



ISSN: 2583-049X

Received: 17-10-2022 **Accepted:** 27-11-2022

Solid Waste Management of Dimapur Town: Are the Locals Willing to Pay for Improvement?

Dr. Polakshi Bhattacharyya Baruah

Assistant Professor, Department of Economics, Assam Don Bosco University, Assam, India

Corresponding Author: Dr. Polakshi Bhattacharyya Baruah

Abstract

The urban governance has to face a challenging situation to serve the cities with increasing generation of solid waste. This paper intends to showcase the scenario of solid waste management of the Dimapur town of Nagaland, India and examine the local people's willingness to cooperate with the municipalities to minimize the problem. Contingent valuation (CV) method with open-ended format have been used to know the willingness to pay (WTP) of the people for proper management of the waste. A sample of 100 have been selected to interact with from the closest distance of the dumping site. Where the residents face various health issues and other problems like bad odure that prevent them from conducting any social functions at their residents. The objective of the study is to understand the various problems faced by the residents of the area and to estimate the wiliness of the people to join hands with the municipal council to address the problems.

A 2SLS regression model is applied to analysis the data, by selecting two instrumental variables. The model reveals that the age of the respondent is significant at a level of .009, with a unstandardized B value of -022, which implies that with every increase in age there is a probability that the willingness to pay decreases by 2.2 percent. The distance from the dumping area is significant at .000, which shows that it is highly significant factor. This study might be helpful to policy makers in formulating policy, of paid service relating to solid waste management in Dimapur.

Keywords: Solid Waste, Dimapur Municipal Council, Willingness to Pay, Health Issue, Instrumental Variables, R1, R58, R59

1. Introduction

In the work of Dingwerth and Pattberg (2006)^[7], Barraz and Le Galès (2010)^[4], the term governance is referred to as a system of self- regulating, co-regulating of both private and public actors and government institutions to peruse some common interest and social affairs. The urban governance is an administrative system that refers to all the process beginning from decision making process to the implementation process of policy affairs mainly involving the urban issues of a specific geographical area under that administrative system. The efficiency level of the urban governance is mainly count by the effectiveness in delivering some services like solid waste management and water supply, it has been observe that with the ever increasing size of the population in urban areas the service providers are facing a huge challenges to proof their efficiency. Halla & Majani, (2003)^[8]; Mwangi, (2000)^[22]; Ogu, (2000)^[22]; Zia & Devadas, (2008)^[28].

The problem of solid waste management in urban areas has been a major concern for the policy formulation bodies since 1960's, but the seriousness of the problem has been felt only after the outbreak of plague epidemic in Surat in the year 1994. (F.V Gandhi 2016)

There is no dough that the increase of population at an alarming rate is posing a threat to the urban governance in imparting its services in an effective manner. The total urban population in India in 2011 stood at 373.1 million and it is projected to reach 600 million by 2030. Urban India generates 42 million tonnes of solid waste annually, or 115,000 tonnes a day, which is between 0.2 and 0.6 kilograms per person each day, this is indeed going to be a big challenge for the urban governance in the absence of proper institutional reforms (ICRA Management Consulting Services Limited, 2011).

Understanding the seriousness of the solid waste management problem in urban areas the government of India undertook several initiatives under the Municipal Solid Waste (MSW) rule 2000, where the local governing bodies were made responsible to implement proper local waste management. Schemes like the Jawaharlal Nehru National Urban Renewal Mission (JnNURM) and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT). The Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Housing and Urban Affairs (MoHUA) have together rolled out policies and programmes to address these issues of SWM, (Ministry of Urban Development, Govt of India



International Journal of Advanced Multidisciplinary Research and Studies

2017).

But most of these programmes failed to achieve their objectives due to a lack of clarity and awareness amongst the stakeholders, and poor enforcement by the regulators, Satpal Sing (2020). A satisfactory management of solid waste is also an essential prerequisite for the attainment of 17 broad sustainable development goals (SDGs) 2030 in developing countries including India. The SWM is directly related to the goal number 6 (Clean Water and Sanitation) and indirectly paves the ways for executing the other goals of SDGs. Hence, the policymakers must emphasis on effective management of solid waste through proper reforms in the structure of the urban governance as a powerful driver of sustainable development, Mahajan (2019)^[17].

