2020

Live Light

An Interactive Website for Waste Management in Badlapur

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Feedback Page

I. Acknowledgement

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II. Introduction

As the global temperature rises, species die and resources grow scarcer, sustainable or green consumer behaviours occupy an increasingly important role in saving our habitat and promoting environmental awareness. The project aims not only to convey the need and importance of being a green consumer in this throwaway culture but also to make available the information in a way that it aids the young urban dwellers attain and sustain a green lifestyle.

With my research, I have discovered several reasons behind the disinterest in developing solutions to the excessive waste generation and its mismanagement. One reason is that these green habits seem to be at odds with the fast-paced urban lifestyle. It needs a significant change in behaviour and thinking, and change is always difficult. An equally important reason is the lack of media coverage and information along with the social stigma around waste collection and disposal. However, one of the most important reasons is that the waste disposal system has been completely separated from the rest of society. The waste collected is sent to dumping grounds, where it is hidden from the public eye. Most people are unaware of the functioning of the disposal system, along with the issues it is facing. Due to this secretive nature, society is unaware of the significance of waste production and the efforts of waste handlers.

What is needed to fix this problem is awareness. With the use of the internet, this information can be spread easily to one group in particular: the youth. As the first generation that has grown up with the internet, they are one of the most knowledgeable groups, having the most reach when it comes to

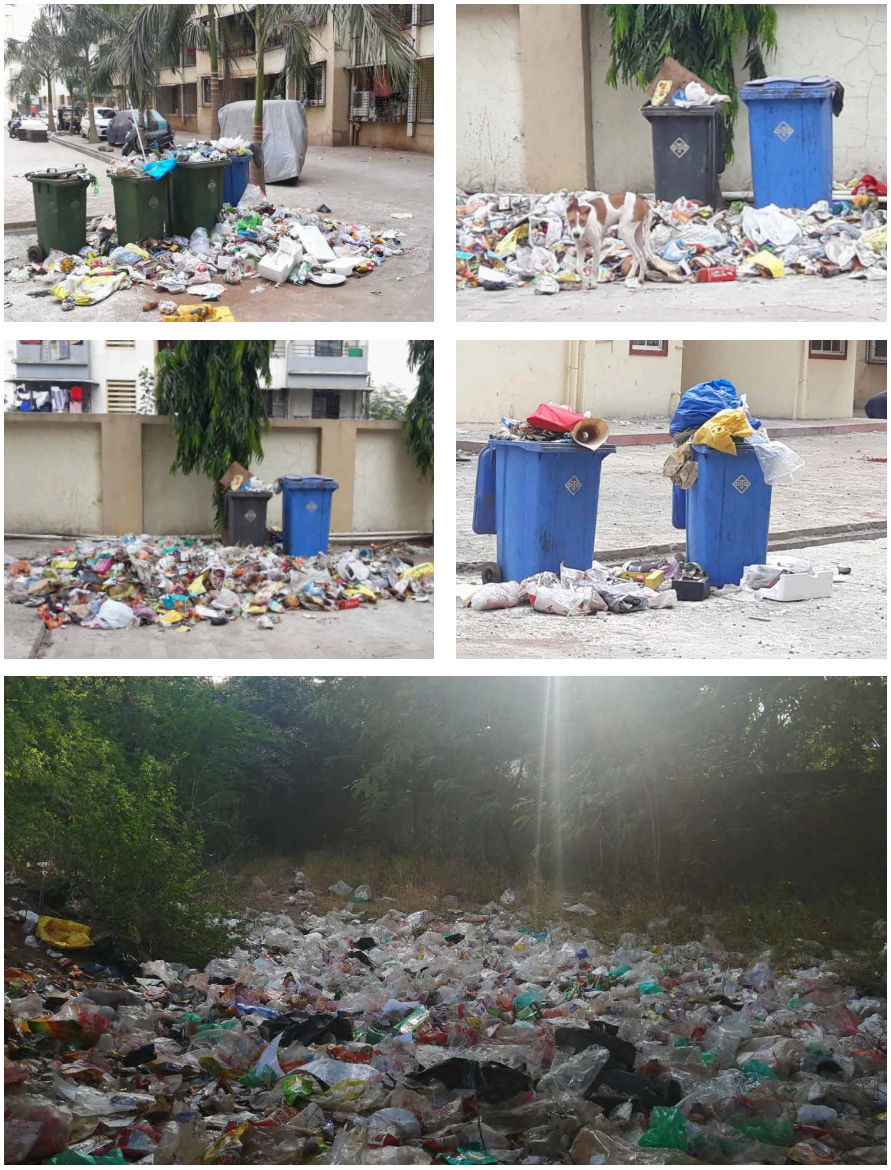
communication. They are also the first generation that will have to face the consequences of waste mismanagement. More than anything else, starting early is an excellent way to develop good habits, empathy and a sense of ownership. For the above reasons, the youth of Badlapur was selected as a primary audience.

