Project 3 Report

KAUN KAREGA SWACHHA BHARAT?

Upasana Gadgil | 136250004 | Visual Communication

Guided by: Prof. Raja Mohanty

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Visual Communication Project 3 by
Upasana Gadgil
136250004

Guide
Prof. Raja Mohanty

Submitted in the partial fulfillment of
the requirements for the degree of
Master of Design
in Visual Communication

Industrial Design Centre
Indian Institute of Technology
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DECLARATION

I declare that this written submission represents my ideas and work in my own words and where other ideas and words have been included, I have adequately cited and referenced the original sources.

I also declare that I have adhered to all principles of academic honesty and integrity and have not fabricated, misrepresented or falsified any idea/data/fact/source in my submission.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom permission has not been taken when needed.

Signature : 

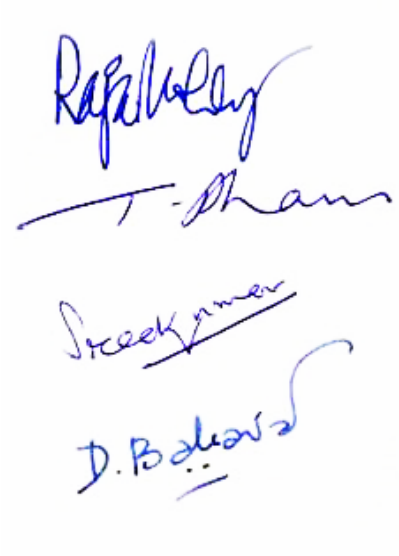
Name : Upasana Gadgil

Roll No. : 136250004

Date :

APPROVAL SHEET

This Visual Communication project entitled "KAUN KAREGA SWACHHA BHARAT? - Can IITB be a Zero Waste campus?" by Upasana Gadgil, 136250004, is approved in partial fulfilment of the requirements of Master of Design Degree in Visual Communication.



Project Guide :

Chair Person :

Internal Examiner :

External Examiner :

Date :

Place :

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ABSTRACT

The project gets its impetus from the 'Swachha Bharat Abhiyan' launched by the Prime Minister of India. Since the task of keeping the metropolises, cities, towns and villages clean is a challenging one the project attempts to understand some of the different dimensions of such a mission. It then examines two contexts - one that has to do with aspects of cleanliness in the immediate environment i.e the campus of IIT Bombay. The second one is the village of Vavoshi in the Raigad district of Maharashtra. The communication design sought to be developed through the project focuses on wet waste managment in the campus of IIT Bombay.

INTRODUCTION

India has been a home to around 1.2 billion people. Its a democratic country where government takes care of its citizens. Government has a role in economy, education, health, business, culture, cleanliness, safety and security, infrastructure and planning of the country. When it comes to cleanliness, collecting and disposing Solid Waste from the cities is a critical task carried out by municipal corporations, which is a government body. The total MSW generated in urban India is at 68.8 million tons per year (TPY) or 188,500 tons per day (TPD). There is a 50% increase in MSW generated within a decade since 2001. It is guessed, urban India will generate 160.5 million TPY (440,000 TPD) by 2041. In the next decade, urban India will generate a total of 920 million tons of MSW that needs to be properly managed in order to avoid further deterioration of public health, air, water and land resources, and the quality of life in Indian cities. Soon, India will not be able to dispose these wastes properly.

The project 'Kaun Karega Swachha Bharat' begun with the realization that people of India are aware of the problem of 'Aswachhta' but are not really keen or able to do anything to resolve it. Cleanliness begins from home and to evoke this sensitivity in us, this project is a response to the initiative 'Swachha Bharat Abhiyan' launched by the Prime Minister of India. As the project begun, it became essential to understand why 'Aswachhta' exists and how people think about 'Swachhta', for which a lot of research study and talking to people was done. After the primary and secondary study, it was believed 'Aswachhta' is the result of man's own deeds, sheer ignorance towards the subject and the increasing demands and consumption. It appears the whole world is falling prey to the materiaistic economy making people greedy. And so is the case with India. Increasing consumption is leading to more waste generation and landfills are getting exhausted generating huge amount of methane gas leading to global warming.

The prime minister nominated many celebrities for cleaning India with the brooms in their hands. The initialization certainly created buzz amongst the

overcome 'Aswachhta' its important to bring change in the counsciousness of people which will effectively make the environment a 'Swachh' place to live.

Swachhta has two important dimensions - internal world that is the mind of the person and the material world. This project aims at understanding both and further focuses on what design interventions can do to the status of solid waste managment in India. The two different environments were taken as case study - IIT Bombay campus and a village Vavoshi in Raigad district. The study involved understanding the differences and similarities between the two environments, their cultures, consumption and disposal habits reponsible for unclean surroundings. This study examined the present status of waste management in IIT Bombay and Vavoshi, its effects on public health and the environment, and the prospects of introducing improved means of disposing municipal solid waste (MSW). The systems and techniques discussed are Informal and Formal Recycling, Aerobic Composting and Mechanical Biological Treatment, Small Scale Biomethanation, Refuse Derived Fuel (RDF), Waste-to-Energy Combustion (WTE) and Landfill Mining (or Bioremediation).

The study was to find ways in which the enormous quantity of solid wastes currently disposed off on land can be reduced by recovering materials and energy from wastes, in a cost effective and environmental friendly manner. This report is the result of four months of study and includes data collected from the literature, communication with professionals in the field of waste managemnet and sanitation and extensive field investigations in the mentioned regions. Four field visits to Vavoshi over a period of 2 months and field visits to IIT waste management gave substantial understanding of how various techniques are followed based on that area's requirements. Due to the variance in the amount of residential waste generated the actions needed to manage them vary. The visits included travelling to informal recycling hubs, waste dealers shops, composting facilities, RDF facilities, WTE facilities, sanitary and unsanitary landfills, landfill mining sites, and numerous municipal offices. These visits provided the opportunity to closely observe the impact of waste management initiatives, or lack thereof, on the public in the mentioned regions.

This report promotes a solid waste management system for all which includes integrated informal recycling and wet waste composting as primary and cost effective methods to reduce the burden on landfills. The challenge lies in how to achieve this goal by bringing real and permamanent change - that is the change in consciousness. Though it is a long term goal, this project is a good start for it.

Informal recycling can be integrated into the formal system by training and employing waste pickers to conduct door-to-door collection of wastes, and by allowing them to sell the recyclables they collected. Waste pickers should also be employed at material recovery facilities (or MRFs) to increase the percentage of recycling. Single households, restaurants, food courts and other sources of separated organic waste should be encouraged to employ small scale biomethanation and use the biogas for cooking purposes. Use of compost product from mixed wastes for agriculture should be regulated. It should be used for gardening purposes only or as landfill cover. Rejects from the composting facility should be combusted in a waste-to-energy facility to recover energy. Ash from WTE facilities should be used to make bricks or should be contained in a sanitary landfill facility. Such a system will divert 93.5% of MSW from landfilling, and increase the life span of a landfill from 20 years to 300 years. It will also decrease disease, improve the quality of life of urban Indians, and avoid environmental pollution.

Presently, people are not conscious about keeping their surrounding clean. The motivation to come up with such a project came from the careless attitude of people who dont mind spitting on road and littering in public spaces. The curiosity to understand this behviour and psychology led to these enitre efforts.

This report is helpful for the students who are working in the areas of sanitation, solid waste management, waste water management, urban and rural space planning, social cause, compost making. It is helpful to the design students to understand how a social cause project gets direction. The purpose of this report is to document the complete design process which includes stages like observations and findings, articulation of a problem, ideation and conceptualizing, prototyping, execution and implementation of solution, learnings and conclusions to help the reader understand complete flow of this visual communication project.

ACKNOWLEDGEMENTS

Firstly, I would like to thank IDC, IIT Bombay for the freedom in choosing such a subject.

I thank my project guide Prof. Raja Mohanty for his support and guidance at every stage of the project. The discussions and field trips undertaken during the project helped in a better understanding of the complexity of the problem. Thanks to Mr. B. S. Patil, Public Health Officer at IIT Bombay, for giving me substantial information about waste management in IIT Bombay. Also, thanks to Mrs. Mana Chaterjee, the CEO of 'Green Practices' for the encouragement and support to promote composting. I would like to thank the residents of Vavoshi for their willingness to share and for their warmth.

Lastly, thanks to my family for their love, encouragement and support.

1 INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

With effect from 1 April 1999, the Government of India restructured the Comprehensive Rural Sanitation Programme and launched the Total Sanitation Campaign (TSC). To give a fillip to the Total Sanitation Campaign, effective June 2003 the government launched an incentive scheme in the form of an award for total sanitation coverage, maintenance of a clean environment and open defecation-free panchayat villages, blocks and districts called Nirmal Gram Puraskar. Effective 1 April 2012, the TSC was renamed to Nirmal Bharat Abhiyan (SBA). On 2 October 2014 the campaign was relaunched as Swachh Bharat Abhiyan.

'Kaun Karega Swachha Bharat' is a response to the intiative of Swachh Bharat Abhiyaan.

1.2 SWACHH BHARAT ABHYAAN

Swachh Bharat Abhiyan (Clean India Mission) is a national campaign by the Government of India, covering 4041 statutory towns, metros and villages to clean the streets, roads and infrastructure of the country. This campaign was officially launched on 2 October 2014 at Rajghat, New Delhi, where Prime Minister Narendra Modi himself cleaned the road. It is India's biggest ever cleanliness drive and 3 million government employees and school and college students of India participated in this event. The mission was started by Prime Minister Modi, who nominated nine famous personalities for the campaign, and they took up the challenge and nominated nine more people and so on (like the branching of a tree). It has been carried forward since then with people from all walks of life joining it.

The components of the programme are: a) Construction of individual sanitary latrines for households below the poverty line with subsidy (80%)

where demand exists. b) Conversion of dry latrines into low-cost sanitary latrines. c) Construction of exclusive village sanitary complexes for women providing facilities for hand pumping, bathing, sanitation and washing on a selective basis where there is not adequate land or space within houses and where village panchayats are willing to maintain the facilities. d) Setting up of sanitary marts. e) Total sanitation of villages through the construction of drains, soakage pits, solid and liquid waste disposal. f) Intensive campaign for awareness generation and health education to create a felt need for personal, household and environmental sanitation facilities.

Objectives of Swachh Bharat Abhiyaan

This campaign aims to accomplish the vision of a 'Clean India' by 2 October 2019, the 150th birthday of Mahatma Gandhi. It is expected to cost over INR62000 crore (US$9.7 billion). The campaign has been described as "beyond politics" and "inspired by patriotism".

Specific objectives are:
- Elimination of open defecation
- Conversion of insanitary toilets to pour flush toilets
- Eradication of manual scavenging
- 100% collection and scientific processing/disposal/reuse/recycling of municipal solid waste
- A behavioural change in people regarding healthy sanitation practices
- Generation of awareness among citizens about sanitation and its linkages with public health
- Supporting urban local bodies in designing, executing and operating waste disposal systems
- Facilitating private-sector participation in capital expenditure and operation and maintenance costs for sanitary facilities.

Overview of the Events

- 15th August, 2014 Public Recognition of a national problem by the Prime Minister Narendra Modi from the Red Fort, Delhi.
- 2nd Oct, 2014 launching of the Swachha Bharat Abhiyaan on Gandhi Jayanti by the Prime Minister Narendra Modi.
- With appointment of brand ambassadors of high profile individuals Priyanka Chopra, Sachin Tendulkar, Salman Khan, Kamal Hasan, Anil Ambani, Shashi Tharoor, Mridula Sinha, Baba Ramdev
- Media exposure and newspaper announcements of acceptance of the responsibility with brooms in the hands
- In response to the appeal of PM for the involvement of corporate houses in this effort - announcements by TCS, Reliance, FICCI of commitments of large CSR funds
- Announcement by the governor of Maharashtra of nine torch bearers for Maharashtra State – their names.

Image 1, Nominations by the Prime Minister for Clean India campaign

Image 2, Bollywood actors Priyanka and Salman Cleaning garbage

2 SWACCHTA

2.1 SWACCHTA AND THE MATERIAL WORLD

Cleanliness is both the abstract state of being clean and free from dirt, and the process of achieving and maintaining that state.

Every person has his own idea of cleanliness. Cleanliness is a personal matter of concern where others cannot interfere. Like, one might consider cleanliness by washing hands with soap before meals or one might just wash without using the soap or one might use spoon to eat. He will make sure that clean food goes into his body in whatever way. The degree of cleanliness might differ from person to person. Standards of cleanliness are not the same around the world, and people grow up with varying concepts of cleanliness.

In schools, a clean, well-ordered school environment in many countries helped students develop good habits of cleanliness. But adults are not always good examples of cleanliness in daily life. People who keep their bodies clean by daily taking bath but manufacture products which cause environment pollution. Are they clean? People who buy clean vegetables everytime in new plastic bags, are they clean? People who sweep their own homes and throw out the dust or garbage from their window, are they clean? Literate people wearing clean and gentlemen clothes, while travelling buy sandwich in a disposable plate and after eating thow the plate out of the bus window, are they clean? Are educated people clean and uneducated unclean? One cannot have a concrete definition for cleanliness.