1.1 Profile of the study area

Dimapur is the largest town in the state of Nagaland, India. It is the only plain tract of hilly Nagaland and has a railway station and an airport space for connectivity and economic activities. Dimapur comprises of 23 Wards and 2 villages. Each wards comprises of different colony and sub-colony. The total population of Dimapur town is 122,834 (Census 2011) ^[5] density of population is 6750. The solid waste generated on daily basis is accounted to be 115 ton per day. Out of which the organic waste comprises of 14982.45 kg, non-organic waste - 11241.84 kg and the plastic waste is 27029.16 kg. (Data collected from Dimapur Municipal council 2021). The solid waste of the town is mainly managed by bio-redemption method. All the collected waste of the town is dumped in a common landfill which have created a havoc in term of health and environment to the town over the years. The town, which is the gateway of Nagaland, is littered with garbage, urinating behind a lamppost, spitting and throwing wastes on the road seems to be the order of the day. Heaps of garbage are seen scattered and dumped not only on main roads, but are also discarded in front of private residences in almost all the localities. Sometimes, compounds of buildings under construction are turned into dumping grounds by the local residents. The city's streets are littered with potato chip packets, and betel nut wrappers. These inorganic wastes clog-up the gutters, and cause artificial floods at the drop of a shower, S. Phom (2013)^[23].

1.2 Methodology

A sample of respondents are taken from the Burma colony of ward number 3. This colony is selected for the study because the colony is closest to the dumping site about 2.5 km from the dumping site. As this study intents to find the willingness of the people to cooperative with the municipality to undertake a cleanliness drive Generally the areas closest to the dumping site will be more affected by it, and hence the respondents will be more cooperative to overcome the worse effect and thereby the number of protest bidders is expected to be low. A sample of 100 respondents were interacted from the Burma colony.

Primary data is collected through direct interaction of the respondents. A hypothetical situation is put in front of the respondents that suppose the municipality wants to clean the dumping area on regular basis for which the residents of the area will be asked to make a monthly payment to the municipality, as they will be beneficiaries of this cleanliness drive of municipalities. The field survey reveals that three out of the total respondents were protest bidders, who did not respond to the questionnaire and stated that it is the sole responsibility of the municipality to address the issue of solid waste. Now excluding the protest bidders from the further analysis of the study, the sample size comes to 97.

The next step is to run the correlation among the variables, as two variables income and education are found to be highly correlated, and there is high probability of leading to bias estimation, 2SLR model, regression model is applied to find the significant impact of the variables, by selecting instrumental variables to replace the highly correlated independent variables.

1.3 Objectives

- 1. To examine the various inconvenience faced by the people of the area.
- 2. To examine the factors that affect the willingness to pay.

2. Literature review

Despite of several attempts to address the burning issue of solid waste management, no attempts are yet successful enough to handle the matter in a holistic manner (Ahluwalia & Patal, 2018) ^[1]. This study also stated that the Municipalities are struggling to handle vast waste manually the lack of adequate machinery and tools for scientific treatment of the collected waste is posing serious impact environment.

The absence of appropriate centralized/decentralized treatment system is another cause of lack of proper management in solid waste in most of the cities of India, Satpal Sing, (2020). Annepu, (2012) ^[3] pointed that municipalities are focusing only on the collection part of the waste but the other part that is the treatment of the collected waste is missing.

Ahmed & Ali, (2006)^[2] and Huda & Hoque, (2008)^[11] have pointed out in their studies that there has been a huge gap in the garbage generation and collection of garbage in the cities which have made the urban governance vulnerable to citizen grievances. They also stated that factors like increase in population, lack of fund and lack of civic sense among the citizens are the major hindrance for the urban governance.

Studies emphasis on the importance of segregation of waste, as one of the prime responsibilities of urban local bodies to run the system of SWM in an organized manner, it stressed on the three streams, i.e., bio-degradable, recyclable and non-degradable (Pradhan, 2008 and Chatterjee, 2009). People's participation level is another factor considered in proper management of solid waste can enhance the speed of effective delivery of service by the local bodies especially in the case of solid waste management, the people civic sense and cooperation with rules and laws relating to waste management do have a positive impact on the functioning of the governing bodies (Kirunda, 2009) [16] and (Mungure, 2010). In the city of Guwahati the municipality bodies reveals that the major challenge faced is the lack of land for the disposal of the waste and also stated that the potentiality to generate energy from the waste could not be fully utilized due to the lack of facilities (Pradhanand et al., 2012)^[14]. The situation of waste management in the two cities of North East India, Shillong and Imphal reflected that the lack of sanitary landfills is a serious problem due to which the solid wastes are dumped in the open places, creating nuisance and unhygienic conditions (Mipun et al., 2015)^[24] and (Yadav & Devi, 2016)^[27]. Unless institutional reforms are put in place

