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A SOCIAL COST BENEFIT ANALYSIS OF "DOOR TO DOOR GARBAGE COLLECTION PROJECT"

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Abstract

Waste management is one of the major concerns of the developing countries today. The increase in population and the exploitation of all kinds of natural recourses without the inclusion of sustainable practices have added to generation of solid and hazardous waste endangering living beings and the ecosystem. More or less every country is putting effort to develop and maintain an effective mechanism for managing waste. In India, many states and cities including Assam have undertaken significant steps to address this issue. Sivasagar, a city in Upper Assam has recently joined this endeavor and is on its way of implementing certain projects. This study would focus on Social Cost Benefit Analysis of a project named "Door to Door Garbage Collection" recently implemented by Sivasagar Municipal Board. It is expected that the study would reveal relevant social cost and benefits to be considered while undertaking such kind of projects in developing nations.

Key words- Social Cost, Social Benefit, Garbage.

Introduction

One of the most prominent problems in the planet is the continuous degradation its natural resources. The growth of urbanization has intensified the rate of environmental pollution. Apart from air and water pollution, most serious problem which modern cities are facing is managing the solid waste produced in the cities, which is again an element contributing to the increase in pollution. Developing countries including India still struggle to implement the plans and policies related to waste management. Despite being a world leader in working on preventing, reducing and managing healthcare waste and the adoption of Schemes like Swatch Bharat Abhiyan, there are certain aspects in this system which have remain overlooked in India. This has resulted in the scenes where heaps of garbage can be seen in and beside the roads and river tanks of many cities posing significant threat to flora and fauna. There are many projects and schemes taken up by the

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government to handle certain aspects of waste management. Among them, Door to Door garbage collection is actively been undertaken in a lot of cities across India. Some cities have successfully implemented the project and some other were not so successful showing opposite results than expected. Even though Door to Door garbage collection project seems to be a project which when implemented can only benefit the society, it may not mean that the society does not incur any loss on implementation of such projects. This study focuses on analysising the social cost and benefits of Door to Door garbage collection project in Sivasagar municipal area, Sivasagar district, Assam, India. It would give an insight into whether projects taken up for the welfare of the society, benefits the society without a cost? It would also reveal the stakeholders related to such project apart from the targeted groups.

This paper comprises of twelve sections. The introduction is followed by a brief summary of the concept of Municipal Solid Waste management. The next section gives an insight into the project area followed by a brief description about the current status of waste management system in Sivasagar Sub district. The fifth section describes the project considered in this study. This is followed by the methodology adopted in the study. The seventh section focuses on the limitations of the study. The next section consists of the Social Cost Benefit Analysis followed by a Social Cost Benefit Matrix. The tenth section consists of discussion and recommendations based on the analysis. The next section concludes the study followed by references which are expected to help other researchers in their study.

Municipal Solid Waste management

The Municipal Solid Wastes Management and Handling Rules (2000) has defined 'municipal solid waste' as 'commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but includes treated bio-medical wastes'. Municipal solid waste includes garbage – highly decomposable objects like food, trash (bulky items like old appliances and slowly decomposable items like paper, glass, metal objects, etc. The proper management of solid waste is imperative for avoidance of miserable living conditions and maintenance of ecological balance. Managing solid waste initiates right from their generation and involves storage, collection, segregation, transportation, disposal, recycling and reuse. One of the method of collecting waste is Door to Door garbage collection, which involves storing the waste in segregated form and collecting of waste from door step of primary waste generation source by authorized agencies/groups/ individuals and dropping the waste to secondary point of collection or point of disposal. This method involves the engagement of more human resource as compared to other methods of waste collection.

