



A Geographical Interrogation of Solid Waste Management : A Case Study of Puri town, Odisha

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Abstract

Human resource is the most precious of all resources. Man plays a dual role of a producer or creator and a consumer or destroyer of resources. He offers his labour, primarily, mental and secondarily physical when he creates a resource. Being most dynamic, man is never satisfied with mere living, he has always tried to refine his living conditions and environment. This ultimately leads to environmental deterioration. Since the beginning, humankind has been generating waste, be it the bones and other parts of animals they slaughter for their food or the wood they cut to make their carts. With the progress of civilization, the waste generated became of a more complex nature. At the end of the 19th century the industrial revolution saw the rise of the world of consumers. Not only the air get more and more polluted but the earth itself became more polluted with the generation of non-biodegradable solid waste. The increase in population and urbanization was also largely responsible for increase in solid waste. Solid waste is one of the most immediate environmental pollution caused due to rapid rate of industrial growth and urbanization. Being human we produce waste in nearly everything we do. Solid wastes are unwanted materials disposed of by man, which can neither flow into streams nor escape immediately into the atmosphere. These non-gaseous and non-liquid residues result from various human activities, which can cause pollution in water, soil, air etc.. The term Solid Waste refers to the “unwanted and thereby discarded waste materials from houses, street sweepings, commercial industrial and agriculture operations arising from man’s activities (WHO 1971), “It conglomerates mixture of dust, ash, vegetables and putrescible matter, paper and packaging materials of all variety and forms, rags , glass, metals, and combustible and non-combustible debris”.
Key word: environment, industrial revolution, pollution, solid waste

Introduction

Modern man’s greatest contribution to pollution is increasing which is mainly taking place on land. Out of which solid waste pollution creates a havoc for the modern man’s society. The ramification of the uncontrolled solid waste generation would create a severe environmental hazard in future days. Thus its proper management should be the prime duty of any concerned municipality. Many developing and developed countries are also facing solid waste problem. So an effective, efficient, and sustainable waste

management system is still rare in India. Hence, it is noteworthy to make proper management or plan of this increasing hazardous problem. Keeping in view of this problems, Puri town in Odisha has been selected as the study area.

Significance of the Study

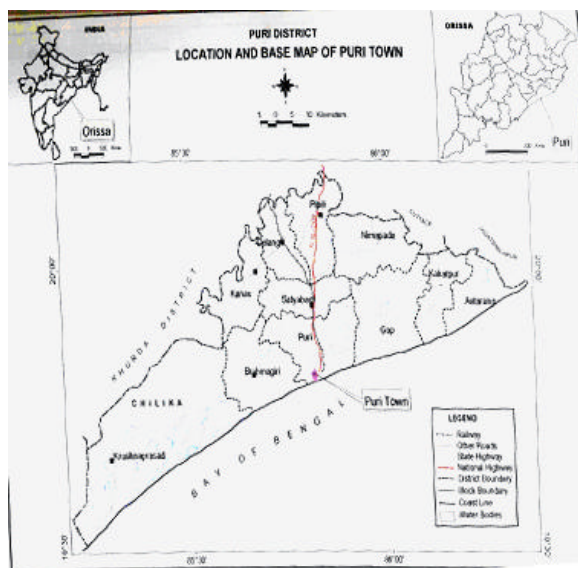
The basic purpose behind this present study is to find out the environmental crisis which is taking place in Puri urban region. Puri, one of the historic and sacred places in the world attracts thousands of pilgrims from different corners of



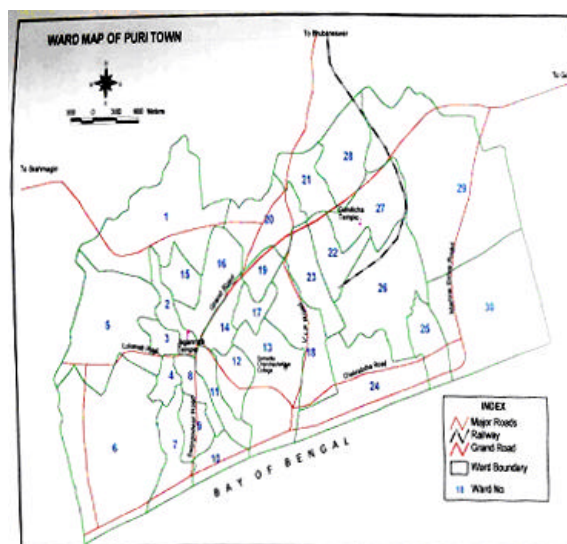
India and abroad, is getting polluted day by day. Now it is high time to know what are the major causes responsible for the pollution in Puri town. Due to rush of pilgrims in Puri town, the water, air, and noise pollution are commonly found. But another kind of pollution, i.e. solid waste pollution is emerging as a new type in Puri. So it is most vital to make a thorough study on solid waste pollution in this area starting from its generation to management. Again this study is more significant for the academicians, planners, administrators and bureaucrats for the understanding of the proper management and planning of solid waste in Puri town. The detailed study highlights some possibilities to overcome the above problems for the development of the holy town.