to address these challenges effectively, the process of urbanization cannot be taken forward to support the twin objectives of improving the quality of life of India's rapidly growing urban population and transforming Indian cities to play their role as engines of growth in India's current stage of development, Corbridge, Harriss, & Jeffrey, (2012)^[6]. Economic growth rate and the increasing level of urbanization, along with rising proportion of middle classes population in the cities accompanied by inadequate planning is leading to serious situation of inefficient solid waste management. The policy makers are facing a challenging situation as to how to ensure a better living condition for the residents. It stressed on the institutional reform of urban governance to address the problem, Gore & Gopalkumar, (2015)^[9]. There are other studies that too argue that unless institutional reforms are made a sustainable urbanization process cannot take place to ensure the twin objectives of improving the quality of life of India's rapidly growing urban population and transforming Indian cities to play their role as engines of growth in India's current stage of development Kazmin, (2016) [15]. Among other problems one of the main the problem faced by the municipality for the smooth conduction of their services, the problems are mainly shortage of finance and workforce for efficient management of solid waste (Gupta, 2010) [10]. The lack of finance as pointed by is another important problem the municipal corporation. The municipal revenues are at a decline trend, it constitute only 1.08 % of GDP in 2007-08, which have further decline to 1.03 % in 2012-13, Mohanty, $(2016)^{[18]}$.

A Brief Description about Dimapur Municipal Council (DMC):

The latest available data show deterioration in almost all of the major financial indicators of empowerment for urban local governments in India from their already very low levels. Total municipal revenues constituted only 1.08% of gross domestic product (GDP) in 2007–2008 and declined further to 1.03% of GDP in 2012–2013. By comparison, this ratio was 4.5% in Poland, 6% in South Africa, and 7.4% in Brazil (Mohanty, 2016) ^[18]. Municipal own revenues accounted for 53% of the total municipal revenues in 2007– 2008 and declined further to 51% in 2012–2013

The Dimapur Municipal Council (DMC) has to face the problem of lack of financial assistant to meet its challenging task of managing the huge unorganized heap of waste. The DMC is an autonomous body and manage the financial needs through Residential Sanitary Tax (RST), house rent and trade license. However even though it some funds from Swach Bharat Mission and Amrat Mission, but that is not sufficient enough to meet the requirement. Apart from lack of financial assistant the DMC also faces the problem of lack of staff to run the task of managing the huge heap of waste generated on daily basis. In an around it have 220 sanitation staff that include drivers, sanitation inspectors, sadars, sweepers and labour but as for most of them their job is not regularized, hence absenteeism from duty create another issue for the DMC (reported by DMC administrator).

3. Socio-Economic Profile

3.1 Distribution of Respondents according to their age, gender and education: Age is count as an important independent various in social science research, age being a

measure of maturity have an important role to play in decision making regarding some social and personal issues. The age group of the respondents has been divided into five groups, where 18 percent respondents are from the 20-30 age groups, 32 percent of the respondents are from the 31-40 age group, in the age group of 41-50 there are 19.5 percent respondents and in the remaining two age groups (51-60 and 61 above) there are 19.5 percent and 11.3 percent respondents respectively. Gender wise distribution of the sample reveals that the sample consists of 56 percent are male and 43 percent are female respondents.

Educational level of the respondents has a vital role to play in solving the problem in an effective way. Looking at the educational level of the respondents it reveals that 28 percent of them have primary level of education, 30 percent are class X passed and 22.6 percent of them are class XII passed, 10 percent are graduate and 9 percent of the respondents are post graduate.

3.2 Distribution of the respondents in term of their monthly income: The income level of the people is an important variable to be taken into consideration as it is expected to play a vital role in influencing the willingness to pay. The income variation of the respondents (Fig 1) reveals that 23.7 percent of the respondents came under the income level of Rs 5001-10000 per month, 35 percent of them falls under the income group of Rs 10001-15000 and in the income group of Rs 15001-20000 there are 31 percent respondents and 10.3 percent respondents are with an income of Rs 20001-25000 per month.