Project area description

The area considered for the project is Sivasagar, Assam. Sivasagar is one of the most culturally rich and famous city in Assam. The Sivasagar town of Sivasagar district located about 150 km east from Kaziranga National Park and 50 km east from Jorhat of Assam state in north-east India It is characterized by high humidity with annual rainfall about 2000-2300 mm nearly 60-80% of which occurs during the monsoon months (June-August). Sivasagar Municipal Board, with population of about 51 thousand is Sibsagar sub district's only municipal board located in

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Sibsagar sub district of Sivasagar district,Assam. Total geographical area of Sivasagar municipal board is 11 km^2. Population density of the city is 4638 persons per km^2. There are 14 wards in the city, among them Sivasagar Ward No 10 is the most populous ward with population of 8311 and Sivasagar Ward No 08 is the least populous ward with population of 1379[1]. Sivasagar is a well recognized tourism destination and most of the time during the year it is heavily flooded by tourist all over the world.

Current status of waste management system in Sivasagar Sub district

Sivasagar Municipal authorities have been following the practice of collecting and disposing of waste since a long time. There are instances where heaps of indisposed garbage was found in public places creating an unhealthy environment. Moreover, a significant quantity of garbage was thrown in nearby water bodies and drains resulting into water and air pollution. Further, in certain residential areas garbage was burnt without following the proper method. In addition to this, a person crossing Sivasagar by road may witness a municipal dumping site near Assam Darikapar, Namtial Pathar Sivasagar. This facility site is situated close to a dense demographic area which is on the bank of river Darika, a sacred tributary of Brahmaputra river. Despite being besides the National Highway 37, the dumping site did not have any fencing or entry gate until 2019. However, the Sivasagar Municipality Board has engaged itself in an endeveaour to manage its waste management system. The board has come up with a proposed Model Action plan for 7 thematic areas which involves the Waste Management plan. This plan has been subdivided into-

1) Solid Waste Management
2) Plastic Waste Management
3) C&D Waste Management
4) Bio Medical Waste Management
5) Hazardous Waste Management
6) E- Waste Management

The project considered for Social Cost Benefit Analysis in this paper is an integral part of Solid Waste Management plan of Sivasagar Municipality Board. The present status of Solid Waste Management, as revealed by the board stand as follows-

Table 1

Sl.No.	**Action Areas**	**Sivasagar Municipal Board**
1.	Report on inventory of total solid waste Generation	
1(a)	Total solid waste Generation	10.5 MT/Per Day
1(b)	Qty. of Dry Waste segregated	2.5
1(c)	Qty. of Wet Waste segregated	0.10
1(d)	Qty. of C&D Waste segregated	Collection Not Initiated
1(e)	Qty. of Domestic Hazardous Waste(DHW) collected	No Facility
1(f)	No of Old dump sites	01

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1(g)	Qty stored in dumpsites	Not estimated
2.	Waste Management Operations	
2(a)	Door to Door Collection	90%
2(b)	Mechanical Road Sweeping	Not initiated
2(c)	Manual Sweeping	60%
2(d)	Digesters (Bio Methanation)	Not initiated
2(e)	Segregate Waste Transport	50%
2(f)	Composting Operations	Not initiated
2(g)	MRF operations	Not initiated
2(h)	Linkages with recyclers	Not initiated
2(i)	Linkage with TSDF/CBMWIF	Not initiated
2(j)	Involvement with NGOs	Initiated
3.	Adequacy of Infrastructure	
3(a)	Waste Collection Trolley	2 required, 1 available
3(b)	Mini Collection Trolley	2 required
3(d)	Bulk Waste Truck	1 required
3(e)	Bio Methanation Unit	Not Available
3(f)	Composting Unit	Not Available
3(g)	Material Recovery Facility	Not Available
3(h)	Waste Deposit Centers	Not Available

Source: available at http://sivasagar.nic.in/pages/depf.pdf

From the above table it is clear that the Solid Waste Management status of Sivasagar sub district lacks the adoption of a number of Waste management operations. In addition to this there is a lack of adequate infrastructural facilities which otherwise would have enabled the board to execute its strategies in the most efficient manner.