Most often two people from different places and cultures when staying together in the same place as room-mates have issues over cleanliness. Because they both have different understanding of cleanliness. A woman who makes fresh food for her family, but gives away 2-3 days old stale food to her maid, is she clean in her thoughts? Cleanliness, however, is much

more than an outward appearance. It is an all-embracing ethic of sound living. It is also a state of mind and heart that involves our morals and worship. Cleanliness is a combination of having clean thoughts where others' happiness and health is a concern, clean body which is free from diseases and should be taken care of and clean environment where you be and keep clean so that others stay healthy. Maintaining a clean environment is no longer a matter of personal importance.

At restaurants people who make and serve food should maintain hygiene. At places like schools, restaurants, hotels, airports, hospitals high standards of cleanliness are expected.

Gandhiji's Thoughts on Cleanliness

"Sanitation is more important than independence". We got independence but the dream of a clean India is still unfulfilled. Gandhiji always believed, It is essential for everyone to learn about cleanliness, hygiene, sanitation and the various diseases that are caused due to poor hygienic conditions. The habits learnt at a young age get embedded into one's personality. Even if we inculcate certain habits like washing hands before meals, regular brushing of teeth, and bathing from a young age, we are not bothered about cleanliness of public places. Why? Are we so selfish that we dont care about others' health and well being?

He said, "No one should spit or clean his nose on the streets. In some cases the sputum is so harmful that the germs infect others. In some countries spitting on the road is a criminal offence. Those who spit after chewing betel leaves and tobacco have no consideration for the feelings of others. Spittle, mucus from the nose, etc, should also be covered with earth". (Navajivan dated 2 November, 1919). He learnt in the west that a lavatory must be as clean as a drawing-room. To him the test of a people's standard of cleanliness was the condition of their latrines.

Gandhijisaid, “So long as you do not take the broom and the bucket in your hands, you cannot make your towns and cities clean."

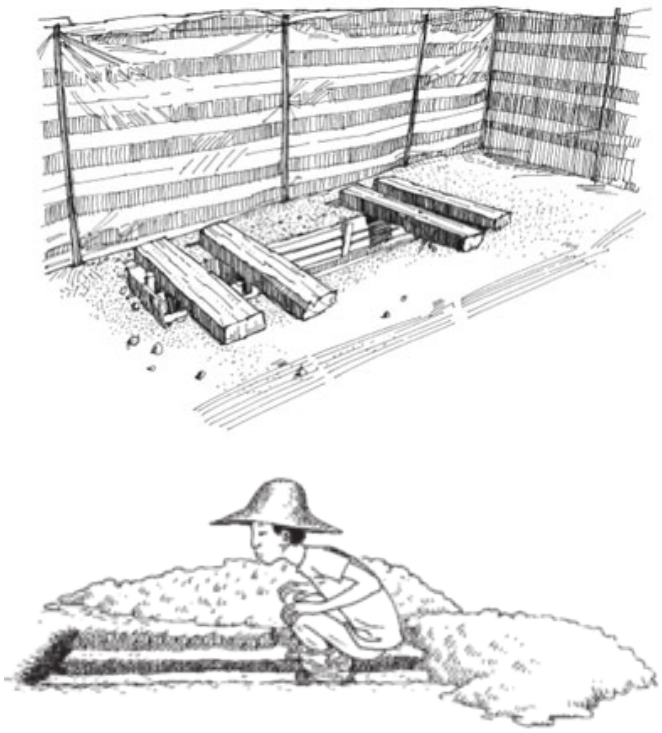


Image 3, Bicameral Trench Latrines

Gandhi learnt scavenging in South Africa. His friends there lovingly called him the great scavenger. Mahatma Gandhi said, "Everyone must be his own scavenger." All scavenging work in his ashram was done by the inmates. Gandhi guided them. No dirt could be found anywhere on the ashram ground. All rubbish was buried inpits. Peelings of vegetables and left-over food was dumped in a separate manure pit. The night-soil, too, was buried and later used as manure. Waste water was used for gardening. The farm was free from flies and stink though there was no puckka drainage system.

Gandhi and his co-workers undertook sweeper's work by turns. He introduced bucket-latrines and bicameral trench latrines. Gandhi showed this new innovation to all visitors with pride; rich and poor, leaders and workers, Indians and foreigners all had to use these latrines. This experiment slowly removed aversion for scavenging from the minds of orthodox co-workers and women inmates of the ashram.

Image 4, Bucket Latrines

2.2 WASTE MANAGEMENT

Man has needs and hence demands. Along with the act of consumption there is also some percentage of wastage that happens. This is a common phenomenon across the world and hence waste management forms an important subject for a human. Man has to take care of the waste generated by him since its a daily unavoidable acitvity and needs proper process which will manage waste without harming balance of the ecosystem. Also, man can consume only clean things and not waste hence it is essential to keep waste away from the consumables. Therefore, the place we eat and the place we defecate are always far from each other.

Waste management is the generation, prevention, minimization, removal, collection, transportation, characterization, monitoring, storage, treatment, handling, reuse and residual disposition of solid waste. The term usually relates to materials produced by human activity and the process is generally undertaken to reduce their effect on health, the environment or aesthetics. Waste generated is in two forms - solid and wet waste. In simple language, waste which is liquid in nature or which has high mositure content and is easily decomposable falls into the category of wet waste. Solid waste too can be decomposed but can take longer time compared to wet waste.

Waste management practices are not uniform among developed and developing countries; rural and urban areas; and residential and industrial sectors.

History

Waste management took an important place in human life because of industrialization. Industrialization had many positive effects on society in Europe in 18th and 19th centuries. The creation of power machines and factories many new job opportunities. The new machinery increased production speed of goods and gave people the ability to transport raw materials. It lead to urbanization. Urbanization is the movement of people into cities and city building. Citizens wanted to live closer to the factories that they worked at. The western world went from rural and agricultural to

urban industrial. Despite its many positive effects, industrialization had a negative inpact on Europe too. Urban areas doubled and tripld over the period of time leading to overcrowding in cities. Large population started causing many health problems. High density population led to unhealthy and dirty living conditions. Cities were unsanitarty and diseases filled the streets. There were no sanitation codes in the cities and many citizens started falling sick. This led to the need of proper waste management. Same is the scene in India today. Overcrowding has made the cities in India dirty.

2.3 SOLID WASTE AND SEGREGATION

Solid waste is discarded material which has served its purpose and is no longer useful. If MSW is improperly disposed, it can create unsanitary conditions and these conditions in turn can lead to pollution of the environment and to the outbreaks of diseases spread by rodents and insects.

Solid Waste can be classified into different types depending on their source:

1) Household waste is generally classified as municipal solid waste
2) Industrial waste as hazardous waste and
3) Biomedical waste or hospital waste as infectious waste.

Municipal Solid Waste

This category of waste consists of household waste, food wastes, paper, cardboard, plastics, textiles, glass, metals, wood, street sweepings, landscape and tree trimmings, general wastes from parks, beaches, and other recreational areas, construction and demolition debris, sanitation residue and waste from streets. Sometimes other household wastes like batteries and consumer electronics also get mixed up with MSW. This waste is generated mainly from residential and commercial complexes. With rapid urbanization and change in lifestyle and food habits, the amount of municipal solid waste has been rising rapidly and its composition is changing too. In 1947, cities and town in India generated an estimated 6 million tonnes of solid waste, in 1997 it was about 48 million tonnes. In the span of 50 years after independence, waste generated is 7 times more. Not all solid waste is collected by municipal corporations. Around more than 25% of solid waste

generated is not collected hence is it not the part of above mentioned numbers. Municipal soild waste numbers can never be accurate.

Municipal solid waste is typically collected and dumped by municipal vehicles at landfills. This waste can be segregated into four broad categories:

1) Organic Waste - Kitchen waste, vegetables, flowers, leaves, fruits.
2) Toxic Waste - Old medicines, paints, chemicals, bulbs, sprays, fertilizer & pesticide containers, batteries, shoe polish, expired cosmetics.
3) Recyclable - Paper, glass, metal, plastic, clothes.
4) Soiled - Hospital waste like cloth soiled with blood, sanitary pads, bandaid, baby diapers, dressing cloth and cottons.

Different types of waste generated take their own time to decompose.

Hazardous Waste

Industrial and hospital waste is considered hazardous as they may be toxic to humans, animals and plants. They can be corrosive, highly inflammable or explosive and react when exposed to certain things eg gases. Hospital waste contaminated by chemicals like phenols and formaldehyde which are used as disinfectants are hazardous. Mercury inside thermometer is hazardous. Its direct exposure to sun can be fatal. Industires of metal, chemical, paper, pesticide, dye, refining and rubber are major hazardous waste generators. Household waste like old batteries, shoe polish, paint tins, old medicines and botttles too is hazardous. Toilet and washroom cleaning liquid cans.

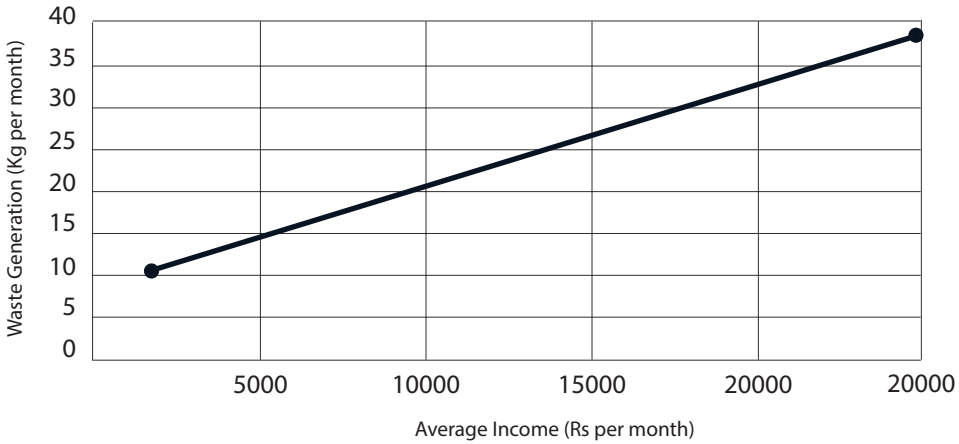
Infectious Waste

Hospital waste is considered infectious as it may spread diseases to humans, animals and plants. This waste is generated during the diagnosis, treatment, or immunization of human beings and animals or in research activities. It may contain sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical waste, etc. These are in form of disposable syringes, swabs, bandages, body fluid, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner.

2.4 WASTE MANAGEMENT IN INDIA

Economic Growth, Population and Change in Lifestyles

India is the 2nd most populous and a developing country where the contrast between rich and poor social classes is evident. Many people still do not have proper housing, food, employment and hygeinic and healthy life. There is a substantial percentage of people who still lack these basic needs. On the other side, it appears rich people of India are living a peaceful and clean life. The waste generation rate generally increases with increase in GDP during the initial stages of economic development of a country , because increase in GDP increases the purchasing power of a country which in turn causes changes in lifestyle. Even a slight increase in income in urban areas of developing countries can cause a few changes in lifestyle, food habits and living standards and at the same time changes in consumption patterns. Therefore, high income countries generate more waste per person compared to low income countries due to the difference in lifestyles. Waste generation is the consequence of both rising standards of living and urban population growth. High income areas generate more per household than low income areas. Hence actions needed to manage them vary.



An urban space in India is a location characterized by high human population density. India's urban population has increased from 27.80 per cent in 2001 to 31.10 per cent in 2011 recording a 3.30 per cent growth. People living in urban areas have increased by over nine crore during this period.

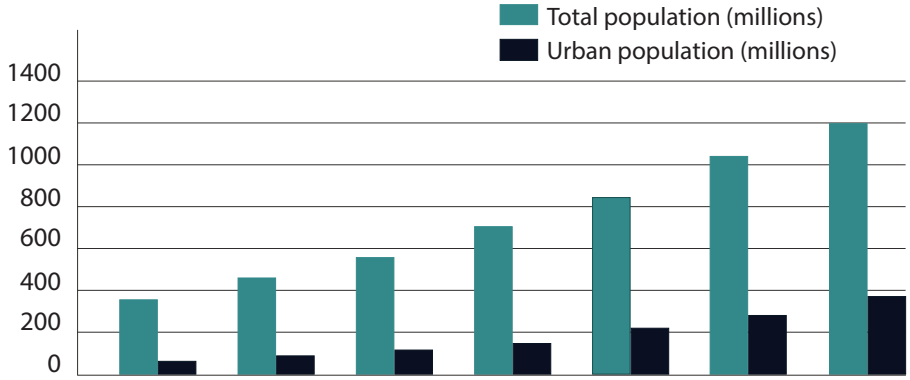


Figure 1, Total Population and Urban Population Growth in India

India has witnessed massive growth in its urban population and it is envisaged that the urban population will double to 750 million by 2050. For decades our policy planners and city administrators have been facing challenges such as large influx from rural areas, land and water pollution, inefficient use of resources, unplanned growth, sub-standard delivery of urban services. The urban population growth in the past decade increased the quantum of wastes generated by urban India by 50%.

Rapid change is happening in India in regard to lifestyle and housing is a major part of it. Urban spaces are considered to be the better places to live as they provide services like education, healthcare, fresh water supply, food, sanitation, electricity, shopping places, banking, and transport. Migration is a result of urbanization.