Study Area

Puri, one of the “CHAR DHAMS”, and the holy city of Lord Jagannath is located between 19.28° N. and 26.29° N. latitudes and 84.56° E. and 86.25° E. longitudes. The town of Puri is located almost at the geographic centre of the district, and is bounded by sea on south east, Mauza Sipasaurubali on west, Mauza Gopinathpur on the North and Mauza Balukhand on the east.



National Highway 203 connects the town with the state capital Bhubaneswar, which is about 60km. away from Puri. It is also connected by broad gauge railway line with Khurda road, an important railway junction on the South-Eastern railway connecting Howrah to Chennai. The administrative jurisdiction of Puri Municipal area spreads over 16.3268 sq. kms. and stretches along the sea-shore measuring about 5 K.M. The entire municipal area is divided into 32 wards; having total population of 1,57,837 as per 2001 census.



Objectives

The main objectives of this paper is to establish the status of existing system of waste generation, collection, transportation, recycling and disposal. The specific objectives are :

- To identify the sources of solid waste generation in the Puri town.
- To find out the environmental crisis, an aesthetic disturbance which is taking place in Puri town due to solid waste.
- To analyze the spatio-temporal frameworks of solid waste generation, collection, and disposal.



- To access the processes and practices being used for the collection and disposal of solid waste generated in the town.

Methodology

The present empirical study is conducted in Puri town of Odisha which is an important pilgrimage place. The study is based on both qualitative and quantitative data collected through survey method and interview. The sources of data are both primary and secondary. The primary sources of data have been collected through field research and sample survey. The secondary sources of data are collected from municipal authority by interview and from various related books and journals.

Sources of Solid Waste

Solid waste may arise from different sources and hence fall into different categories:

- Domestic refuse: kitchen and food wastes, plastics, papers and road sweepings.
- Market refuse: generally wastes from vegetables and non-vegetable matters, packing materials such as bamboo baskets, leaves, plastics, cardboard/timber boxes etc.
- Hospital refuse: wastes such as syringes, needles, ampoules, bottles, cottons, plasters and spoiled medicines.
- Road refuse: wastes such as leaves, animal droppings, human wastes, litter and dust.
- Garden refuse: wastes such as leaves, branches, plants and broken pots etc.
- Business area refuse: various types of paper, cigarette and beedi butts, match sticks, bus tickets etc.
- Cattle-shed refuse: animal wastes and general litters. Trade refuse: cloth cuttings from tailoring shops and waste from auto repair centers etc.
- Building construction refuse: earth, concrete, bricks and plasters, sand etc.
- Industrial refuse: oil soaked racks, timber scantlings and chemical refuse including toxic matter.

Based on the characteristics, the garbage may be categorized into various types such as: hazardous, toxic, corrosive, inflammable, explosive. Hazardous garbage is very much dangerous compared to other types; it arises from chemical wastes such as batteries, medical wastes, old medicines, insecticides etc. Some hazardous garbage is poisonous and such a waste arises from cleaning products, rat poison and pesticides and is known as toxic. The hazardous waste that can dissolve anything which it touches is known as corrosive garbage. This type of waste arises from batteries, oven cleaners, drainage cleaners and ammonia based cleaners etc. Some hazardous waste can catch fire and release toxic fumes into the air and so called as inflammable garbage. Certain hazardous wastes, which blows when mixed with other chemicals or when it is dropped on the ground, is known as explosive garbage; mainly found in spray cans, gasoline and lighter fluid.

Table – 1
Characteristics of Solid Waste in Puri Town

Waste	Source	Characteristics
Refuse	Domestic	Biodegradable (food, oil, vegetables)
	Official/ institutional	Non-biodegradable (polythene bags)
	Markets/ commercial	Combustible (textiles, glass, rubber)



	Commercial centres	combustible (paper) Biodegradable (combustible) combustibles (paper, polythene, packing materials)
Burning Ash	Solid fuel burning	Generally alert
Building waste	Construction/demolition rejected materials/ equipments	Metallic or building materials.
Clinical waste	Nursing Homes and Hospitals	Hazardous
Sewer sludge	Sewer cleaning	Biodegradable and inorganic
Road	Road sweeping	Polythene, waste paper, leaves, dusts etc.