The final product of this project is a website which not only describes the problem and complexity of it but also provides different alternatives and steps that one can perform individually or as part of the community to be a part of the sollution. The 'Live Light' website provides a platform for people to find green stores and alternatives around them. It also provides a platform where people can sell, lend, rent, buy or borrow old stuff, improving the communication within the community and reducing the need for new products. The website also provides a platform for the citizens to book waste management services for buildings, societies, institutions or even for small ocassions. A part of the website also acts as a link between the citzens and the Kulgao-Badlapur Municipal Corporation (KBMC). It allow people to post complaints which if backed by a large number of people, can be converted into a petition. It is also a place where the KBMC can post their news and responses.

The most important thing is to be able to turn good actions into good habits. The best way to do that is to address young minds. This website hosts downloadable material and structure for a campaign that will help volunteer to address young kids and help build good habits in them at an early age.

During the summer break after my third year of engineering, I was staying at my parents' house in Badlapur, a town near Mumbai. One day, I heard my mother yelling over the phone at Indrojeet Burman, who looks after the door to door waste collection in my society, Shashwat Park. No one had come to collect the waste for the 3rd consecutive day. Then my mother asked me to go to the society office to check what the problem was. On my way to the society office, I saw that all the building and community bins were overflowing. The waste that was piling up was covered in flies and smelled terrible. In the society office, Indrojeet told me that the Kulgaon Badlapur Municipal Corporation's (KBMC) garbage truck had not picked up the garbage since last week. It went on for another couple of days. Mosquitoes had started breeding near the dustbins. People came to the community bins to throw their waste over the already overflowing dustbins. People had begun falling sick due to the mosquitoes and flies, the stench was unbearable, and people had started panicking. It was all chaotic. Soon as the bins became too messy, people started dumping their waste in the naala right next to the society compound. Garbage was everywhere.

Then suddenly, one day, the KBMC garbage truck came and picked up all the trash, and from the next day, it was back to normal. That day my society realized, if it weren't for the KBMC, we would have no idea what to do with our waste. That was the first time I felt that waste was a growing problem.



Waste pollution in my locality

Soon after identifying waste as a problem, Shashwat Park started adopting measures as part of the solution. It became the first society to start a local composting pit for all the buildings' organic waste was composted. But due to lack of proper knowledge of starting and maintaining it, the composting pit had become a nuisance. It was too close to the house, maintenance was challenging, and foul smell had become a huge problem. Flies and mosquitoes had started breeding near it, and soon enough, Shashwat park became the first society to shut down their compost pit.

When my professors asked me to think of a topic for my final communication design problem, I immediately knew that I wanted to address the issue of waste management.

III. Formulation of the problem statement

Statement 1: To address solid management as an integral part of the lives of people living around the waste management plants and try to spread awareness about the current situation, come up with a more efficient and incorporating solution and motivate the audience to do the same.

The above statement was the first problem statement that I had formulated based on the limited knowledge of the field and the problem. In the discussions following the submission of this statement, my professors pointed out that the problem statement lacked clarity. They asked me to reform the problem statement by narrowing down to a specific question, a fixed target audience, and a communication strategy.