Image 5, Changing lifestyles - Trend of Shopping in Malls

On the other side, urban spaces have not necessarily aided the quality of life of all Indians. One-fifth of the Indian urban population lives on less than a dollar a day. Income levels in cities may appear to be higher, the cost of living is also constantly increasing, resulting in shrinking savings, inadequate access to health care and lack of quality education. People assume that there are ample resources that will never end, but due to increase in population and their increasing needs and demands, it has become harder to the cities to cope up with the pressure. Cities offer employment regardless of the person's literacy. It is said no one can die out of hunger in a city. Some people move for the better future of their kids, some to earn better livelihood and some to live their dreams. In 1950, 70% of the Indian population lived in rural areas. Since 2007, more than half of the population stayed in urban areas. People are migrating to the cities like Bangalore, Pune, Mumbai, Delhi, Kolkata and they are on their way to overcrowd it.

Solid Waste Management in India

It is observed, 70% of the Indian cities lack sanitary landfills to dispose the waste. The existing landfills are neither well equipped or well managed and are not lined properly to protect against contamination of soil and groundwater.

Domestic Waste - Over the last few years, the consumer market has grown rapidly leading to products being packed in cans, aluminum foils, plastics and other such non biodegradable items that can cause uncalculable harm to the environment. Packaging products attractively to gain more buys is one of the leading cause for rapid solid waste generation in the cities. Fast lifestyle has changed the way things are packed today. Once upon a time, fresh vegetables was preferable, but today shrink wrapped vegetables are more preferable since it can be bought in large quantities and stored in the refrigerator, In India, few cities have banned the use of plastic and they seem to have achieved success. Ladakh is a tourist place where plastic bags is highly discouraged. Ladakh imposed a strict ban on plastics in 1998. Despite of it, tourists are so influenced by the ads that at the top they consume soft drinks likemountain dew and throw away there itself. In many large cities like Bangalore, Pune, Mumbai, Delhi, Kolkata shops have

started packing items in reusable or biodegradable bags. This practice needs to be extended across the country and eventually across the world to considerably lessen the burden of solid waste on the earth.

Image 6, Shrink Wrapped Vegetables Sold in Malls

Industrial Waste - Thousands of small scale and bigger industrial units simply dump their waste which is generally toxic and hazardous in open spaces and nearby water sources. Over the last three decades, many cases of serious and permanent damage to environment by these industries have come to the fore. India generates around 7 million tonnes of hazardous waste every year, most of which is concentrated in four states: Andhra Pradesh, Bihar, Uttar Pradesh and Tamil Nadu. Every day, 764 industries in the mainstream of ganga consume 1123 million litres of water and discharge more than 500 litres of untreated wastewater illegally directly into Ganga river. This industrial waste is making Ganga river dangerous for use as the source of drinking water with dangerous chemicals and heavy metals. Kanpur is now listed as the most polluted city along Ganga.

Rapid industrialization has resulted in the generation of huge quantity of waste, both solid and liquid, in industrial sectors such as sugar, pulp and paper, fruit and food processing, sago/starch, dairies, tanneries, slaughterhouses, poutries ets. Despite requirements for pollution control measures, these wastes are generally dumped on land or discharged into water bodies like Ganga without adequate treatment and thus become a large source of environmental pollution and health hazard.

Image 7, Ganga Polluted with Industrial Waste

Management of industrial solid waste is not the reponsibilty of local bodies. Industries generating solid wastes have to manage such waste themselves and are required to seek authorization from respective State Pollution Control Boards under relevant rules. However, though joint efforts of SPCBs, local bodies and the industries, a mechanism could be evolved for better management.

Ewaste - Over the years our dependence on the electronic products has grown manifold both for domestic and for office uses and this has resulted in generation of electronic waste all over the world and so in India. E-waste is a fast growing waste stream. On an average, E-waste makes up approximately 11 percent of municipal solid waste stream as per the study. Many municipalities are facing problems with huge amounts of E-waste because rapid changes in computer technology attract people to throw the gadgets of old technology.

Image 8, Informal Ewaste Collection

Obsolete computers, colour cathode ray tubes, mobile phones and other electronic appliances form the electonic waste. These electronic waste contain hazardous substances such as lead, mercury, chromium, etc. Toxics abundant in electronic waste are released into the environment through leachates in land fill sites or through incinerator ash. Toxic air pollutants are released into the environment through incenerators. Therefore, management of E-waste has become a priority in India. Presently, there is not any legislation enacted for disposal of E-waste in India.

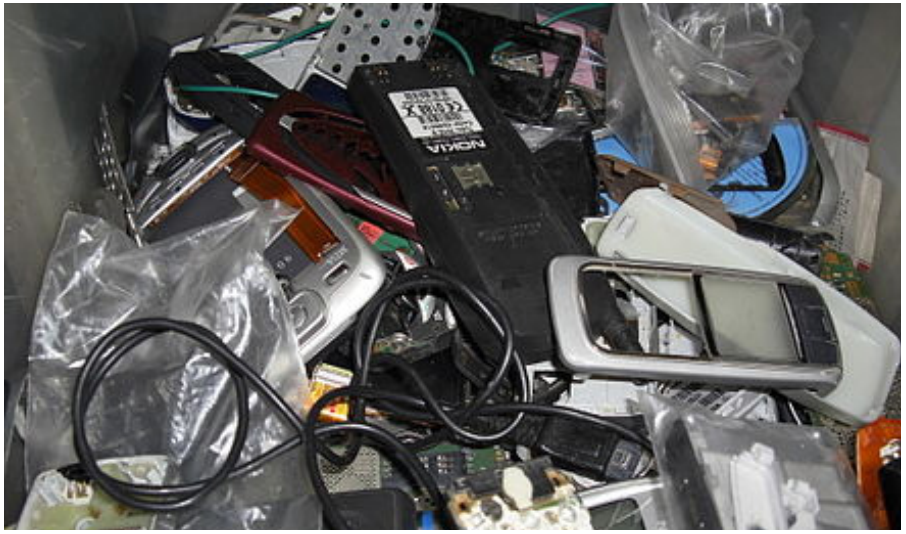


Image 9, Discarded Obselete Mobile Phones

MSW Composition

Materials in MSW can be broadly categorized into three groups, Compostables, Recyclables and Inerts. Compostables or organic fraction comprises of food waste, vegetable market wastes and yard waste. Recyclables are comprised of paper, plastic, metal and glass. The fraction of MSW which can neither be composted nor recycled into secondary raw materials is called Inerts

Inerts comprise stones, ash and silt which enter the collection system due to littering on streets and at public places. Waste composition dictates the waste management strategy to be employed in a particular location. Organics in MSW are putrescible, and are food for pests and insects and hence need to be collected and disposed off on a daily basis. The amount of recyclables like paper and plastic in MSW dictates how often they need to be collected.Recyclables represent an immediate monetary value to the collectors. Organics need controlled biological treatment to be of any value, however due to the general absence of such facilities, organics do not represent any direct value to informal collectors.

MSW Components	Materials
Compostables	Food waste, landscape & tree trimmings
Recyclables	Paper, Cardboard, Plastics, Glass, Metals
Inerts	Stones and silt, bones & other inorganic materials

Table 1, Components and Waste Materials in MSW

Composition of Urban MSW in India

A major fraction of urban MSW in India is organic matter (51%). Recyclables are 17.5 % of the MSW and the rest 31% is inert waste. The average calorific value of urban MSW is 7.3 MJ/kg (1,751 Kcal/kg) and the average moisture content is 47% (Table 6). It has to be understood that this composition is at the dump and not the composition of the waste generated. The actual percentage of recyclables discarded as waste in India is unknown due to informal picking of waste which is generally not accounted. Accounting wastes collected informally will change the composition of MSW considerably and help estimating the total waste generated by communities.

The large fraction of organic matter in the waste makes it suitable for aerobic and anaerobic digestion. Significant recyclables percentage after informal recycling suggests that efficiency of existing systems should be increased. Recycling and composting efficiency are greatly reduced due to the general absence of source separation. Absence of source separation also strikes centralized aerobic or anaerobic digestion processes off the list. Anaerobic digestion is highly sensitive to feed quality and any impurity can upset the entire plant. Aerobic digestion leads to heavy metals leaching into the final compost due to presence of impurities and makes it unfit for use on agricultural soils. In such a situation the role of waste to energy technologies and sanitary landfilling increases significantly. This is due to the flexibility of waste-to-energy technologies in handling mixed wastes. Sanitary landfilling needs to be practiced to avoid negative impacts of open dumping and open burning of wastes on public health, and on air, water and land resources. Therefore, increasing source separation rates is always the long term priority.

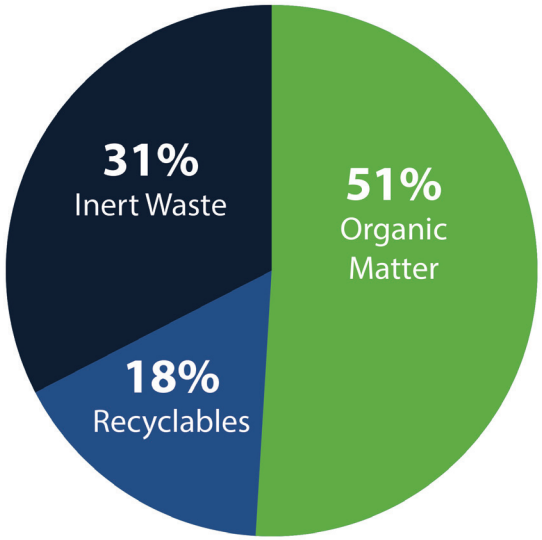


Figure 2, Composition of Urban MSW in India

Recyclables and Informal Recycling

A significant amount of recyclables are separated from MSW prior to and after formal collection by the informal recycling sector. The amount of recyclables separated by the informal sector after formal collection is as much as 21%. The amount of recyclables separated prior to collection is generally not accounted for by the formal sector and could be as much as four times the amount of recyclables separated after formal collection. Comparing the percentage of recyclables in MSW in metro cities with that in smaller cities clearly shows the increased activity of informal sector in metros and other large cities. Increased presence of informal sector in large cities explains the huge difference in recyclables composition between large and small cities. In metro cities, which generally have a robust presence of informal recycling sector, the amount of recyclables at the dump is 16.28%, whereas in smaller cities where the presence of informal sector is smaller, the composition of recyclables is 19.23%. The difference of 3% in the amount of recyclables at the dump indicates the higher number of waste pickers and their activity in larger cities.

Image 10, Informal Recylcing - Segregating wire cables from the electronic waste

SMW Stake holders and their roles

Solid Waste management in India falls under the domain ULBs. However there are many sets of actors other than the ULBs in waste management activities. They are classified into four main groups.
1) The publick sector (national authorities, state authorities, local authorities and local public departments) constituting the central set of players
2) The private sector (large and small registered enterprises carrying out collection, transport, disposal and recycling
3) The small scale, non registered private sector (waste pickers, itinerant buyers, traders in waste materials and non registered small scale enterprises
4) The local community and its representatives (NGOs, RWA and other CBOs)
Internaational organizations, both aid agencies and fianncial institutions can be added to this category as they ar important actors in MSW as financiers of innovative approaches ans also shapers of waste management policies.

Funtions of Urban Local Bodies

1. Urban planning including town planning
2. Regulation of land use and construction of buildings
3. Planning for social and economic development
4. Roads and bridges
5. Water supply for domestic, industrial and commercial purposes
6. Public health, sanitation, sanitation conservancy and solid waste management
7. Fire services
8. Urban forestry, protection of the environment and promotion of ecological aspects
9. Safeguarding the interests of weaker sections of society, including the handicapped and the mentally retarded
10. Slum improvement and upgradation
11. Urban poverty alleviation
12. Provision of urban amenities and facilities such as parks, gardens, playground
13. Promotion of cultural, educational and aesthetic aspects
14. Burials and burial grounds, cremations, electric crematoria
15. Cattle pounds, prevention of cruelty to animals
16. Vital statistics, including registration of births and death
17. Public amenities including street lighting, parking lots, bus stops and public conviniences.
18. Regulation of slaughter houses and tanneries.

When one closely looks at the above activities, one will realise that all these activities are inter-related and are directly responsible for cleanliness. Solid Waste Management is one of the most important duties of local government, usually associated not only with garbage, but also with street cleaning, the maintenance of roadside drains and dealing with sanitation residues. Local government has to carry out its other functions in a way that it does not contribute in generation of more solid waste. And proper system has to be designed to manage whatever is being generated at present.

Government Authorities

To understand the Solid Waste Management in India, its important to understand the roles of all relevant government bodies working for Solid Waste Management.

Ministry of Poverty Alleviation and Housing - It is responsible for providing opportunities for poor through a variety of programmes including income generation and slum improvement.

Ministry of Environment and Forests - Through the Central Pollution Control Board, it monitors environmental conditions, devises standards, and keeps records of the progress in solid waste management practices across the country.

Ministry of Nonconventional Energy Sources - invests itself in solidwaste issues through its national programme on energy recovery from urban and industrial wastes and offers financial incentives for the devlopment of such schemes.

State Pollution Control Board - Oversees and monitors the management and handling of municipal, industrial, hazardous, and bio medical wastes. It also governs the location and setting up of landfill sites in the cities.