Environmental Hazards due to Solid Waste

Puri, one of the coastal towns of eastern India, is known all over the world as an important center of pilgrimage and an enchanting beach. Over thousands of pilgrims and tourists visit the town every year. It's sunny beaches, colorful wild life, traditional culture, and rich heritage attracts thousands of people, not only from India but from abroad also. As a result of which the local environment is affected directly. As far as pollution is concerned, large scale solid waste generation is a new threat to the Puri town. The improper and unscientific disposal of solid wastes create a huge environmental risk specially for the pre-school children, waste workers and general public, by producing toxic and infectious materials. Uncollected solid waste also increases risk of injury, and infection.

In the absence of proper waste management, this waste lies littered on our streets, road corners, and improperly disposed of in vacant land. All these are serious health hazards apart from being eyesores. Again they invite host of problems like increasing numbers of vectors like flies, mosquitoes, etc. scavengers such as stray dogs, pigs and rats which spread dangerous

diseases, and also generates bad odour and pollution. During the monsoon season, the unattended waste not only putrefies but also chokes the drains; as a result the whole town becomes a disease procreation ground.

General Methods and Practices of Solid Waste and its Management in Puri Town

Solid waste is a statutory term that defines any matter in solid form that is in no longer human use and is discarded. It is a material that the user abandons within urban areas and it requires no compensation upon abandoning. Management implies a conscious choice from a wide variety of alternative proposals and the deliberate adoption of a strategy or a number of strategies designed to meet realistically short term objectives, yet specifically providing sufficient flexibility for the preservation of longer term of options.

In Puri Municipality, there exists a mechanized bio-compost plant for treatment of garbage, generated in the town of capacity 100 tonnes per day. The plant is meant for the reduction of polluting substance in the domestic city waste by treating it with enzymes and herbal concentrate and diving value added in organic manure or organic fertilizer for use in agriculture.



This solid waste management plant is situated at Puri town on two hectares of land. Initially the plant started a project for the reduction of solid wastes from Puri town by Indo-Norwegian Development Co-operation under the administrative control of Government of Odisha, Forest and Environmental Department funded by Odisha Environmental Programme and presently executed by Krishi Rasayan Private Limited, Kolkata. This project aims at simple, economical and eco-friendly disposal of solid waste of Puri town.

Management of solid waste involves a complex set of parameters including the generation pattern, collection efficiency and proper disposal techniques. Collection, transportation and disposal practices should be done without disturbing the delicate balance of the urban surroundings in particular and environment in general. Any management of waste has to be sustainable in nature as the process of generation is never ending. In Puri, although the population growth is not very fast, but high level floating population to the town makes the management of urban solid waste more vulnerable for environmental pollution and degradation. In the town proper attempt has been made to identify the sources, types and quantities of solid waste. Later with due care the Municipality authority has initiated proper waste management technique covering five steps i.e. collection, transportation, storage, segregation and disposal.

Major Steps of Solid Waste Management

Collection

Collection of waste is the first step of waste management system. The entire Puri district is divided into 32 wards and 106 Sahis, so the waste collection process is done in the entire wards and Sahis. From the management point of view, Puri is again divided into 8 zones or

conservancy districts and one malaria zone. The conservancy districts are as follows:

- i. The right hand side of sea beach covering part of Balisahi to Baliapanda to Lokanath Road and Dakhina Dwara of the Jagannath Temple.
- ii. The left hand side of sea beach covering Kacheri Road to Dolmandap Sahi.
- iii. Starting from Harihar Square to Heragohiri sahi covering Municipality market and Labanikhia Chhaka.
- iv. Lion's Gate of Jagannath temple to Gundicha temple covering entire Grand Road.
- v. Starting from bus stand to Narendra Tank covering Siddha Mahavir, Kumutipatna, Balighat and Atharanala to Balagandi.
- vi. The sixth zone covers the entire area from Subhash Bose Square to Railway Station including Penthakata, Sanskrit University and Srikshetra Colony.
- vii. The seventh zone represents the area starting from Narendra Tank to Dolabedi covering entire Markandeswar Sahi, Mangalhat and Laxmi Bazar.
- viii. The eighth zone or conservancy district covers the entire Sea Beach area.

Currently in Puri Municipality, about 640 sweepers are working daily. Out of which 43 sweepers engaged in Malaria section and the rest 597 persons including both male and female collect waste from different zones of Puri. The zonal distribution of sweepers is decided by the Zamadars and Multipurpose Health Workers (MPHW), which is headed by health officer. Again the general classification of sweepers are of three types, Regular or Permanent, Temporary Regular, and Temporary or daily wagers.

Transportation

The refuses from dustbins and roadsides are transported in two wheeler barrows which



are provided by the Municipality to each sweeper, to nearby storage centers. In Puri town, primarily there are 8 storage centers or dumping grounds, which store the wastes or garbage coming from the entire Puri districts or the above mentioned conservancy zones.