Fig 1: Monthly Income wise distribution of Respondents

3.3 Health Problems and other Problems Faced by the Residents of the Affected Area: Health problems arise due to uncollected solid waste and waste often leading to many infectious diseases including water borne diseases such as cholera and dysentery. The water borne diseases are likely to occur due to contaminated water, there is a high probability that the ground water of the nearby area of the dumping place is contaminated over the years and air bone diseases like some skin problems is also been reported by the respondents which is mainly due to the polluted air in the dumping area.

The table 1 below reveals that majority of the respondent complains of skin problem, followed by dysentery and ringworm problem. Some of the respondents suffer from more than one health problems like ringworm and dysentery (19.5 percent of the respondents), 16.4 percent of the respondents stated that they suffer from skin problems and dysentery followed by ringworm and skin problems (14.4 percent of the respondents). The other category includes disease like malaria, dengue as the dumping area is a major breeding area of mosquito.

Table 1: Distribution of respondents according to the various health problems faced by them

Skin problems	Dysentery	Ringworm	Skin problems & Dysentery	Ringworm & Dysentery	Ringworm & Skin problems	Other health problems	Total	
22.6	8.2	5.2	16.4	19.5	13.4	14.4	97	
Source: Field survey								

Apart from health problem the residents of the area also faces some other problems like all time a bad odor prevails in the area, which prevent them from organizing any social functions like marriage and other social gathering. The respondents also admit that they have to make some extra expenses in the form of room freshener, air freshener and other miscellaneous stuffs to get rid of the bad odor.

3.4 Willingness to Pay of the Respondents:

During the field survey it has been observed the residents of the wards are very much aware of the harmful effects of the dumping site. They have appeal to Dimapur Municipal council several times regarding their problems but no measures have been taken so far to solve the problems. The inhabitants of at least 7 colonies under United North Block, Burma Camp restricted the movement of the trucks belonging to Dimapur Municipal Council to the dumping ground, however, the blockade was relaxed following an assurance from the Municipal Affairs Cell that the dumping ground would be shifted to some other place within a month, unfortunately years have passed but no action have been taken by the Dimapur Municipal council. From time to time the protest to remove the dumping area is being made by calling for blockade, but the authority did not pay any heed to the grievances of the residents. (Field survey).

A hypothetical situation of a cleanliness drive have been put in front of the respondents and were made aware of the benefit supposed to be derived after the cleanliness drive. They were also asked express their willingness to pay to help the municipality to carry out this cleanliness drive in a form of a municipal tax monthly.

An open-ended format has been used in this study; to observe their willingness to pay an amount per month if the municipality take up a cleanliness drive in their area in regular interval. Out of the total respondents 3 respondents are genuine zero and none are protest bidders the remaining 97 respondents are positive bidders. The following fig 2 shows the classification of respondents according to the amount they are willing to pay to keep the area clean. It shows that out of 97 respondents, majority of them i.e., 37 percent are willing to pay an amount within Rs 251-500, about 32 percent of them are willing to pay within Rs 100-250 and 24 percent stated that they are willing to pay and amount Rs 501-1000 and 7 percent of the respondents are willing to pay an amount of Rs 1001-1500. In an average it has been observed that the respondents are willing to pay an amount equal to Rs 300 per month.



Fig 2: Distribution of the Respondents in terms of their Willingness to Pay

4. Findings

A 2SLS Regression Analysis, is used to interpret the data. The regression model can be express as below

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + U$$
(1)

Where, Y =willingness to pay,

 X_1 = monthly income, X_2 = age of the respondents, X_3 = education level of the respondents, X_4 = distance from the damping area and

 X_5 = gender of the respondents,

U=error term.

A correlation test have been run to test the degree of correlation among the variables in equation 1, the result of correlation reveals (table 2) that the X_1 (monthly income) and X_3 (education level) are highly correlated with a correlation coefficient of 0.984, that means X_1 and X_2 are endogenous variables and estimate of regression model 1, thus might give a bias estimate.

Table 2: Coefficient Correlations

	Monthly income	Age	Education level	Distance	Gender
Monthly income	1.000	.074	.984	446	072
Age	.074	1.000	002	295	.103
Education level	.984	002	1.000	.388	.104
Distance	446	295	.388	1.000	013
Gender	072	.103	.104	013	1.000

To avoid the bias estimate of the model, the study used a 2stage regression using two instrumental variables namely Z_1 (extra expenditure incurred to keep the area odour free) in equation 2 and the other instrumental variable is Z_2 (mode of discharging garbage) in equation 3, given below.