Urban Local Bodies - ULBs are key players in solid waste management as laid out in the 74th CA where the ULBs are projected to be solely incharge of all urban services, which will be funded through their own resource mobilization efforts. Waste management is covered under the 6th function of the 12th schedule of the 74th CA as "public health, sanitation conservancy and solid waste management" a mandatory function of ULBs

Non - Government Initiatives

To understand the Solid Waste Management in India, its important to understand when, why, how, where and by whom new initiatives were started and the relative time required in realizing the efforts. These initiatives have been devised in response to the local conditions to which the main actors in the initiave responded.

SEWA (Self Employed Women's Association) 1972, NSDF (National Slum Dwellers Federation) 1974, Unnayan 1976

During the post independence years, urbanization happened rapidly; displacement, migration of refugees and the attraction of cities led to urban overcrowding, overloaded infrastructure and the unintended city of slum and pavement dweliers. Local governments did not have the resources to cope, and cities became worn down, squalid, ill serviced and unhealthy many with half the poulation living in slums. As a result of it, SEWA, NSDF, Unnayan and many more NGOs were founded to help fill in the gaps. Some of these were not primarily interested in Solid Waste management, their advocacy and social work among rag pickers and a direct impact.

SEWA
SELF EMPLOYED WOMEN'S ASSOCIATION

National Slum Dwellers Federation

EXNORA

Focuses on mobilizing and empowering communities to participation preserving nature and preventing environmental degredation thereby improving the quality of life of the common man.

Excellent
Novel
Radical

Exnora international was founded in 1988, is a Nonprofit, non political, secular, non governmental, environmental service organization. The vision has been to promote sustainable human settlements through the promotion of waste management as an income generating opportunity. It helps local authorities through consultation as well as partnerships to manage zero waste centers.

Stri Mukti Sanghatana

It is a womens liberation organization based in Mumbai at Deonar which launched a Parisar Vikas programme for waste pickers in 1998 with cooperation of Municipal Corporation of Greater Mumbai(MCGM). The programme aims to address the problems of waste management and of self employed women engaged in the menial tasks of collecting waste. Its vision for solid waste management and climate change is decentralized and thus saving vehicular emissions and transportation, low cost, energy efficient, labour friendly and generates employment, high resources recovery, environmentally sound, sustainable.

Stree Mukti Sanghatana
(Womens Liberation Organization)

And for this Stri Mukti Sanghtana have designed some strategies - organizing and training women rag pickers and issuing identity cards to them, helping them form waste cooperatives, helping them establish self help or micro credit groups, helping them get the right price for the dry waste collected, imparting training to women ragpickers in alternative skills such as gardening, vermiculture, biomethanation, etc, promoting health awareness and education programmes, providing family coundelling to distressed women, conducting awareness programs in schools and colleges to promote recycling, motivating and helping citizens institutions and corporates to adopt zero waste concept.

Habitat for Humanity

Habitat for Humanity International was founded in 1976 by Millard and Linda Fuller who developed the concept of 'partnership housing' that centered on those in need of adequate shelter working side by side with volunteers to build simple, decent houses. Homes were built and sold to families in need at no profit and no interest - and the basic model of Habitat for Humanity was established.

Habitat for Humanity®

SWaCH

SWaCH (Solid Waste Collection and Handing) is india's first wholly owned cooperative of self employed waste pickers or collectors and other urban poor. It is an autonomous enterprise that provides front end waste management services to the citizens of Pune. SWaCH undertakes primary collection (door to door) and transfer the waste to secondary collection system. Waste pickers would retain the right to the income earned from the recovery andsale of recyclables. This scheme was launched and was functioning to the satisfaction of citizens, wastepickers and PCMC.

SWACH
A higher level of self-reliance

Me2Green

This is a self funded NGO based in Chembur founded by Mrs. Charvi. It connects students to organizations and NGOs to provide them with internship on the subject of environment. Environment includes animals, trees, clean ups, garbage, water conservation, sanitation, etc. One is sent to work on the area of his interest.

Green Yatra

Green Yatra is a Non-Profit-Non-Governmental organization (NGO). A devoted Yatra (journey) toward protection, conservation and improvement of our Mother Nature and Humanity. Our sole objective is to pass on a habitable GREEN pollution free Earth and a better World to the future generations. Green Yatra works towards nullifying the imbalance caused by us, our society and our people. Our goal is to bring the focus on value and importance of our planet and environment to all human beings, and urge ALL to adopt a Reduce, Reuse, Recycle and Realize lifestyle in order to support and respect the efforts to preserve the planet, our one and only source of life.

Government Initiatives

JnNURM (Jawaharlal Nehru Urban Renewal Mission) 2005

The scheme was announced by prime minister Manmohan Singh on 3rd Dec, 2005. It is an unique reform driven infrastructure improvement project that aims to create economically productive, efficient, equitable and responsive cities. Aim is to redevelop Indian cities, since India has always primarily focused on rural areas. To bring urban transformation, active participation is sought from State government and urban local bodies in the mission cities to undertake infrastructure projects for improving urban utilities and a series of reforms to ensure sustainability of the infrastructure investments made under the mission. In the last 6 years of implementation of JnNurm Indian cities have witnessed widespread infrastucture development linked to municipal services. Solid waste management sector is one amongst them having developed 44 projects with an approved cost of Rs.1,9778.60 crores.

Nirmal bharat Abhiyaan 1999

Nirmal Bharat Abhiyaan (NBA) previously called Total Sanitation Campaign (TSC) is a program following the principles of community led total sanitation and was intitiated by Government of India in 1999.

It is a demand driven and people centered sanitation program. The objective is to accelerate the sanitation coverage in the rural areas so as to comprehensively cover the rural community through renewed strategies and saturation approach. Priority is to provide individual household latrines, solid and liquid waste management, cost effective and sustainable sanitation.

Swachha Bharat Abhiyan 2014

Effective 1 April 012, the TSC was renamed to Nirmal Bharat Abhiyaan.

On 2nd October 2014, the campiagn was relaunched as Swachha Bharat Abhiyaan.
Its a national campaign by the Government of India covering 4041 towns to clean the streets, roads and infrastructure of the country. The target is complete sanitation in the next five years which includes getting rid of open defecation and smart management of both solid and liquid waste across the country. The campaign was officially launched on October 2, 2014, where Prime Minister Narendra Modi himself cleaned the road. It is considered as one of the biggest cleanliness drive. Every citizen should take ownership of whichever area is convineint for him to clean and invite his 9 members for the same. This will lead almost every citizen of the country to contribute towards cleanliness. To propogate the campaign Narendra Modi nominated 9 people - Sachin Tendulkar, Baba Ramdev, Kamal Hasan, Kapil Sharma, Priyanka Chopra, Anil Ambani, Rajdeep Bais, Salman Khan, Shashi Throor and complete team of Tarak Mehta ka Ulta Chashnma. On 8th Novemeber, Modiji nominated one more set of nine people and next on 25th December 2014.

स्वच्छ भारत
एक कदम स्वच्छता की ओर

Why is India not clean?

Every city in India has local bodies to take care of waste generated. But the density of population is too much and capacity of local bodies to deal with large amount of waste generated daily by this dense population is less. In such scenario, a responsible attitude of citizens is expected. Infact, attitude of the people is the cause of India's dirtiness and not poverty. The lack of funds which is typically thought as an obstacle do not explain the dirtiness of India's public spaces. It is observed people do not take ownership for the waste they create and depend on government bodies to take care of it. Many Indian houses are meticulously cleaned and spotless. Yet right outside rows of these clean houses, there are filthy streets with mountains of garbage. This shows that the public sphere is a concept in Indian society that has traditionally been absent.

People in India have traditionally stuck to their family, community and caste group. These groups and communities were the mediums through which most people conducted their social interaction. Thus, the concept of a shared public space, used by everyone and kept clean to everyone was not one to take hold in a segmented society. This is changing however, as old social barriers break down and more and more people mix and congregate in urban areas. Many times god pictures are used to stop people from creating dirt.

Indians' concept of cleaning and doing physical work in order to make spaces clean is associated with lower classes and castes. There is little incentive for anyone to work hard at keeping public spaces clean. Better-off people do not feel it is dignified to clean while worse-off people resent to do the tasks of cleaning, which in India are often extremely dehumanizing due to the extreme accumulation of garbage and feces. They thus have absolutely no incentive to do a thorough job.

This has created a destructive cycle in Indian society that India is only now recovering from. Often the materials, including water, that are necessary for cleaning are denied to the cleaners themselves because they are perceived as unclean. Fear of contamination and pollution thus reinforces that uncleanliness of cleaning communities and society in general. Handling trash, including human waste, literally makes certain people in India untouchable because these people clean the garbage of others but cannot really clean themselves. This is a recipe for the accumulation of dirt throughout India. Cleanliness was always a problem in India. Well-bred individuals have always refused to clean. This attitude was evident, for example at the 1901 Congress Party convention, "where Mahatma Gandhi told delegates it was a disgrace that manual scavengers were being used to clean the latrines. He asked delegates to clean their own latrines and when they did not, he publicly cleaned his own."

Indian peoples' traditional attitude is the core problem for India not being clean. Indians blame government and BMCs for cleanliness. What is governmnent going to do if a person has a bad habit of spitting on the road. What is BMC going to do, if a lady throws garbage out of her house window?. BMC is not going to entertain peoples' stupid behaviour. People ought to understand that there is honor in manual labor as well. There needs to be a broad social acknowledgement that the artisan — one who works with his or her hands — is equally dignified in labor as one who works with the mind. This in turn will help make India a cleaner place as well.

Japanese people prefer working with own hands. In Japan, irrespective of their status and salary, they do their own work. What is needed in India is a Japanese-style attitude towards cleanliness where everyone, no matter their social status, learns that it is his or her duty to clean shared spaces, starting in elementary school. In many Indian schools, cleaning, especially cleaning of toilets, is a task relegated to a certain worker or student, usually of a lower caste. If this person fails to perform this task adequately, nobody else does the necessary cleaning, and filth accumulates. Hence, India is unclean because of its own deeds.

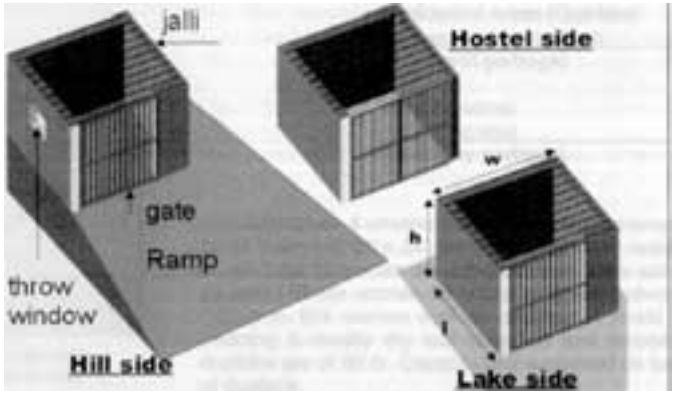
Thus it is crucial for important social figures to set an example by openly and publicly cleaning and showing that anyone can perform this labor without losing dignity. Thus, it is a great thing that Modi is sending this message to the people of India. It has both a practical component (actually cleaning) as well as a psychological component, both of which are necessary for India to become clean.

2.4 PROJECTS ON SWACHHTA IN IDC

Solid Waste Management System for IIT Campus

Student: Bipin Lokhande
Faculty Advisor: Prof. Praveen Nahar

A solid waste management system suitable for IIT campus residents based upon a specially carried out survey was designed. The basis if it was the extracted best part of existing running system. Considering the mentality, habits, interests and pro-activeness of the residents; the system was designed for success.



Solid Waste Management in Mumbai

Student: Avinash Jayakumar
Faculty Advisor: Prof. Purba Joshi

Solid Waste management is a global issue requiring urgent attention.
It is a particularly severe problem in Indian cities like Mumbai as the overwhelming population and continuous growth combined with poor management strategies leads to visible garbage pile–up everywhere, causing reduction in quality of life of citizens.
Existing 'pick–up and dump strategies' are ineffective due to the lack of space, and negative environmental side effects of landfills. There is an urgent need to reduce the quantity of waste being sent to landfills.
The study undertaken by this project has shown that littering is also common because existing dustbin solutions are not user–friendly, have no visibility and are poorly deployed.
This project studies the context of the current problem and offers implementable solutions to allow more effective solid waste management through increased segregation to reduce landfill waste, proper disposal of solid waste by citizens through higher bin visibility and improving civic sense through education.

Hygienic Rural Toilet - Dry Sanitation System

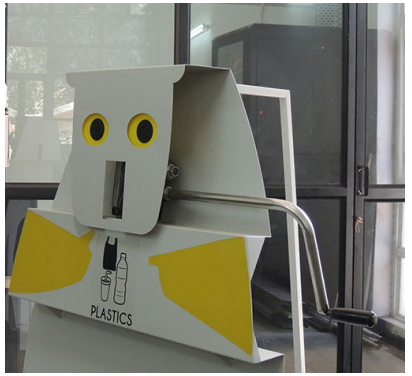
Project by: Prof. K Munshi
Sponsored by: Ministry of Drinking Water & Sanitation Government of India

Need of the Project: Where there are no latrines people resort to defecation in the open. 665 million Indians practice open defecation, more than half the global total. 1,000 children younger than 5 years die every day in India from diarrhea, hepatitis- causing pathogens and other sanitation-related diseases. The crisis is especially acute for girls. Many drop-out of school once they reach puberty because of inadequate lavatories, depriving the country of a generation of possible leaders. The toll on human health, due to unhygienic sanitation conditions is grim.
To design hygienic dry sanitation system which avoids direct discharge of excreta into the nearby water bodies or open lands. To come up with a sanitation solution catering specifically to the needs of rural India with water shortages which is cost effective, managable, modular and sustainable.