When I started reading about waste and what impacts it had on society I came across the case of Deonar dumping ground in Mumbai. Located in the city's Deonar, an eastern suburb of the city, it is India's oldest and largest dumping ground, set up in 1927. It is managed by the city's civic body, Brihanmumbai Municipal Corporation (also known as Municipal Corporation of Greater Mumbai). Mumbai produces a whopping 8,700 tonnes of solid waste per day, and BMC has no alternative way of disposing of this waste. Because of the reasons mentioned above, the dumping ground that should have been shut down at the age of 30 years is now 93 years old, with thousands of rag pickers scavenging its heights each week. After a lot of reading and thought, I narrowed down the topic to Mumbai and its dumping ground and reformulated the problem statement accordingly.

Statement 2: The project aims to spread awareness about the generation, management, and impacts of solid waste on health and the environment. It also aims to implement and sustain measures to reduce the amount of solid waste that reaches the dumping grounds and Arabian sea in Mumbai.

The above statement was not an effective problem statement, as it lacked a specific communication strategy. In one of the discussions, one of my professors suggested that human behaviour should be at the core of it. He also added that the way of looking at the problem was not unique and exciting around. People had looked at the issue of waste management. He suggested that I look at why the problem had grown in the last few decades as the habit of throwing away things is older than the first civilization itself. He asked me to study various kinds of packaging (new and vernacular) to understand what affected the generation of waste and why this was not a problem a few decades ago.

I selected Big Bazaar and Sector 21 Market of Gandhinagar to study different kinds of packaging and behaviours. I selected these places as together, they catered to buyers and sellers from all economic backgrounds. I have attached the field report at the end of this document. During the field visit I found out that there was lack of awareness regarding the health and environmental impacts of waste pollution. I also observed that the generation of waste depends on various factors like economy, technology, overall development, etc. This field visit also helped me look at the issue differently. I decided that instead of focussing the communication strategy on how to manage the waste, I decided to focus it on how we could reduce the generation of waste itself. This Field visit also helped me identify consumerism as one of the main reasons behind this growing waste problem. Keeping all the observations in mind I reformulated the problem statement. After many revisions the following statement was accepted as the final problem statement at the end of 3rd semester.

Statement 3: As the global temperature rises, species die and resources grow scarcer, sustainable or green consumer behaviours occupy an increasingly important role in saving our habitat and promoting environmental awareness. The project aims not only to convey the need and importance of being a green consumer in this throwaway culture but also to make available the information in a way that it aids the young urban dwellers attain and sustain a green lifestyle in the town of Badlapur.

The above problem statement clearly stated what I wanted to say, why I wanted to say it, whom I would say it to and how. It was a complete problem statement. I went to Badlapur during the break before the 4th sem to collect more information, and structure it to build the material for the communication. I spent some time learning about the existing waste management system, and how a dumping ground works. I also spent some time reading other factors that affect the generation of waste. The field report of the same is attached to this document. By the end of the field visit, with the help of my guide, I was able to identify three sections in which the strategy would have to be divided into to bring about measurable change.

The first part that was identified was the lack of holistic idea of waste, its generation, its impacts and how it can be minimized amongst the citizens of Badlapur. However to bring about any kind of change, a change of lifestyles of citizens will be needed which is not something that can be achieved overnight. Unless the current waste management system does not support the new lifestyle, people will resist the change. Hence the knowledge of current solid waste management and disposal systems becomes necessary. This makes the 2nd section. The third part is the platform which can bring all the information and like minded people together. Keeping all this in mind, I changed the problem statement to accommodate all this and the results of the second field visit.

Final problem statement: The project aims to communicate the idea of waste in relation to economy, technology and society to sensitize the citizens of Badlapur, primarily the young urban dwellers, towards the ecological and health impacts of the waste. This project also aims at providing a platform that acts as a guide for citizens to attain and maintain a green lifestyle while helping them meet their waste management and disposal needs.