Project description

Name of the project: Door to door Garbage Collection

Present Status-The Sivasagar Municipality Board, as a major initiative towards the implementation of its Solid Waste Management plan has undertaken the Door to Door Garbage Collection and Management project. Some of the key points of this project are:

1) The project involves engagement of Women SHGs under Day NULM in association with Swachh Bharat Mission (Urban).
2) In November 2019, the board inaugurated the project with a pilot project covering two wards- ward no. 10 and ward no.14 of Sivasagar sub district.
3) The remaining wards will be covered periodically by engaging ALF and SHGs in the upcoming days.
4) The project primarily focuses on door-to-door collection of waste with source segregation.
5) Under this project, the local people are supposed to start backyard composting or pit composting.

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6) They are also required to keep the waste separately as dry waste and wet waste.
7) As a part of this initiative, a MoU was also signed between SMB and ALFs/SHGs of DAY-NULM, namely Mulagabharu and Janani SHG.

Proposed Plan- The Project have been adopted by SMB under the guidelines of Municipal Solid Waste Management and Handling Rules, 2016. The program chalked out for the implementation of the project has not been made fully available in the e-platform and obtaining the same in person was restrained due to the prevailing pandemic situation Therefore, in order to carry out the SBCA of the Door to Door Garbage Collection Project in Sivasagar, the mechanisms of the project as required to be followed by all ULB's as per the Municipal Solid Waste Management and Handling Rules, 2016 and as followed by some of the cities in Assam have been laid down below:

1) Door to door collection of segregated solid waste from all households includes slums and informal settlements, commercial, institutional and other non residential premises. From multi-storage buildings, large commercial complexes, malls, housing complexes, etc., this may be collected from the entry gate or any other designated location.
2) Two bins (one blue and one green) would be provided to the each household initially free of cost. Afterward the householders would be responsible to maintain them.
3) The waste needs to be segregated at source to facilitate recovery, reuse and recycle.
4) The concerned ALFs/SHG would be responsible to /Tricycle/Pushcarts/E-Rickshaws/Small motorized vehicles for primary collection and transporting it to secondary collection point.
5) The users are required to pay a certain amount of monthly fees for utilizing this service.
6) The period of the project ceases to be five years.

Methodology

Social Cost and Benefit Analysis stages

i) Identification of various parties- In the first stage of the SCB Analysis an attempt has been made to identify all the parties which may be directly or indirectly influenced by the project.
ii) Mapping the impacts (direct and indirect) - Secondly, the impacts of the project on various stakeholder during different time frames has been taken into consideration. There may be externalities of a project which may not enter into any commercial account, all such impacts which may be intended and unintended as well as direct and indirect have been taken under purview.
iii) Establishing Counterfactual- The status of the project area including the parties involved before the implantation of the project, i.e. before November 2019 have also been looked into. This has facilitated the establishment of facts regarding what was or is the scenario in the absence of the program (in case of some wards).
iv) Identifying various social cost and social benefits- The social cost and benefits from the project have been identified keeping in mind the different time frames of the project.

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v) Social cost benefit matrix- A social cost benefit matrix have been formed on the basis of the parties, social cost and social benefits identified in the above stages.

Limitations of the study

The research that underpins this study is not free from limitations. The key limitations are listed below-

i) The study required certain data present in documents like the Request for Proposal for Solid Waste Management by Sivasagar District, bye laws governing the Door to Door garbage collection project in Sivasagar, Details of MoU signed between SMB and ALFs/SHGs of DAY-NULM, namely Mulagabharu and Janani SHG. There is an absence of such documents on the e- platform. Due to the Pandemic situation, it was difficult to collect primary data from SMB and the Researcher have to rely on secondary sources for obtaining information about the project.

ii) Certain operations like adoption of e-rickshaws for collection of garbage were assumed to be true on the basis of rules laid in Municipal Solid Waste Management and Handling Rules, 2016 and as followed by some of the cities in Assam. However this may not be the case.

iii) Another important limitation of the study was the time constraint.