Plastic Garbage Bin cum Shredder

Project by: Paulanthony George
Faculty Advisor: Prof. Purba Joshi

This project traces an attempt to remove the aversion from an enforced activity like solid waste disposal, keeping in mind the various stakeholders involved. It also takes into account segregation and attempts to formulate a system that helps volume reduction, by converting the activity into a playful one and packaging it into a facia that arouses curiosity and removes the age old perception and aversion towards dustbins or spaces for disposal. The backbone of Mumbai's waste system are its waste handlers both MCGM's handlers and the oft unrecognised rag-pickers, a part of the project deals with the employment of this community that earns its bread from the sorting and recycling of our waste.



A Photo Study of Garbage and Littering Behaviour in Mumbai

Project by: Sylvan Lobo
Faculty Advisor: Prof. Purba Joshi

Mumbai is renowned for its vibe, character, liveliness and the solidarity among its people. Yet it seems a shame to look around and notice all the filth and litter that is inescapable from view. Of late, along with the Swachh Bharat campaign, a lot of campaigns and citizen movements such as the Ugly Indian, Hindustan Times Clean My Mumbai and the Kachra Project have risen up towards cleaning up; towards a cleaner city and India. It has been high time for a long time now. Considering photography as a means to communicate, document and collect data, it was observed public spaces like stations and around monuments and observed how people littered, the kind of litter itself, the infrastructure, etc. An attempt was made to categorise, study and analyse the photographs with some questions in mind related to understanding littering behaviour. Also studied some literature on what influences littering behaviour, including architectural notions, community aspects and existing approaches to manage litter.

Compost Pit for IIT Bombay Campus

Project by: Prof. B. K. Chakravarthy

Vermiculture pit at IITB campus are one of the measures introduced to conserve resources under Green Campus Initiative which aims at making the institute environmentally self sustainable. This pit uses deep burrowing indigenous worms which are easier to maintain and do not emit foul smell. With this technology vermiculture can be carried out in any sized vermibed, even in an earthen pot.

3 KAUN KAREGA SWACCH BHARAT

3.1 CHOOSING THE PROJECT DIRECTION

With the progress in secondary research study about the subject, the need to study present waste management methods followed at different areas to understand the similarities and differences between them was felt. It is important to know why the following areas are dirty and how people can contribute in cleaning those. Following areas were rationally thought to be taken as case study for the project : Kanjurmarg Station, IIT Bombay Campus and Vavoshi Village.

Kanjurmarg Station

Kanjurmarg is a railway station on the central line of the Mumbai Suburban Railway network. It is a main access point for IIT Bombay, KV Powai, NITIE, Hiranandani gardens and other locations in Powai. The station was built in 1968 and named after the local village Kanjur.

It was thought to take this location for case study, because of the evident presence of the dirt all over the station. Also, daily a large no. of commuters use the location. When they go through the station, cleanliness campaign at the station will have a consciousness multiplier effect on regular commuters as well as new commuters. It is guessed and expected the commuters will do relative comparisoning between all the local stations which will lead them to spread the message of cleanliness consciously or unconsciously.

Aim was : To make 'Kanjurmarg Station and its 1 km radius of environment' organized and clean through change in consciousness of people in that area.
For which, further plans were made of inaugrating the event on 26th January, 2015 with the hands of ace Indian Sportsman Sachin Tendulkar. Calling TV media to cover the inauguration event.

Later, when more thought was given to the idea, I realized this will become a mere publicity act which will attract more crowd but will hardly do any change in the thought process of people in regards to cleanliness. I clearly do not aim for any unnecessary show off. The larger aim of the project to bring the change in consciousness of people which is a gradually slow and a difficult thing to attain. Hence, the thought of taking Kanjur Marg station for the project case study was dropped.

IITB Campus

It is a consciously developed campus which has retained and increased the green cover with rich flora and fauna. It is well connected to the city by trains and buses and all the facilities required are available on the campus. All students and most faculty live on campus in student hostels and IIT staff quarters with the peaceful atmosphere of the campus mostly untouched by the pollution of rest of the city.

Me being a student and resident of the IITB campus thought to take up the challenege to clean and enhance the campus space, to begin with, rather than attempting a practically almost an impossible idea of cleaning up the Kanjurmarg Station by bringing the change in consciousness of people in a span of 4 months of the project. Being in the campus all the time, I observe it and one question is constantly raised into my head, 'Can there be more such beautiful and dirt free spaces all over the country?'

It was thought a good idea to take IITB campus for the project as case study and analyze how and why its so beautiful, how its waste is managed, what more efforts it reuires become self sustainable. Major study is to understand the waste management and the methods used to keep the campus clean. Understanding people, their psychology, their income and occupation and lifestyle, consumption habits, waste handling and ways of disposal by every house also forms an important part of the study. This will help me communicate the complete picture of cleanliness management in campus to every resident to bring the required change in their behaviour to make campus 'zero waste'. The larger goal of the project is to make the campus 'Zero Waste'. It can become a model for other communities to adapt. This project can be a small beginning for a bigger change.

Vavoshi Village

India is more of rural spaces than urban spaces. India still cannot be called Urban because more than half the country's population is in rural spaces. Hence, it is important to look at the waste management in rural area. In India, typically, there are no agencies or bodies which will take care of waste handling in rural areas. Rural people themselves take care of the waste and cleanliness of their space. This understanding led me to consider village also as an area for the case study. I visited Sakhadbav village in Shahapur district and Vavoshi in Raigad district, both around 100 kilometres away from Mumbai.

Sakhadbav is a village with high water scarcity which has adversely affected their water related activites like agriculture. This has resulted into efficient use of resources like water. Also, this affects their income level and consumption of things.

Vavoshi is a village which aspires to be like a city. People there no more wish to continue agriculture and hope to have concrete houses. This trending in the village makes me curious to understand their thought process and their aspirations. The change in their lifestyles and consumption patterns and its impact on waste generation, and how cleanliness is looked upon in this whole process of changes happening in the people of Vavoshi can form an effective study for the project. This is how urban spaces come into exitence. The study will allow me to understand what exactly affects cleanliness.

Conclusion

It was important to study two different environments and understand aspects like peoples psychology, their activities and income, consumption patterns which affects waste generation. Are Urban and Rural spaces same in these aspects or different? and Why? To change consiousness of people, its necessary to understand their thinking, otherwise its next to impossible to change someone the way he behaves or thinks.

3.1 CASE STUDY 01: A LOOK AT IITB CAMPUS

About IITB

Indian Institure of Technology at Powai, Mumbai was established in 1958. It is a 500 acres of green wooded land with Powai and Vihar Lakes on either side. IIT Bombay is a small township in itself. Rich in natural flora and fauna to begin with, the campus' green cover has been maintained and even increased over the years. Education and research are the twin pillars of this institute and the ambience is one in which new ideas and creativity can flourish.
The campus is connected to the city proper — an hour's distance — by buses and local trains. However, most facilities are available on campus itself, including banks, a shopping centre, two excellent schools for children, and a well-equipped hospital. All students and most faculty live on campus, in student hostels and IIT staff quarters.

Population of the campus - Around 6000 people

584 Major Buildings - 100 are residential buildings where Professors, Lab assistants, Workers, Project Staff, Research Assistants

16 hostels - There are a total of 16 hostels, of which two hostels (Hostels 10 and 11) and a part of the newly constructed hostel (Hostel 15) are for female students.

15 departments - IIT Bombay has 17 departments, 13 multi-disciplinary centres, and 3 schools of excellence

1 hospital - It has seven departments. All IITB residents get free checkup and medicines here.

Sports Area - The institute has two swimming pools; football, hockey and cricket grounds; and tennis, basketball, squash and volleyball courts. It also has a Students' Activity Center (SAC) for various cultural and other extracurricular activities.

Schools - The campus also houses two high schools, one of which is a Kendriya Vidyalaya and the other is called IIT Campus School.

Understanding Waste Management in IITB

Public Health Office - Its a small office building set up next to girls hostel 11 opposite to the main ground which takes care of the following things in the campus. PHO keeps the whole campus clean.

1) Housekeeping:
- Housekeeping work at departments, sections, hostels, main building, central library & schools on Sqm area basis as per scope of work.
- Housekeeping work during various institute, departments & students

2) Pest Control:
- General pest control
- Anti termite treatment.
- Sewage Manhole (chamber) treatment for cockroache control.
- Treatment against bad smell.

3) Mosquito Control:
- Anti Larval treatment.
- Fogging treatment for Adult mosquito control as per schedule.
- Spraying of insecticide for insects and mosquito as per schedule.
- Checking & treatment of mosquito breeding places.
- Checking of overhead tanks.
- Fogging & Spraying at school, labour camps and construction sites.

4) Rodent Control:
- Rodent control treatment in all over the campus.

5) Solid Waste Management:
- House to House garbage collection.
- Segregation of solid waste into recyclable & non recyclable waste.
- Collection, transportation & disposal of garbage from all Hostels, academic & residential area.
- Treating food waste by Bio composting process.
- Bio composting for the dry leves by forming pits
- Biogas plant for treatment of food waste generating in Hostels.
- Collection of garbage from all labour camps.

6) Stray animals:
- Sterilization & vaccination of dogs.
- Disposal of dead animals & birds.

7) Licening with BMC:
- Solid waste disposal.
- Dog nuisance.
- Caracas removal from the campus.
- Anti malaria treatment inside the campus.

8) Water Conservation SBT plant:
- Running the soil biotechnology plant for treating waste water & recuse for flushing purpose.

9) Pre-monsoon Activity:
- Storm water drains cleaning.
- Collection & disposal of unwanted material from campus.
- Storm water drain treatment.
- Department & Hostel Buildings. Terrace cleaning work.
- Department Buildings. Surrounding cleaning work.

10) Services During Institute Functions
- Convocation function, Mood Indigo, Tech – Fest, Seminars/ Lecture, PAF, Examinations, Community Hall, Gulmohar Building & Lawn.

11) Road and storm water drains cleaning:
- All Main Roads, All residential, Academic & Hostel area Roads and Storm water drains cleaning.

12) New Additional Activities:
- Installation of various size dustbins through out the campus.
- Development of 2 TPD Biomethanization plant for treatment of waste food.
- Department & New Residential Building duct cleaning.
- Department & New Residential Building lift treatment.
- Development of stationary compactor for storage & transportation of garbage.

Agencies appointed by PHO

Total 450 people from different agencies are hired to keep the campus clean. Agencies are paid on the basis of cleaning done sqr per meter area. Every department, residential building and hostel has a supervisor from their entity who keeps track of the work done by these PHO workers daily by feeding the data online.

Image 11, Waste management tour at IITB by Tata Centre

Committees for waste management at IITB

Green Campus Committee - It is a committee with 18 members, set up in 2010 February. It focuses on making the campus more green. Activities like tree plantation, cleaning of lakes or streets collectively are carried out.

Swachha Bharat Abhiyaan Committee - Narendra Modi, our prime minister publicly recognized the problem on 15th August at the Red Fort and declared the national campaign 'Swachha Bharat Abhiyaan. Every government institution has a committe of Swachh Bharat Abhiyaan. In IITB it was set up in September 26, 2014 with 7 members from the campus. Professor Jyoti Prakash is the Convenerof this committe. It focuses on the cleanliness of IIT post office, walkways outside the campus, compounds of the campus.

Tata Centre - Tata centre in the campus of IITB is working on technoloy to enhance waste management. The motive is to make IITB a model for waste management and when successful apply it in same other scenarios. Hence, to get the real picture of present waste management members of Tata Centre are staying on campus. They want to create aiding for waste management in whatever way possible if not really technology.

Image 12, High rise - Ananta

Solid Waste Management at IITB

Waste from the campus (hostels, few residential buildings, streets and departments) is segregated as wet and dry at the collection point by PHO vehicles.

Wet waste

1) Out of 100% campus buildings, 30% are residential buildings, amongst which 10% do not do segregation.

2) Out of 100 residential buildings, presently wet and dry waste segregation is happening only in four buildings - Ananta, two C type buildings (Nilgiri and Sahyadri) and Vidya Niwas. High rise buildings like Ananta have secretaries, hence segregation method could be easily implemented. Daily 80 - 100 kgs of wet waste is collected. Rest 96 residential buildings are throwing mixed waste.

3) Vermicompost plant located at hill side just opposite to Aravali residential building makes compost out of dry leaves collected across the campus and also from 80 - 100 kgs of wet waste from the four residential buildings.

Image 13, Vermicompost pit next to Ananta

4) All hostels mess wet waste is used to create biogas which is used for cooking in Hostel 3 and 4. This bio-methanation plant supporting 2 metric ton of wet waste is located just behind hostel 4.

Image 14, Biogas plant behind hostel 4

Image 15, 660 litres trash bin for department

Image 16, Dry waste collected from the campus by PHO vehicle

Dry waste

1) Dry waste in 660 litres of bins from departments, residences, and other buildings is collected by PHO vehicle and stored until BMC vehicle collects it.