The variable Z_1 used as an instrumental variable of X_1 as it has been thought that expenditure is a true reflection of income, here the expenditure on air freshener in taken to replace the variable of income.

Secondly Z_2 is used as an instrumental variable for X_3 as education level reflects one understanding level of an issue (here the disposal of garbage) and show some maturity in cooperating with the management system to dispose the garbage. Hence, mode of discharging the garbage (Z_2) is used as a proxy variable of education level (X_3).

$$X_{1=\alpha_0} + \alpha_1 Z_1 + V \tag{2}$$

Where,

 X_1 = Monthly income

 Z_1 = Extra expenditure incurred to keep the area odour free

$$X_3 = \pi_0 + \pi_1 Z_2 + E \tag{3}$$

Where,

 X_3 = Education level

International Journal of Advanced Multidisciplinary Research and Studies

Z₂= mode of discharging garbage

The execution of the 2SLS model using the instrumental variables has been below, the model summary (table 3) shows that value of R square is 0.385 which implies that the 38.5 percent of the variation in Y is explained by the 2SLS model.

Table 3: Model Summary

Multiple R	.621
R Square	.385
Adjusted R Square	.349
Std. Error of the Estimate	.813

In the next table (table 4) the F value is 10.772 which show that the model is statistically significant at 1 per cent level; this implies that the model is acceptable.

Г	at	ole	4:	AN	O	VA	١
L	aı	лс	- .	n i v	v	V L	3

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	35.628	5	7.126	10.772	.000
Residual	56.887	86	.661		
Total	92.515	91			

Table	5:	Coefficients

	Unstandardized	Coefficients	Data	т	C :~
	В	Std. Error	Бега	1	Sig.
(Constant)	3.265	.606		5.388	.000
Monthly income	9.021E-005	.000	1.000	1.076	.285
Age	022	.008	250	-2.664	.009
Education level	219	.641	300	341	.734
Distance	002	.000	394	-3.903	.000
Gender	064	.166	033	382	.703

The table 5 above reveals the level among the dependent variables the age of the respondent (X_2) and distances from the dumping area (X_4) are the significant factor influencing the decision of wiliness to pay (Y) in the equation 1 of 2SLS model. The age of the respondent is significant at a level of .009, with a unstandardized B value of -022, which implies that with every increase in age there is a probability that the willingness to pay decreases by 2.2 percent. The distance from the dumping area is significant at .000, which shows that it is highly significant factor. With every 100-meter increase in the distance from the dumping area the possibility that the willingness to pay may declines by 0.2 percent. The other variables like monthly income, education level and the gender of the respondents are not significant on influencing the decision of willingness to pay.

5. Conclusion

People's participation is recognized to be an essential phenomenon to be taken into consideration while measuring the success of any scheme or project to be implemented.

The willingness to pay is considered to be an important measure to know the people's intention to cooperate with the governing body to address a common issue. Studies like Mulate *et al.*, (2019) and Ismail, (2021)^[13], have examined the household level willing ness to pay for a better solid waste management system in their residential area. The present study also finds that the people residing nearby the municipality dumping site in Dimapur town, reveals their intention to cooperate with the municipality, to minimize the harmful effect of the dumping site of Dimapur town.

6. References

 Ahluwalia J, Patal U. Solid Waste Management in India. An Assessment of Resources Recovery and Environmental Impact. Indian Council for Research on International Economic Relation, 2018. https://icrier.org/pdf/Working_Paper_356.

 Ahmed S, Ali M. People as Partners: Facilitating People's Participation in Public Private Partnership for SWM. Habital International. 2006; 30(1):781-796.