Social Cost Benefit Analysis

i) Identification of various parties-

A particular project always has a target population to be impacted. In case of Door to Door Garbage collection project, the target population is the general public residing in the area where the project is undertaken. Other Non targeted stakeholders may include- Government, SMB, Skilled Laborers, Unskilled Laborers, MSME's and the SHG's/ALF's of Sivasagar.

ii) Mapping the impacts- The probable impacts of the project economic and non-economic as well as direct and indirect are imperative for social cost benefit analysis. These are listed below-

Direct	Indirect
Increase in awareness regarding cleanliness and hygiene	Sustainability oriented efforts would be initiated
Improvement in the instances of sewage choking, dumping of waste in drains/ empty plots	Reduction in Operational and maintenance cost of drains
Improvement of soil quality resulting from backyard composting by local people	Land appreciation and
Reduction in the number of stray animals feasting on garbage dumps in the city area	Reduction in instances of animals dying due to consumption of hazardous waste materials and plastics.
Scope for practicing and adopting measures for reuse and recycle	Reduction in quantity of waste to be further treated by SMB
Generation of employment for both skilled and unskilled laborers	Reduction in availability of unskilled labors for alternative jobs in other areas.

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Promotion of MSME's	Increase in employment generation
Economic Empowerment of Woman due to the involvement of SHG's/ALF's	Promotion of Gender equality and Women autonomy
Enhanced Community participation	Increase in consumption of electricity due to increased number of e-rickshaws involvement in the project
Reduction of space available for parking	Reduction in Air, Water and Soil Pollution
Reduction in issues related to health and safety.	Adverse economic effects on the health care market

iii) Establishing Counterfactual-

The project has come into operation since November 2019, covering two wards of Sivasagar sub district and the rest are supposed to be covered during the lifetime of the project which in this case is 5 years as discussed earlier. It is significant to understand and establish the condition of the town in absence of such a project. As mentioned in the introduction section, in absence of a planned solid waste management system the city has been facing a lot of problems which mainly revolves around the health issues faced by the inhabitants. Air pollution and water pollution is another major threat to the society. With the implementation of this project, these issues can be addressed. However, it is worth mentioning that, due to the flow of tourist to the city throughout the year and also for it being a major city in Upper Assam, the town experiences a huge traffic and parking issue. It evidences lack of space in certain specific areas. There are bulk dustbins in some specific location which are not well maintained. The implementation of the project would surely affect these situations prevailing in the city.

iv) Identifying Social Cost and Benefits-

After identifying the impacted groups, the impacts and counterfactuals, a clear picture have been extracted with regard to the social cost and benefits that the project intervenes. The lack of infrastructures that the city is evidencing has been taken into due consideration since the absence of infrastructural facilities will highly effect the results expected from the project. An effort has been made to put forward the social cost and benefits of the project, giving due consideration to such issues.

Social Cost-

- Firstly institutionalizing of the door to door waste collection process by involving ALF's/SHG's will burden the SMB with the task of uninstalling the existing system of waste collection. This includes incurring cost of removing dustbins from certain parts of the city and chalking out of plan to dispose them.

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- The change in the process of collecting waste may lead to cutting down of employment of some individuals or groups who were primarily engaged in the system of garbage collection before the application of the project.
- If the project is successfully applied in all the 14 wards, the city may face scarcity of laborers (skilled and unskilled) in alternative field of works as Door to door collection system requires the engagement of a huge manpower.
- The increase in number of E-rickshaws shall hamper the ongoing traffics issues faced by the area. This may ultimately lead to an increase in the number of accidents occurring per month. In addition to this intensive use of E-rickshaws will add to the power consumption rate of the sub –district.
- Provided the present status of infrastructural facilities, at the initial stages of the project the risk of health issues of unskilled and skilled laborers is intense. They are the one coming into direct contact with all kinds of waste. In absence of proper infrastructure and material they would be exposed to great danger.
- Certain users of the service may have to reduce their rate of savings as well as consumption due to the fees levied upon them by the SHG's/ALF's. The uniformity in amount to be paid by households irrespective of their residence location or their income level will restrict them from increasing their rate of savings or capital formation.
- Some stray animals feed on organic waste provided to them by households. The practice of composting may lead to reduction of such activities resulting in instance deteriorating the conditions of stray animals