2) Stationary Compactor is used for lessening the volume of dry waste which is located at hill side. Dry waste from the whole campus is first compressed and then collected by BMC vehicle to the landfill.

3) Recyclable dry waste is sent to Stri Mukti Sanghatana for further segregation and recycling from which women of the organization earn money. In return IIT does not take any money, it does it as social work.

4) Huge electronic, furniture and metal junk from the departments and labs is given to the agencies who win the tender.

5) Hazardous waste from chemical laboratories and hospitals is collected by a particular agency hired by PHO and treated before disposal. IIT pays this agency on the basis of quantity to dispose the waste properly. This hazardous waste is taken for treatment to a plant at Taloja, MIDC.

Image 17, Sanitary compactorat hill side

Image 18, Waste dumped into the compactor

Image 19, Every 2 days filled compactor is replaced with the empty one

Working of Sanitary Compactors

1) Around 1.8 MT to 1.9 MT*dry waste which is daily collected by PHO vehicles across the campus from departments, residences, streets and other buildings is dumped into the sanitary compactors.

2) Stationary Compactor is used for lessening the volume of dry waste, then it is collected by BMC vehicle to the landfill.

3) Compactor can accomodate 7.5 MT of dry waste. Within two days compactor gets full with around 4 MT dry waste.

4) The waste dumped into the compactor is not completely dry, it does have some amount of organic waste in it. Hence, it stinks. There is a rule of IIT to dispose the waste from the campus within 24 hours, which does not allow the same compactor to be kept until it is completely full with 7.5 MT. Hence, on the second day the filled compactor is replaced with empty compactor. And the process repeats every two days.

5) This has certainly reduced the transpotation cost.

6) This compactor is worth Rs. 40 lacs and belongs to IITB.

*(*Amount of waste generated changes almost every 6 months)*

WASTE SEGREGATION IN NUMBERS

Total Waste from the campus per day

(1 Metric Ton = 1000 Kg)

Recyclable Waste

Out of 02 Metric Ton i.e 2000 Kg of dry waste only 600 kg of waste is recyclable

Image 20, Dried leaves collected at one place to be carried to the composter

Image 21, Agency takes away rusted iron, obselete electronics, wooden furniture

CONCLUSION

It becomes difficult for workers to deal with mixed waste. Smell becomes unbearble and it leads to their neglegance towards the work. It causes ill health. Becomes difficult to retain workers.

Mixed waste is difficult to segregate , hence normally it goes mixed to landfills and we are being irresponsible here.

Mixed waste possibly can be seperated but needs expensive methods. Hence, is not preferred and cant be resused or recycled. Its compacted to be sent to landfills.

Not all houses or quarters in IITB have balconies and terraces and lawns or free spaces to keep two or three different dustbins for glass, solid waste, wet waste. hence it becomes difficult to convince them to do segregation at source.

its a government rule to clear of the waste from the campus within 24 hrs, hence they cant store it after that. Hence, collection has to happen on time. No holiday for people in this sector since their is no holiday for consumption and waste generation. its a daily and constant activity. If not carried out propely can be hazardous.

CHALLENGES

The fundamental key to effective waste management is seperation of wastes at source. If wet,organic,biodegradable waste is kept seperate, it can be used for composting to produce clean, uncontaminated and valuable fertilizers. If not seperated, wet waste is mixed with full of broken glasse, bits of metal, plastics which is dangerous to handle or requires expensive seiving,. But the dry waste is contaminated with rotting vegetable matter and is dangerous and difficult to sort. Paper becomes worthless. Seperation at source by householders, business and industry and institutions seems like a starightforward task to aacomplish, but it is full of difficulties. Many people do not understand why it should be done, they find it distateful, do not have place to store different containers for seperate waste, some think they are already paying for the service, or are simply disinterested. Public education is reuired to make them understand the importance of seperation at source.

SEGREGATION - AN IMMEDIATE REQUIREMENT

Why segregate?
Segregation at source has three advantages: It makes both the dry and wet waste more readily reusable, it thus reduces the amount reaching the landfills site and hence reduces transportation and dumping costs. However it is not widely practiced.

Types of segregation

Normally household and commercial waste can be segregated into two broad categories dry waste, much of which can be recycled and wet waste for composting.

IITB too classifies its waste into wet and dry waste, where dry waste is further classified into recyclable and inert. Dry waste from households mainly contains plastic, metal, glass, paper, cloth and expired chemicals or medicines. Segregating dry waste in these five different categories is very important to make it properly recycled and reused. This waste can be further classified into waste that is thrown out and waste which is sold. Clean waste of plastic, metal, glass, paper and cloth, is collectd by kabadiwala and sent for further process of recycling. BMC's reponsibility is to collect garbage and dispose, it was never to reduce garbage. Hence, segregation is not their job.

How much change will it bring?
Presently, out of 100 residential buildings only 4 are segregating waste into wet and dry. Total wet waste generated from IIT residential buldings is 1500 Kgs. Segregation of wet waste in the four residential buildings in IITB - Ananta, Sahyadri, Nilgri and Vidya Niwas started in January 2015. Around 80 to 100 kgs of wet waste is daily collected which is used for composting. No wet and dry waste segregation happens in any other residential buildings.

Mixed waste is collected by PHO vehicles and sent to the compactor for compressing, after which it goes to the landfill. Around 1400 kgs wet waste goes to the landfill daily from these buildings.

Daily 2000 tons of dry waste in generated in the campus from which only 200 Kgs is recyclable and recycled. This means, 1800 tons dry waste daily goes to landfill. This also means, in a week total 12600 tons, in a month 50400 tons, in 6 months 302400 tons of waste is sent to landfills. We have built good number of waste mountains till date. We are not sustainable. We are contributing in the deterioration of the earth.

By not segregating, we are losing valuable raw material used for composting. We take food in a consumable format from nature for us to eat and live. But we are not returning it to nature in their consumable format. By mixing waste, its neither useful to us nor to the nature.

If remaining 96 buildings too start segregating, there will be a substantial change in the waste that goes from IITB to the landfill. We should stop 1400 Kgs of wet waste spoiling 2000 tons of dry waste. This is possible only by source segregation. A realistic goal of going 'Zero Waste' is possible in near future if these 96 buidings do not mix their wet waste with dry waste.

Who will do segregation?
BMC's reponsibility is to collect garbage and dispose, it was never to reduce garbage. Hence, segregation is not their job. PHO's responsibility is to collect segregated waste from homes and think of proper disposal of inert and reuse/recycle other waste. Since, segregating is an unpleasent and undesirable acitvity for people who create waste, its wrong to expect other humans to collect and segregate that even if they are paid for it. It should be each person's responsibilty to take care of his own waste. Waste which cant be recycled or reused will be taken by BMC vehicles to the landfill.

POSSIBILITIES TO MANAGE SOLID WASTE AT IITB

The quantity of dry waste going to landfills can certainly be reduced by following ways.

Dry Waste

Every residence should keep seperate cloth bags or bins for plastic, metal, glass, paper, cloth and expired chemicals or medicines. This can also happen at community level. Space is a problem for many at present, but the practice has to begin which will then automatically get blended in their daily routine that it will no more seem to be a problem.

This segregated dry waste from the households in campus can be given to kabadiwalas. Residents can collect it every week and drop it to kabadiwalas shop, since kabadiwalas are not allowed inside the campus unless permission given to them. If not a week, people can decide for themselves the no. of days to collect dry waste. If the dry waste segregation is followed by all the buildings in IITB in the above given format, PHO can arrange to collect the segregated dry waste and make sure it is delivered to respective kabadiwalas. Expired medicines or chemicals should be given back to the chemists.

The figures will get exchanged for present mixed dry waste (1800 tons) and recyclable waste (200 kgs) to mixed dry waste (200 Kgs) and recyclable waste (1800 tons) in near future, if IITB community starts segregating today the dry waste and start giving it to kabadiwalas. **The quantity of dry waste going to landfills can certainly be reduced.**

Why Kabadiwalas / Waste Collectors?

Waste collectors are itinerant informal collectors and buyers, who largely service households, insitutions, commercial establishments and the like. They pick up all the recyclable waste that they can re sell. Some buy materials from householders and enterprises for small sums. They usually have regular routes and regular purchasers for their collected materials.

Some specialize in one commodity, like paper and cardboard, or plastics, This reduces the amount of waste that has to picked up by the local governement by considerable amounts, although no one has yet quantified this. Materials that are sold and resold find a home if they have any use, and if not find their way into recycling industries of paper, plastics, glass and metal with useless residues ending up in dumps.

Wet Waste

Every residence needs to keep a track of how much wet waste goes out from their house. And this is possible only when each residence manages its own wet waste. By not mixing wet waste in dry waste, one is surely stopping it from spoiling dry waste and going it to landfill. But then how each residence can manage wet waste in an effective way?

Composting is the most cost effective way of disposing of biodegradable wastes. However, the success of composting rests heavily on the kind of waste available. Generally, waste produced in India has a high organic content suitable for vermi composting. The process can be taken at neighbourhood level, community leve or at an industrial scale.

People who have big lawns can easily make compost pits where daily wet waste can be disposed. People who do not have lawns or balconies or terraces can opt for urban composting products (like one from daily dump) which can be kept in corridoors. If not, people can opt for community level composting, where for each building one composter will be kept, in which residences can daily put in their wet waste.

Why composting?

This is the only way to give nature back, what we take from it. Composting will turn wet waste into soil which can be used for agriculture or planting.

3.2 CASE STUDY 02: A LOOK AT VAVOSHI VILLAGE

VAVOSHI VILLAGE DETAILS

The Village Vavoshi, is located in the taluka of Khalapur, district of Raigad, in the State of Maharashtra.

Location Details
It belongs to Konkan region. 55 KM from Mumbai Tambati (5 KM) , the Nearby Villages to Vavoshi are Washiwali (5 KM) , Gagode Bk (6 KM) , Vadval (7 KM) , Thanenhave (9 KM). Vavoshi is surrounded by Pen Taluka towards west , Karjat Taluka towards North , Sudhagad Taluka towards South , Panvel Taluka towards North. Pen , Lonavla , Panvel , Uran are the nearby cities to Vavoshi.

Population
337 houses, 1436 people

Local language
Marathi is their mother tongue, They also communicate in Hindi.

Nearby Railway Stations
Dolavali (12 KM), Lowjee (12 KM), Kelavli (13 KM), Khopoli (13 KM)

Occupation
Young people from the age group of 18 to 30 are working in factories near the village for 12 - 16 hours a day. Most of them have sold their agricultural lands to buy materialistic assets like cement houses, cars and two wheelers. People are no more doing farming there. Families income in this village is equal to average or below average. This affects village panchayat's budget which is only 60,000 rupees which is not enough to maintain the village throughout the year.

Condition of the Village
Out of 337 houses only 150 houses have toilets. Rest defecate in open. Water clogging is the biggest issue since it has a rocky land.

WASTE MANAGEMENT IN VAVOSHI

Every house in the village has a pit in their front or back yard where bathing water and kitchen water is collected which is then used for watering plants if any.

Since families here earn just enough, they dont buy much things. There consumption of packaged things is very limited. Hence, their garbage is also less. This is the average quantity of garbage every house throws out.

There are around 10 small shops in the village of around 1500 population. Plastic bags and wrappers of items they sell are found lying in the canal. People either burn or throw away the dry waste in

Generally, prior to any festival or function in the village, villagers burn off the garbage. No vehicle like BMC vehicle collects garbage from the village. Hence, villagers have found out this way of dealing with their

ANALYSIS OF CASE STUDIES

- Since the consumption in Vavoshi is less compared to urban areas like IITB campus, their generation of waste effectively is less.
- Vavoshi village has no management by gram panchayat who manages solid waste in the village. At community level, villagers themselves burn off the dry waste which contains plastic wrappers, thermacol plates, paper waste, oil bottles. Burning works for them but it will not work for IITB since waste generated is in tons.
- Unlike IITB there is less wet waste coming out from each residence in the village which they generally throw in the naturally formed pits around the house or common dumping place in the village. So further it goes back to nature. But there is no proper way followed by the village, and that makes it look a little unorganized and unclean.

Image 22, Demo of composting at IDC

4 EXPLORING APPROACHES FOR COMMUNICATION AND INTERVENTION

4.1 IDEAS FOR INTERVENTION

A) At IITB

Looking at the current picture of IITB, I understand that communication of the importance of segregagtion and the usefulness of solid waste is very important. Dry waste and Wet waste are the two broad categories of solid waste. The management of both the types is possible by every residence, and it is a sustainable activity needs to be made them understand and communicated.

1) Promoting the Concept of Composting for Managing Wet Waste at IITB Campus

It is not a new concept but effective and not practised by large number of population.

Solution : Many houses in IITB are urban and do not have lawns or balconies, in that case convincing those residences is a challenging job. For them, there are produtcs like daily dump offers. Promoting them to the IITBcommunity is one of the important components of this project. Demo for the promotion of these products is one of the effective ways to convey the effective way of managing wet waste along with the importance and benefits of composting.

Reponse : Around 20 people visited for the demo, including non teaching staff, professors and students.

Result : In an hour of demo, managed to convince 6 people from IDC

to buy composters. So, guessing, since then these 6 people are putting all their wet waste into the composters and have reduced the weight over landfill.

2) Promoting the Concept of Composting for Managing Wet Waste at IDC Canteen

Solution : Gave demo to the canteen owner and workers of how and why to use composters.