- Annepu R. Sustainable Solid Waste Mangement in India. NewYork: Waste to Energy Reserach and Technology Council, Columbia, University, 2012.
- 4. Barraz OP. Urban Governance in Europe: The Government of What? Pole Sub, 2010, 137-151.
- Census_of_India_2011_GOI. Census of India2011, Provisional Population Totals, 2011. https://censusindia.gov.in/2011-provresults/paper2/data_files/india2/1.
- Corbridge S, Harriss J, Jeffrey C. India Today: Economics, Politics and Society. The Journal of Public and International Affairs. 2012; 128(3):332-341.
- Dingwerth K, Pattbery P. Global Governance as a Perspective on World Politics. Global Goverance, 2006, 185-203.
- 8. FH, Majani B. Innovative Ways for Solid Waste Management in Dare Salaam, Towards Stakeholder partnership. Habital International. 2003; 23(3):339-350.
- 9. Gore C, Gopalkumar G. Infrastructure and Metropolitan Reorganization: An Exploration of the Relation in Africa and India. Journal of Urban Affairs. 2015; 35(5).
- Gupta K. Solid Waste Management in the World's Cities, 2010.

mirror.unhabitat.org/pmss/getElectronicVersion.aspx?n r=2918&alt=1. Accessed on 23 June 2017.

- Huda S, Hoque A. Household Solid Waste Charcteristic and Mangement in Chittagong, Bangladesh. Waste Management. 2008; 28(2):1688-1695.
- 12. India GO. Ministry of Urban Development Schemes/Programes, 2017.

http://moud_gov.in/schemes_programes.

- Ismail Y. Study of Household Willingness to Pay to Improve Solid. Earth and Environmental Science. Indonesia: IOP Publishing, 2021; 940:2-6.
- 14. Pradhan PK, Mohanty CR, Swar AK, Mohapatra P. Urban Solid Waste Management System of Guwahati City in Northeast India. Journal of Urban and Environmental Engineering. 2012; 6(2):67-73.
- Kazmin A. India's population shift sparks a rethink of rural strategy. Financial Times, 2016. http://next.ftcom/content/950a3f1c-ef47-11e5-9f20c3a047354386.
- 16. Kirunda MP. Public Participation in Solid Waste Management: Challenges and Prospects. A Case Study of Kira Town, Uganda. Master's Thesis, University of Agder, Kristainsand, 2009. https://brage.bibsys.no/xmlui/handle/11250/135141. Accessed 26 June 201.
- 17. Mahajan R. Solid Waste Management: A Prerequisite for Achieving Sustainable Development Goals in India. International Journal of Research and Analytical Reviews. 2019; 6(2):633-641.
- Mohanty P. Financing Cities of India, Municipal Reforms, Fiscal accountability and Urban Infrastructure. New Delhi: Sage India, 2016.

- 19. Mulat S, Walelegn W, Minyihun A. Willingness to pay for improved solid waste management and associated factors among households in Injibara town, Northwest Ethiopia. BMC Research Notes. 2019; 401(12):2-6.
- 20. Mungure JM. Governance and Community Participation in Municipal Solid Waste management, case of Arusha and Dar es Salaam Tanzania. M.Sc. In Environmental Management. Aalborg University, 2008. Retrieved from:

http://www.sciepub.com/reference/123428.

- 21. Mwangi S. Partnership in Urban Environmental Management: An Approach to Solving Environmental Problem in Nakuru, Kenya. Environment and Urbanization. 2000; 12(2):77-92.
- 22. Ogu V. Private Sector Participation and Municipal Waste Management in Benin City, Nigeria. Environment and Urbanization. 2000; 12(2):103-117.
- 23. Phom S, Dimapur the Garbage Capital of Nagaland. Eastern Mirror, 2013. http://www.easternmirrornagaland.com/dimapur-thegarbage-capital-of-nagaland/ Accessed on 15 May 2017).
- 24. Mipun BS, Hazarika R, Mondal M, Mukhopadhyay S. Solid Waste Management in Greater Shillong Planning Area (GSPA) Using Spatial Multi-Criteria Decision Analysis for Site Suitability Assessment, 36th International Symposium on Remote Sensing, 2015.
- 25. Sing S. Decentralized Solid Waste Management in India: A Prespective on Technologyical Options. New Delhi: National Institute of Urban Affairs, 2020, 290-304.
- 26. Sing S. Solid Waste Mangement in Urban India Imperative for Improvement. ORF Occasional papers, 2020, 283-296.
- 27. Yadav IC, Devi NL. Municipal Solid Waste Management in Imphal Town, Northeast India: A Critical Analysis of Existing Management Practices and Proposed Action Plan. International Journal of Waste Resources. 2016; 6(3).
- 28. Zia H, Devadas V. Assessing Informal Waste Recycling in Kanpur City, India. Management of Environmental Quality. 2008; 9(5).