Social Benefits

- SMB's would be able to manage their waste management system more effectively as the waste will be segregated at source and a first task of the management system i.e. collection would be managed and monitored by respective SHG's/ALF's. Planning and implementation of treating the biodegradable and non- biodegradable waste can be made accordingly.
- Government as well as SHG's has the opportunity to generate revenues from both types of waste and that would be possible only if the segregation is done at source. There is a scope for setting up vermi compost plant, where the organic waste can be treated and Waste can be converted to resource. The non biodegradable waste can be recycled and reused, however such action would require installation of Material recovery facility or the engagement of huge number of laborers trained to do the same.
- There will be an increase in generation of employment opportunities for both skilled and unskilled laborers. They would have a steady income source to rely upon for their daily bread. It might enable them to upgrade their social and health status.
- The users of the service will be relived from the burden of managing the generated waste. A practice of segregation of the generated waste will take them a step ahead in maintaining cleanliness and hygiene. Users will likely be concerned about their consumption patterns and their selection of

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biodegradable materials over others. The project encourages backyard composting by the households. Those households having the space/ resource for composting organic waste may also be able to generate revenue from it, depending on their choices of income generation alternatives.

- The scope for reuse and recycle will increase with the segregation at source. This may promote MSME's in the project area. The recycling process requires setting up of MRF's and Bio methanation plant. There is ample opportunity for MSME's to enter this area of business. Also some enterprises may come up with the idea of making products with recycled materials which would embark development in the field of innovation and technology.
- The project engages ALF's and SHG's, which includes women from various sections of the society. Such integration would enhance community participation. Also, it would pave a way for generating revenue for the groups thereby by leading to economic empowerment of women in family and society
- There would be significant reduction in the amount of waste diverted to landfills. The carbon emission by the city can be reduced significantly .This would lead to saving transportation costs for SMB's and facilitate safeguarding the environment.
- The number of stray animals feeding on garbage is expected to be reduced. Now-a-days there are many instance of death of animals caused due to consumption of plastics and other hazardous materials. Introduction of door to door garbage collection and elimination of bulk dustbins may restrict occurrence of such instances. Also many times animals are found responsible for dragging garbage from dustbins and spreading them in and around roads, parks, fields, etc making way for unpleasant smell, dirt, drain blockages and spread of disease. Collection of garbage from doorsteps can address these issues too.

- Decrease in quantity of waste to be treated can significantly contribute to reduce air, water and soil pollution. The residents of the district have witnessed the flowing of waste into river Darika, a sacred tributary of Brahmaputra river, endangering the aquatic life and degrading the water resources of the city. The dumping site near Darikapar has deteriorated the soil quality in and around the place. There are people inhabiting in nearby areas who are bound to breathe the polluted air because of poor maintenance of the site. There would be a halt over all these issues since the project focuses on segregation at source.

v) Social Cost Benefit Matrix

The Social cost and benefits related to Door to door garbage collection project in Sivasagar have been represented in the form of a matrix after giving due consideration to all the stakeholders and the time period fixed for implementing the project-

	Soci	Parties/Stakeholders

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		Government /SMB	SHG's/ ALF's	Skilled/ Unskilled Laborers	Users	Society as a whole	Environment/ Other Living beings
Initial stage of project implementation	SC	Burden of task and cost of uninstalling the existing system of waste collection		Cutting down of employment Risk of health	Reduce their rate of savings as well as consumption		Deterioration in conditions of stray animals (animal dying and suffering from diseases due to lack of food)
	SB		Opportunities of revenue generation	Increase in generation of employment opportunities	Relief from the burden of managing waste	Increased awareness about cleanliness and hygiene Awareness regarding selection of bio degradable materials over others Promotion of MSME's Enhance community participation Women empowerment	Reduction in quantity of waste diverted to landfills
During the span of 5 years	SC				Reduce their rate of savings as well as consumption	Scarcity of laborers (skilled and unskilled) in alternative field of works Increase ongoing traffics issues add to the power consumption	Deterioration in conditions of stray animals (animal dying and suffering from diseases due to lack of food)