Result: Convinced to throw their wet waste into the composter. Since then no wet waste from IDC's canteen goes to the PHO vehicle. IDC is managing its own wet waste.

Image 23, Demo of composting to the canteen workers at IDC

B) In Nasik

It is important to promote the concept of composting outside the campus and in some other city to understand the different responses to the idea from people which brings value to this project.

1) Promoting Composting in Nasik

To understand the repsonse of non IITB community to this concept of managing wet waste, thought of promoting it outside IITB. But the problem of space is constant accross the city of Mumbai. So thought of promoting it to people who have space to keep the products and see how they respond to it.

Solution : Nasik seemed to be a place where I knew few people who would be interested in knowing and doing such activities. I gave them a demo which reulted in new 7 orders for the composters.

Response : New 7 orders. This showed, some people are interested in eco frindly activities but need proper direction.

Result : More 7 people are managing their wet waste and giving it back to nature in a consumable format.

C) At Vavoshi

Looking at the current picture Vavoshi and changing mindsets of people towards life, thought of coming up with a business plan which possibly can raise their income and give them work.

1) Convincing Potters to Make Composters

Potters lane in Vavoshi makes handmade chullahs and plates and diyas based on the orders they recieve.

Solution : Communicating them the importance of segregation and

composting and encouraging them to make composters which can be sold in nearby markets.

2) **Installation of Composters in Vavoshi**

Solution : Communicating them the importance of segregation and composting and encouraging them to use composters for composting. If there is good amount of compost, they can earn livelihood from it.

3) **Teaching Students in Vavoshi the Importance of Segregation**

Solution : Arranging informal sessions with kids where we plant trees using compost. During this activity, what is compost, how it is made, why is is made all these questions should be answered and encourage them to start composting at home. Getting school kids familiar with tree planting and the concept of compost will help them learn the importance of waste, how to manage waste and how waste can be useful. Planting fruit trees will in return give them fruits to eat. This will be the motivation for them to take care of their plants. This habit will inculcate in them the interest to grow their own food.

4) **Composting as a Means of Livelihood**

Vavoshi is just 55 km away from Mumbai. Vavoshi can think of business opportunities from the activity of composting. Since, the transportation cost would be minimal.

Solution : Teach them to make compost out of their wet waste and sell it. This can be their business to earn livelihood. Women can actively take part in it. Or they can start doing their old occupation of agriculture with their own compost. Growing exotic vegetables like red and yellow capsicums, mushooms, babycorns and sell it to the nearby potential market that is the nearby cities, Pen (17 KM), Lonavla (21 km), Panvel (29 km), Uran (33 km).

Result: Convincing young generation is a bit possible but not very easy. The people are aspiring to have concrete houses and 9 to 5 jobs and fixed salary.

5) **Cleaning the Dirty Areas in Rememberance of Late**

Clear of the dirty areas in the village and plant fruit trees there dedicating every tree to each late person from the village. This will build respect for the place in villagers mind and the place will stay

Solution : A collective activity with all the villagers on Sunday to clear off all the dirty corners of village and plant fruit trees which will after few years fruit for them.

6) **Diya Installation**

There is a whole lane of potter families in Vavoshi, which is struggling to ear livelihood.

Solution : After cleaning the whole village with villagers great particiaption, on one special day, lighting the whole village with diyas made by potter. This will symbolize that cleanliness and aethetics

together can create great magic. And also encourage our traditional way of celebration by lighting diyas. Inviting professors to the village for this beautiful visual treat. Potters will get encorsgement.

4.2 COMMUNICATION DESIGN IDEAS

Looking at the message to be delivered to the target audience, it appears, 'Movie' and 'Book' are the effective and suitable visual communication media for this project.

BOOK and MOVIE possibilities

1) Communicating the Importance of Solid Waste Segregation

Dry waste can be sent to kabadiwala as mentioned in the earlier chapters and wet waste can be composted. These are cost effective and convinient methods. People get confused whethe a tetra pack of juice is dry waste or wet waste or a wet paper is wet waste or dry waste.

Solution : Communicating Solid Waste segregation in a small booklet specifically for the IITB Community. Also Creating a posters with visuals explaining residents the importance of segregation. How segregation should be done. What goes into wet and dry and organic waste which will make the PHO workers life a little easy. This can be put up on the notice board of every building in IIT. Making a small movie doing the same tasks and can be shared via mail to every resident of the campus.

2) Change in Lives After Using Wet Waste Composter

Composting is not a new idea. It has always been happening in nature. If you see in forests, dried leaves shed and within few days they mix with soil, start decomposing and form compost which helps trees get nutrients for themselves and grow healthy.

Today, collectively managing wet waste from every house has become a critical task for municipal corporations. People who have been using composters at home to manage their wet waste can share their views on the issue which will form a great message to be delivered to the audiences. This movie will involve views of people like manufacturers, franchise holders, transporters and buyers. Viewing this movie a person should understand how life changing it is to manage wet waste on one's own by using composters.

3) A Documentary on the Lives of Ragpicker Kids

Kid waste pickers put their hands into the dirty and horrendously stinking bins and segregate paper, plastic, metal and glass to be recycled and reduce the waste on landfills. They get terrifying hand and leg injuries. Needles penetrate through their fingers and hands. Sharps cut their fingers into half sometimes… But who cares? Do these people even exist for us?

In reality, their life is very different from the kids from a well to do family. This movie should bring in the picture of how and why these kids come into this profession. I visualize, Kids after their schools playing on landfills as they get time. And again going back to the work of rag picking. How their childhood is hampered. What do they think of education and what are their aspirations? What role do we play in their life?

4) A Day in the Life of a Ragpicker

To shoot a day in the life of a rag picker will be an interesting way to show how he is contributing his whole day in cleaning the spaces and managing waste. And in the complete process, as consumers where can we reduce the difficulties faced by the rag picker to a possible extent so he can be reasonably comfortable and perform better in his work of cleaning.

I visualize this movie, a rag picker starting his day and explaining what all activities he does throughout the day. How long he works, when does

he sleep. Footages of him introducing himself, talking about his daily routine, him working and collecting waste, walking long distances, how unclean and tired he gets while working, how long he travels, how much time he takes for searching the right kind of waste to be recycled, how he decides what to pick up, when and where does he eat, how he deals with the middleman, who buys it, how much a rag picker earns, how enough is the amount for him to suffice his daily family needs. What are his dreams and ambitions?

5) Experiences of Cleaning Workers

Cleaning workers from municipal corporations and many private institutions and organizations talking about their experiences during the job which gives us an understanding about the treatment given to these people and the kind of work they do.
I visualize this movie an interview based one which lets us understand the stereotype views of people for the cleaning job and how it needs a change so that these people feel dignified for the work they are doing.

6) Funful Ways of Managing Waste

This movie gives easily possible, simple and hassle-free ideas of managing solid waste and wet waste at home. A person can learn and explore these ways more using his creativity. Schools kids, home makers, office cleaning staff, etc everyone can view and learn from this video.

7) From Home to the Landfill

We as consumers and waste creators, should know the complete process of how waste from house goes to the landfill and how and who handles it. Different stages like Waste generation, collection, segregation, treatment, raw material, recycling to form new products. What happens to wet waste? Composting, energy generation, biogas, fuel generation. One should get a complete understanding of the start to end cycle of waste management including formal and informal waste management.
I visualize this video, with footages of people throwing all kinds of waste in their dustbins which then is collected by the garbage collectors, difficulties faced by them, waste collected further goes into the clean-up vehicles for separation, useful waste to the factories for treatment and recycling, and inert waste to the landfills. It should contain all the statistics for people to know the intensity of the issue.

8) Segregation is the Only Solution

The problem of landfills has a possible solution of segregation which people are not aware of and those who are aware are lazy to do it. The movie should communicate the importance of segregation, categories of segregation, who does it, further levels of segregation, why and what happens after segregation. How much change this one thing can bring to the huge problem of landfills?
Making people understand how waste is no more waste and can bring you wealth.

9) Waste Management in IITB

IITB campus is a habitat for professors, students, non-teaching staff, animals, birds, trees! It's a small community where people are here to share knowledge. Knowing, how waste management happens in IITB will be useful to IITB residents and interesting for outsiders. Outsiders can wish to take lessons from the video showing the process followed by IITB for waste. IITB residents who are, not segregating now should be convinced to segregate after seeing this video. Many waste management experiments are going inside IITB. It will be good to make them the part of this video.

10) Join in to Recycle Your Waste

Waste management is a global problem. In India, many small, private organizations and NGOs are working in this area and need volunteers. A video, brining all these communities together on one platform so that people understand who all are working in this area where they can volunteer if interested. This will build awareness and also persuade people to join one of these.

5 FINAL DESIGN SOLUTION

5.1 VISUAL COMMUNICATION DESIGN

A) Book : Can IITB be a Zero Waste Campus?

Book aims at bringing the complete picture of IITB waste managemnet to its residents so that they understand their role and the effect of their act. This will help to bring change in their consciousness and behaviour. This book focuses on household waste management and encourages every house in IIT to manage their waste. The idea is to circulate the book to every residence. It is designed for families. A family can have adults, kids, teenagers, old people. The book is designed thinking about the people from different age groups and their interaction with each other in the family. Book contains simple language and lot of visuals and pictures to illustrate concepts and facts. Aim is to make it look interesting to sustain readers attention and encorage them to a positive action as a result. It is in two languages - English and Marathi. and available in two colour versions - colour and B&W. The book illustrates following topics,

- What is Zero Waste?
- Daily Waste Generation
- So Much Waste!
- Lets Know Our Waste
- Who Keeps Our Cmapus Clean?
- Present Waste Management
- What is our Waste doing to the Environment?
- How to Manage Our Waste?
- Get in Touch with Kabadiwallas
- Individual and Community Composting
- Help PHO in Keeping the Campus Clean
- Meet People who Recycle and Compost

B) Weekly Pamphlets

Every Sunday pamphlets will be circulated on different waste related topics in sequence (following the contents of the book) to build curiosity and interest in the audience. Book gives information in one go. Later, it was realized, giving information in one go on a topic like waste might not work whereas delivering information in bits and pieces will help audience to understand, remember and act better. Though and since its going to be a prolonged process, it will give better results. Waste is a topic of extremely less priority to the majority of popluation, hence, putting little little information in front of them might help. Although, both the media of communication i.e book and pamphlets are accessible to them through PHO. Pamphlets are generally thrown and ignored. The challenge is to design pamphlet in a way that they keep it safely instead of throwing and ignoring it. This is also a change in consciousness.

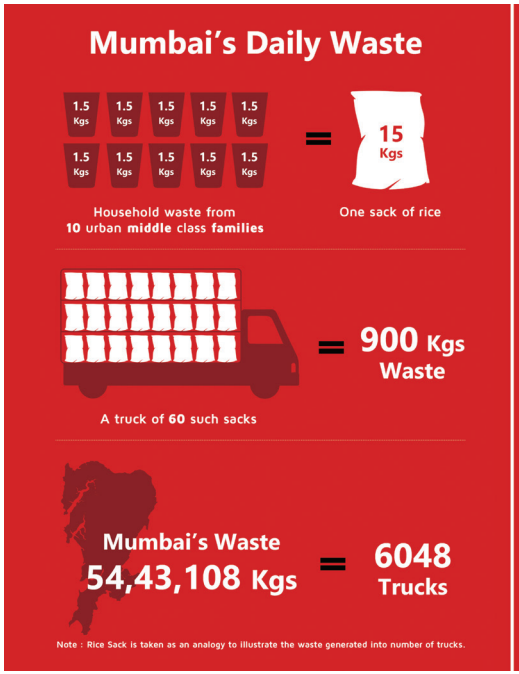
Book Design Process Followed

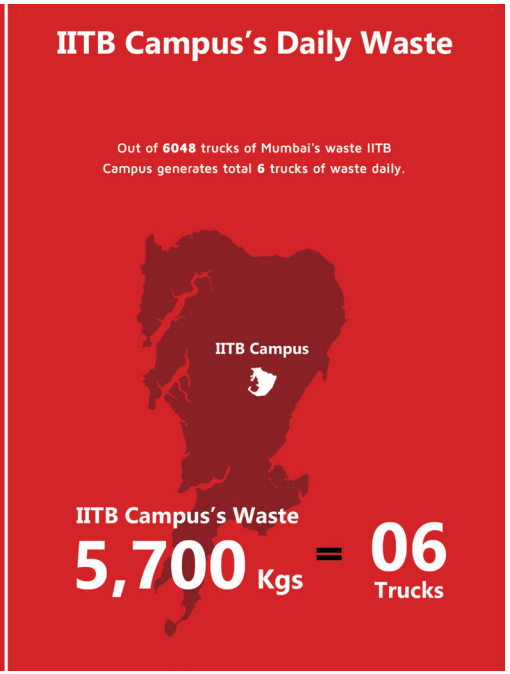
- Study of the subject and knowledge of the relevant topics
- Defining purpose of the book
- Data Collection
- Target user study
- Different ideas for the book (around 5 to 8 ideas)
- Sketching out 2 to 3 ideas
- Select the appropriate one
- Data chunking
- Content design
- Defining visual language for the book
- Deciding approximate number of pages of the book
- Content enhancement
- Iterations of the book
- Testing the visual language
- Testing the message of the book
- Copywrting
- Layout design
- Setting style guide
- Book Cover Design
- Versions of the book - Colour and black & white
- Language versions - English, Hindi and Marathi
- Cheap version of the book

Image 23, FInal Book (The book is available in the library)

5.2 VISUAL DESIGN

A) Few spreads from the book





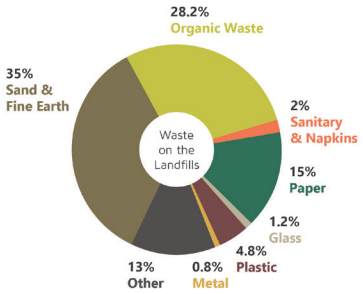
This IS a Zero Waste practice.