Puri Municipality provide 8 tractors and one mini truck for waste transportation and about 25 persons are separately engaged for waste transportation from different corners of the town to dumping sites. All these members work under Vehicle Inspector who is a municipal employee. The frequency of transportation of waste varies from location to location and from season to season depending on the rate of waste generation. Wastes from the market and densely populated areas and from station area are transported daily.

Table 2

Average Physical Composition and Urban Solid Wastes, Puri Town

MSW Characteristics	Volume in Percentage
Paper	2.0
Polythene, plastics	2.8
Green leaves, vegetables	15.4
Dry leaves, grass wood	14.0
Cow dung, animal excreta	2.5
Green coconut Shell	4.0
Ash, silt, sand etc.	44.0
Debris	14.5
Glass	0.3
Leather Waste	0.3
Metal scrap	0.2
Total	100

Source: Odisha State Pollution Control Board website

Storage

Improper storage conditions of garbage create health hazards to the public living around.

The in-sanitary conditions prevent many tourists to come to Puri which otherwise has the potential of attracting 2-3 times, the number of tourists that are presently coming.

Currently, in Puri Town, there are 8 storage centers or dumping sites where garbage are found, covering almost every zone of Puri. They are as follows:

- Near Lokanath Road
- Beachside of Raj Hotel, Swargadwar, Puri
- Beachside of Catholic Church
- Ghodabazar near Women's college
- Near Ram Mandir, Station Road, Puri
- Backside of Gundicha Temple
- Near Masani Chandi
- In front of Bagha – Akhada Math, Badasankha, Puri

Segregation of Recyclable Materials

The urban solid wastes contain materials such as glass, polythene bags, metallic containers which can be recycled if properly segregated. There is no proper facility for recycling by Municipality, but somehow, recycling process is done by the rag pickers and informant collectors. Rag-pickers, who are mostly women and children from weaker section of the society, collect these reusable materials by going from house to house or from waste dump centers. They collect everything which are sellable that fetch money.

Disposal

Puri Municipality generate about 100 tones of waste daily out of which only 30-40 tonnes of garbage is received by solid waste management plant. The rest amount of waste or garbage is dumped haphazardly and gives rise to environmental problem. In general the practices for disposal of waste are worth mentioning viz., Animal feeding, Random refused dumps, Land filling, Open incineration.



Problems and Issues associated with solid waste management

The effort is not sufficient for the proper management of solid waste generated in Puri town. Lack of co-ordination between Puri Municipality and waste management plant is the major problem, as Puri Municipality (PM) is the owner of the plant, but could not satisfactorily help the plant in varied way. Municipality, political authority and most importantly the common people should be conscious about this problem. However awareness among the general public through mass media, meetings, posters and activities of different NGOs is a preventive measure for such an environmental degradation due to solid waste.

Conclusion

The explosion in world population is changing the nature of solid waste management from a low priority localized issue to an internationally pervasive social problem. Risk to public health and the environment, due to solid waste in large metropolitan areas are becoming intolerable. Puri town is currently facing the municipal solid waste dilemma, for which all elements of the society are responsible. Here in this town, community sensitization and public awareness is very low. There is no proper system of segregation of organic, inorganic and recyclable waste at the household level. Though there is an adequate legal framework existing in the country to address municipal solid waste, but what is lacking is its implementation. There has to be a systematic effort in the improvement in various factors like institutional arrangement, financial provisions, appropriate technology, operations management, human resource development, public participation and awareness and policy and legal frameworks for an integrated solid waste management system.

Considering the problems of solid waste various preventive measures are to be taken. The

first and most important aspect is awareness among the general public for such a problematic aspect of the environment. Adequate budget provisions should be made for this. Simultaneously regular monitoring and reporting of sewage and urban solid waste disposal should be made. Of course presently, the urban solid waste management is the sole responsibility of the concerned Municipality and the Ministry of Environment has initiated several schemes for survey of urban municipality area and disposal of biomedical waste through different non-governmental agencies.

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The problem of solid waste management is majorly due to urbanization. Tamil Nadu is one among the most urbanized states in India with 43.86% of state population living in urban areas. The state is therefore, facing a challenge of providing essential infrastructure in urban centers to keep pace with population growth. Solid waste Management is one among the major challenges faced by the state governments in urban areas. The waste collected from Thanjavur town and the study made there on indicated that. Biodegradable content of MSW is a good source of compost for agriculture purpose. Non biodegradable content can be used for recycle, reuse or landfill. The study concludes that installation of decentralized solid waste processing units in metro-politan cities/towns and development of formal recycling industry sector is the need of the hour in developing countries like India. Subjects: Civil, Environmental and Geotechnical Engineering; Engineering Management; Environment & Agriculture. There is complete lack of at-source segregation and management of solid waste. Thus it becomes really difficult to manage burgeoning waste without active participation of the people. It is also important to develop and implement an integrated solid waste management approach taking advantages of existing unorganized sector (rag-pickers) for its cost-effective and sustainable management.