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						rate	
	SB	Planning/Managing the SWM program would be easier. Opportunities of revenue generation Time saving	Opportunities of revenue generation	Increase in generation of employment opportunities Steady income source Upgradation of social and health status	Revenue generation opportunities	Increased awareness about cleanliness and hygiene Awareness regarding selection of bio degradable materials over others Promotion of MSME's Enhance community participation Women empowerment	Reduction in quantity of waste diverted to landfills Reduction of carbon emission Decrease in instances of animal death Reduction of air, water and soil pollution Safeguarding aquatic life and other natural resources
Post implementation (assuming the project would become a permanent sub element of SWM of sivasagar sub district)	SC					Scarcity of laborers (skilled and unskilled) in alternative field of works Increase in ongoing traffics issues Add to the power consumption rate	
				Upgradation of social and health status Steady source of income	Revenue generation opportunities	Increased awareness about cleanliness and hygiene Awareness regarding selection of bio	Reduction in quantity of waste diverted to landfills Reduction of carbon emission Decrease in

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						degradable materials over others Promotion of MSME's Enhanced Community participation Women empowerment	instances of animal death Reduction of air, water and soil pollution Safeguarding aquatic life and other natural resources

Source: SCBA of this paper

Discussion and Recommendations

The SCB Analysis of the Door to Door Garbage collection project adopted by Sivasagar Sub district depicts that even though a project is meant for the benefit of the society it does not comes without a cost. The matrix presented in the earlier section of this study points out the cost and benefits of the project during different time frames, based on the fact that it would be successfully implemented in all the 14 wards of the city. The SBCA reflects that the society and its stakeholder would be liable to face some cost during the initial stages of the project where as during its implementation and post implementation period most of the stakeholders would be benefited. It is quite clear that in the absence of risk and uncertainties as to the implementation of the project, there are more benefits than cost to be incurred by the society. However, these cost and benefit analysis requires the conversion of the same into a common numeraire and also the application of a discount factor, which in this case was quite difficult due to the absence of financial cost benefit data.

The present infrastructural status of SMB is quite unsuitable for the implementation of the project which can prove to be one of the major barriers or an element contributing to societal cost. The policy makers must give due consideration to this aspect. The development of a society always comes with a cost, eliminating such cost may seem difficult but its minimization is very always possible. The SMB requires to chalk out plans to deal with the cost the society is about to incur due to the implementation of the project. In their effort to do so, they should take initiatives towards making provisions to include the skilled/unskilled laborers who were/ are engaged in the waste collection system prior to the project. They should also focus on the maintaining a safe and hygienic working environment to the laborers, providing them with all the requisite safety kits and materials, providing them training to carry on their operations effectively and safely. The project would be a source of maximum social benefit only if the stages following the collection of garbage up to the secondary point of collection is planned and implemented keeping in mind the primary objective of waste management strategy, as such all other stages of the waste management program should be implemented properly.

Conclusion

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With the advent of urbanization and modernization, human civilization and other life forms have experienced both upgradation and degradation. As the most intelligible beings on earth, its high time to realize the cost attached to benefits we tend to obtain from certain projects, together as a society. Sivasagar is one of the most historically, culturally and naturally rich city in Upper Assam. It is densely populated and remains crowded throughout the year adding up to the generation of solid waste. The management of solid waste is one of the major problems of SMB. The implementation of Door to door garbage collection project seems to be beneficial for the society at large. However, there are some serious costs that the society must incur. The Sivasagar Municipality Board should take initiatives to reduce such cost, in order to avail all probable benefits from the project.

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