IV. Media and form

When it comes to waste, most of us think that we know the basics of segregating our waste but do we even know where our waste ends up once it leaves our houses? More important question we need to ask is do we care? This attitude of a large population has been the problem due to which solid waste has become such a threat to the environment. Nowadays many problems faced due to environmental degradation are making news and are being talked about on social media. Many initiatives by common people, NGOs and local and national governments were studied in order to understand how people have attempted to address the same issue to see what has worked and what has not. The literature review is attached to this document. After analysing the initiatives following were the expectations from the potential solution:

1. Potential communication solution must have a great reach amongst the population of the country. It should be something that is easily accessible at the convenience of the people, easy to share, should cross language and platform barriers and be quick when needed.
2. It should effectively communicate how each small action of the people is linked to or responsible for the bigger picture. The strategy should not just be about telling everyone what is the right thing to do. It should aim at building better habits in which the first step is realization. Everyone should realize if and how they are wrong themselves in order for everyone to have the enthusiasm and will to even try to change their habits. Hence the solution should be interactive and based on learning, understanding and contributing.
3. It should support other measures and initiatives that have similar goals

and ideas rather than competing with them.

4. The solution should be participatory, should connect people and be able to propagate good ideas forward. People should not only gain information but must also be able to contribute to it. It should facilitate a dialogue. People should be able to question and discuss the information provided by the system.
5. It should be accurate and clear in terms of the information it provides. The information shared by the people should be moderated as per some guidelines so that the communication channel can be monitored for misuse.

As it is a global issue, the reach of the medium should be as great as possible. The two main media that have the largest penetration in India are television and the Internet. Internet usage in the country has exceeded half a billion people for the first time, pegged at 566 million, driven by rural internet growth and usage.

In ICUBE 2018 report that tracks digital adoption and usage trends in India, it was seen that the number of internet users in India has registered an annual growth of 18 percent. It projected a double-digit growth for 2019 and estimates that the number of internet users will reach 627 million by the end of this year.

"Of the total user base, 87 percent or 493 million Indians, are defined as regular users, having accessed the internet in the last 30 days. Nearly 293 million active internet users reside in urban India, while there are 200 million active users in rural India, it said. The report found that 97 percent of users use mobile phones as one of the devices to access the internet. "Increased availability of bandwidth, cheap data plans and increased awareness driven by government programmes seem to have rapidly bridged the digital gap between urban and rural India. Consequently, the penetration in rural India has increased from 9 per cent in 2015 to 25 percent in 2018," it added. It has then risen up to more than 40 per cent in 2019. Undoubtedly it is the fastest growing media with exponentially increasing reach." (The Economic Times)

Even though TV has similar reach, being a broadcasting medium, it does not support interactivity yet. That is why I have chosen the medium of an internet website for this project. It has great reach and supports interactivity. A website can hold the information in a way that it can be accessed on any device with an internet connection. The information can also be downloaded for offline use. The information can be easily shared on various social media. The website can have a section where the users can upload various experiences and stories regarding the central idea of the project. The website can also help other measures and initiatives to reach other people. A website can host multimedia files. Hence different media can be used for different types of information.

The project will make all the information easily available to the population through the internet and their own social media. It will be available for sharing offline to further increase the reach to people who don't have access to the internet. Through the graphic images and verifiable source

of information, and interactive story telling people will be able to establish a link between their actions and the current circumstances. This will help build a sense of responsibility toward the environment. The set of information will be organized in such a way that the need for change is realized, then all the information for cultivating a new habit and sustaining it is available. The collected information should act as a guide and an aid for the general public and specifically for the young urban consumers who are concerned about the environment and intend to live as green consumers. This information should be free and easily accessible. The Internet has a great reach amongst the population. Hence an internet website that makes available for free and also for offline sharing. It will be a good form of communication for my intents and purposes. On a website, people can not only read but also contribute to the information.

Other than that we have to consider the population which does not have access to the digital media, like school children, people of lowest economic strata and illiterate people. They can be targeted by having print media and volunteers in the communication strategy.

