishwa Nath Mishra Zarin Mahmood	262

A GEOGRAPHICAL STUDY ON SYMBIOTIC RELATIONSHIP BETWEEN FOREST RESOURCES AND
LIVELIHOOD PRACTICES OF SANTAL AND LODHA-SABAR
TRIBES OF PASCHIM MEDINIPUR DISTRICT, WEST BENGAL

□ Aparesh Mondal*

Prof. Uma Sankar Malik**

ABSTRACT

Forest is the pristine motherland of tribes, forest has nurtured them, give them food, shelter and the livelihood opportunities. A large number of tribal communities in India had been deriving their livelihood directly from the environment. By the very nature of their habitat and ecology, the tribes rely heavily on forests for their survival. They used and optimised the utilisation of the forest resources in a balanced productive ecosystem. Most of the tribal communities of West Bengal highly depended on forest for their livelihood since the medieval period. The tribal villages of Paschim Medinipur district are not exception in this regard. An immense impact of forest on their society, culture, economy and polity is seen at large scale. In this research work, the inter-relationship as well as inter-dependency between tribal community and the environment will be analysed properly. This study will find how the forest ecosystem controls the tribal economy, how their occupation and livelihood pattern determined by the forest environment etc. in an objective and qualitative manner.

Keywords : Tribes, forest, livelihood, inter-dependency

1. Introduction

In India it has been observed that wherever there is a large concentration of forest, there is also high concentration of tribes in particular, and the rural population in general. Rural tribes are dependent on forest resources for their livelihoods. For many of them, not only do the resources provide economic sustenance, but the forest is also a way of life socially and culturally. It meets basic needs like fuel wood, fodder and timber that are important for them and their livestock. Their economic activities such as food-gathering, pastoral life, cultivation, handicrafts and other activities are largely based on the forests.

The western province of Bengal, comprising the parts of Bankura, Purulia and Paschim Medinipur have one of the largest concentration of tribes. In the lap of dense forest, thousands of tribes from Santal, Munda, Bhumij, Lodha-Sabar etc. community used to reside

there. A unique life-style, a typical livelihood pattern and a distinct socio-cultural system depending on forest ecology have been developed in the tribal villages of Paschim Medinipur district. A symbiotic relationship between forest ecosystem and various determinants of economic practices have been found there. The present study will try to understand the interrelationship between forest and tribal economy, how the forest determine their livelihood pattern, what are the forest produces available to them and challenges faced by tribes.

2. Significance of the Study

The researcher tries to find out the symbiotic relationship between the mother nature and tribes. From the time immemorial, it has been considered that the forest is the mother of tribes as they are directly as well as indirectly dependent upon forest for survival. Their society, culture, livelihood everything else determined by forest ecosystem.

*Assistant Professor - Department of Geography, Swarnamoyee Jogendranath Mahavidyalaya, Purba Medinipur, West Bengal

**Professor - Department of Geography, Visva-Bharati University, West Bengal

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serfoundation123@gmail.com | serresearchfoundation.in

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Authored by

Aparesh Mondal
Assistant Professor

Department of Geography
Swarnamoyee Jogendranath Mahavidyalaya, Purba Medinipur, West Bengal

Prof. Uma Sankar Malik
Professor

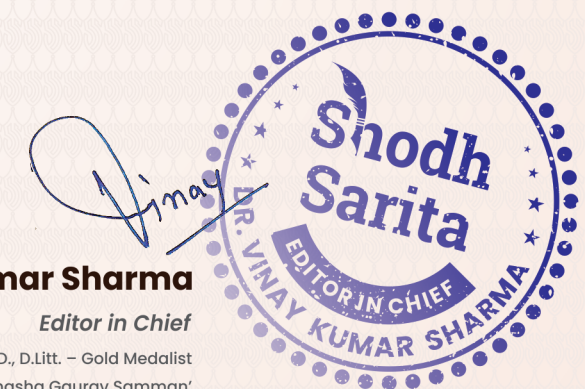
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