This is NOT a Zero Waste practice.

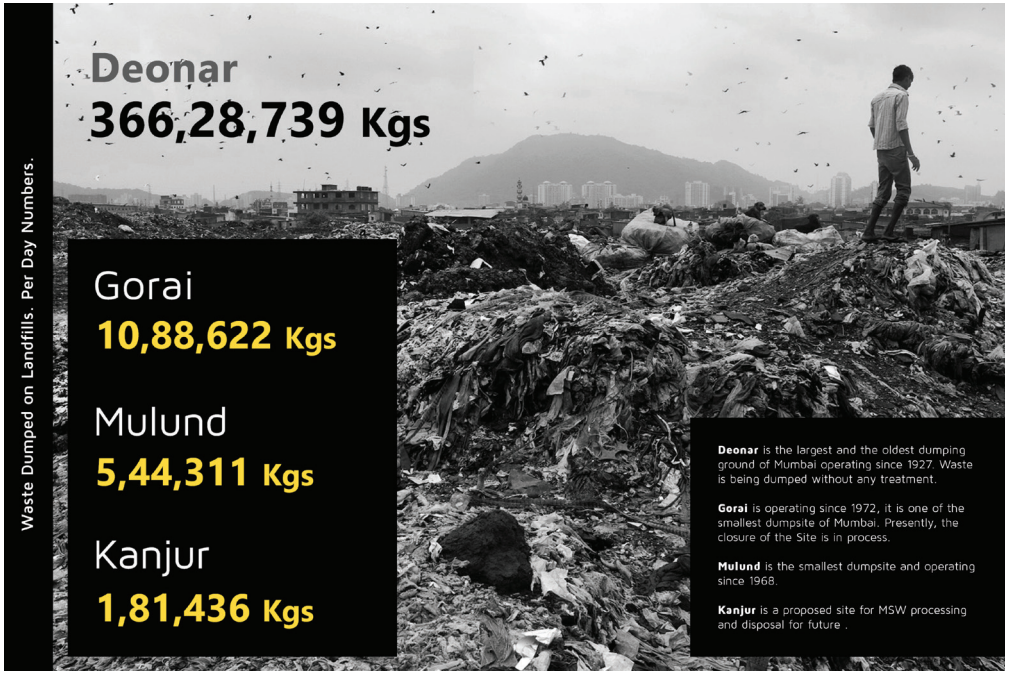
If we would recycle more, we would not dump so much on the landfills.

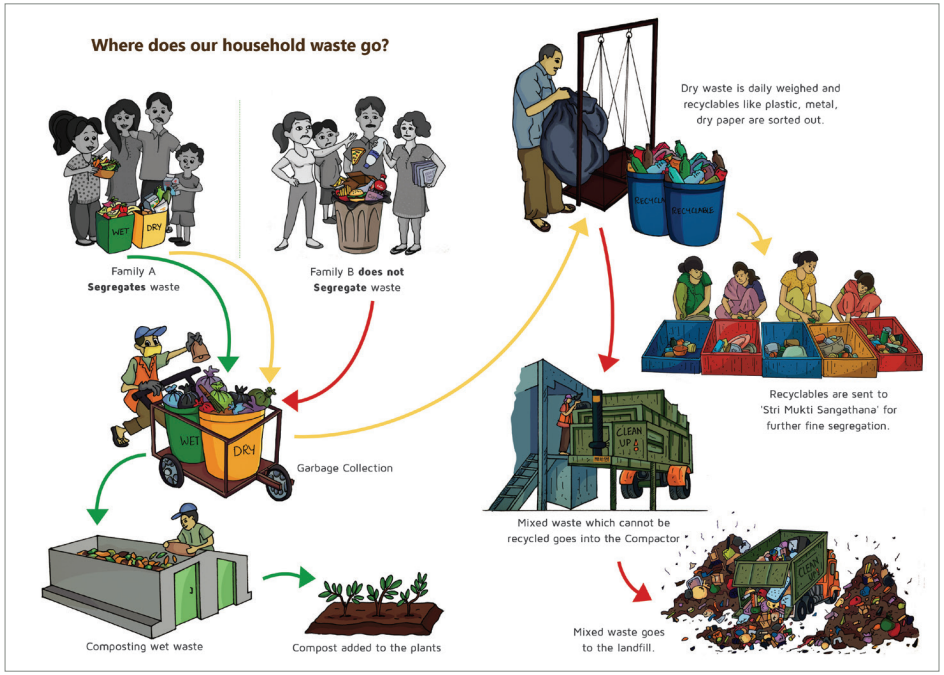
Though plastic composes of only **4.8%** of Mumbai's total waste on landfill, it causes maximum nuisance such as clogging of drains. Moreover, its combustion poses health hazards due to the release of toxic gases.
Paper can be recycled. Plastic, metal and glass are not bio degredable but can be recycled.

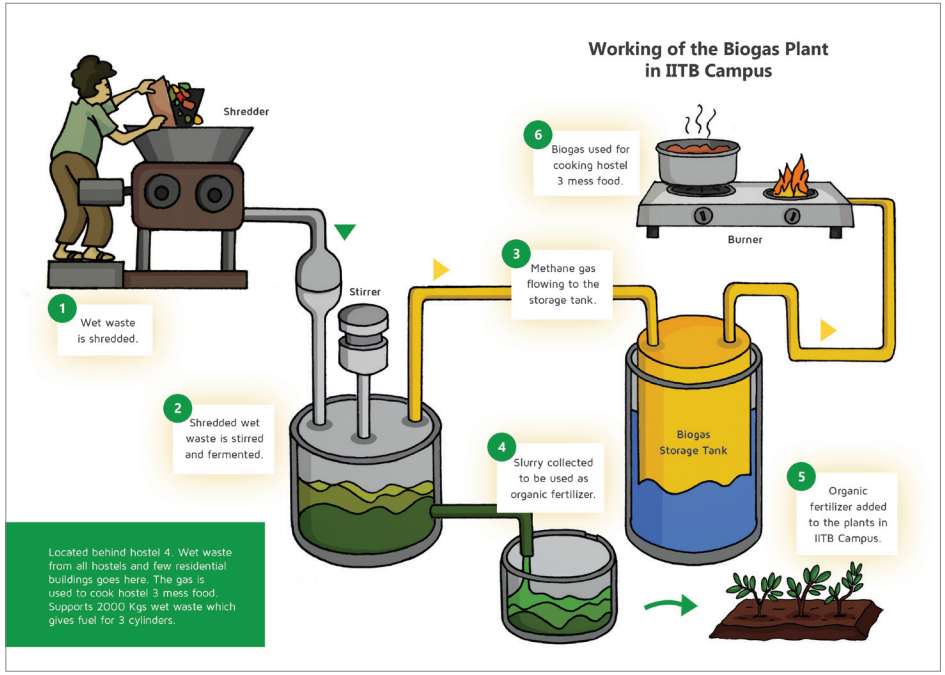
What's in the Mumbai Landfills?



Waste Dumped on Landfills. Per Day Numbers.




Where does our household waste go?
WET
DRY
Family A
Segregates waste
Family B does not Segregate waste
Garbage Collection
Composting wet waste
Compost added to the plants
Dry waste is daily weighed and recyclables like plastic, metal, dry paper are sorted out.
Recyclables are sent to 'Stri Mukti Sangathana' for further fine segregation.
CLEAN UP
Mixed waste which cannot be recycled goes into the Compactor
Mixed waste goes to the landfill.


Working of the Biogas Plant in IITB Campus
Shredder
Stirrer
Burner
Biogas Storage Tank
1 Wet waste is shredded.
2 Shredded wet waste is stirred and fermented.
3 Methane gas flowing to the storage tank.
4 Slurry collected to be used as organic fertilizer.
5 Organic fertilizer added to the plants in IITB Campus.
6 Biogas used for cooking hostel 3 mess food.
Located behind hostel 4. Wet waste from all hostels and few residential buildings goes here. The gas is used to cook hostel 3 mess food. Supports 2000 Kgs wet waste which gives fuel for 3 cylinders.

Landfills have become taller than our high rises.

Along with the rest of the city, IITB Campus is equally contributing to the harm caused to the environemnet by sending waste to the landfills.

7. What harm is our waste doing to the environment?

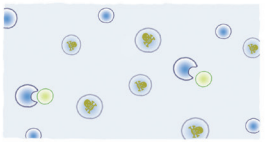
IITB high rise buildings like Aravali, Ananta and Nilgiri.

What happens when plastic goes to the landfill?

This is your mixed waste with lot of plastic bags, bottles and wrappers in it.

Plastic waste mixed with other waste ends up in a landfill. This huge dump is daily trashed in landfill and it continues to take up lot of space.

As plastic sits there being compressed among the layers of other junk, rain water fills through the waste.



The water absorbs the water soluble compounds that plastic contains.

And some of these compounds are highly toxic and together they create a harmful liquid called Leachate

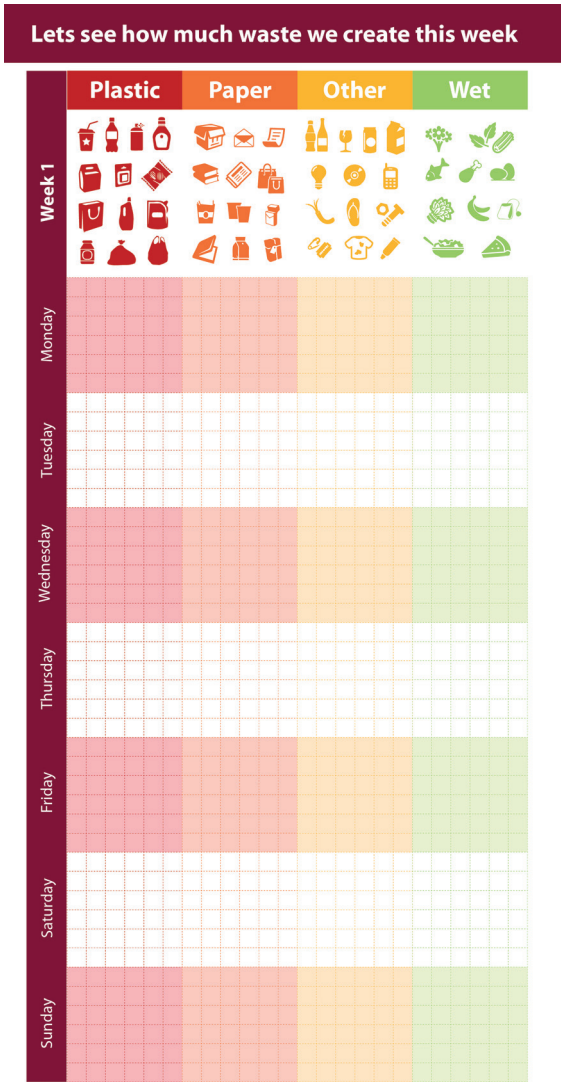
Leechate enters the ground water, soil and streams poisoning the ecosystems and harming wildlife.

For years and years plastic waste goes on accumulating, It takes 1000 years to decompose.

5.2 VISUAL DESIGN

B) Weekly Pamphlet

Front



Back

Waste Study Chart

Weekly pamphlet along with a chart on its back will be given, where every house is expected to track their waste generation. And return the form to PHO. Family who does this regularly gets rewards.

5.3 VISUAL SPECIFICATIONS

Typography

1) **Chapter Titles**
   Font Type **Myriad Pro**
   Font Size **16pt**
   Font Weight **Bold**

ABCDEFGHIJK
LMNOPQRSTU
VWXYZ

2) **Section Titles**
   Font Type **Myriad Pro**
   Font Size **10pt**
   Font Weight **Bold**

AaBbCcDEeFfGgHhIiJj
KkLlMmNnOoPpQqRr
SsTtUuVvWwXxYyZz

3) **Body Text**
   Font Type **Maven Pro**
   Font Size **10pt**
   Font Weight **Regular**

AaBbCcDEeFfGgHhIiJj
KkLlMmNnOoPpQqRr
SsTtUuVvWwXxYyZz

4) **Illustration Titles**
   Font Type **Myriad Pro**
   Font Size **15pt**
   Font Weight **Bold**

ABCDEFGHIJK
LMNOPQRSTU
VWXYZ

Color Palette

Chapter Titles
Font Color : White # ffffff
Background color : Green # 119748

Section Titles
Font Color : White # 119748

Body Text
Font Color : Black # 000000, Opacity 85%

Illustration Titles
Font Color : #563b23

Grid

Four Coloumn

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[3] IIT Bombay Public Health Office. (2015, April 23). Retrieved from Office of Dean - Infrastructure Planning & Support: http://www1.iitb.ac.in/deanpl/pho.html

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