V. Research phase

V. i. Field report 1 (Mall vs Local Market)

a. Introduction

Aim of the field visit was to study various ways of packaging different food products at two markets. Two markets that were selected were Big Bazaar, Sector 21 Market, Gandhinagar. These places were selected to incorporate buyers and sellers from all economic backgrounds so that all kinds of packaging could be observed and studied in contrast with each other.

b. Big Bazaar Mall, 13th Nov, 2019

Initial Observations:

- There was a separate and large section for food which was further divided into
    - Ultra processed food or convenience food- Fried, baked, preserved food, etc.
    - Processed Food- Oil, Flour, Rava, Poha, Idli batter, etc.
    - Unprocessed or minimally processed food- Fruits, Vegetables, grains, dairy, etc.
- The entrance opened into the section of ultra processed food which is the largest section of the three. Large variety of packaged ultra processed food products all packed in multilayered plastic were stacked on rackS almost 7 ft tall. Series of racks stood one behind the other. The number of people here were more than in any other section.
- Next section is of processed food where plastic is still the most used thing for packaging. Some companies package oil in Tin Cans, but mostly oil is packaged in plastic cans, bottles and pouches. Some of the products

like spices, herbs, idli and dosa batter,etc. have additional cardboard box packaging on top of multilayered plastic packaging.

- Next Section was of unprocessed or minimally processed food. Grains here were available packaged in plastic and also available open. Brown paper bags were placed next to them for people to weigh and pack grains themselves.
- All the dairy products were either packed in multilayered plastic or cardboard boxes laminated with plastic. Just like grains, vegetables were also kept open with brown paper bags. There was a guy who would assist you in weighing and packing here. This section was the smallest.

Interviews with the staff

Casual conversations were carried out with some of the staff members of big bazaar like the cashier, the on floor assistant, a guy from the cleaning staff and the guard with the aim of finding out their knowledge about packaged food, food packaging, plastic ban, disposal of packaging waste. The aim was also to get an idea about how much plastic is given out to customers by Big Bazaar in the form of food packaging.

The conversation revolved around the following questions.

- Do you know about the plastic ban?
- Even after the plastic ban, why is above 95 percent of the food products still packed in plastic?
- Is it the same plastic? What is the difference?
- Why is the organisation of the products like this?
- How many packaged food products are sold everyday?
- How should one dispose this packaging waste? How do you do it?
- What is the difference between cooked and processed food?
- Can all these things be packaged any other way?
- How do you bring your lunch?
- Do you know how people package and buy food products outside malls?
- How much waste do you think this plastic dominated food packaging industry generates?
- Do you believe that there is a problem? Do you believe it should be addressed?
- Why do you think the government has banned single use plastic? How is it different from all this packaging?
- What do you think people prefer: packed food or fresh food? Why do you think so?
- Do you think our food habits have changed over the years? How?
- How has the lifestyle changed? How has that affected the food habits? Is it a good change?
- How do you think this packaging waste can be managed or reduced?

Following points were gathered from the discussion and observed.

- Mall restocks thousands of products everyday. On an average 50 packets of each product is sold on a week day and about 100 each per day on weekends. All processed and ultra processed food products are packed in multi-layered plastic. Footfall on a week day is around 2000 and on weekends it goes to about 5000.
- The weight of packaging varies from 1 gram to 100 grams each. About 40000 products are sold everyday and about 500 to 800 kg of plastic

leaves the Big Bazaar everyday in the form of food packaging.

- It was observed that they had very limited knowledge about various kinds of plastic and the plastic that is banned. The common idea of disposal is throwing the waste in the dustbin. The idea of segregation is known but there is little less clarity regarding the proper distinction between dry and wet waste. Some said dry waste comprises everything that is physically dry and others said dry waste consists of non biodegradable waste.
- People buy more convenience food or ultra processed food i.e. food that you don't need to cook and are ready to eat like biscuits, chips, chocos, cornflakes, cold drinks, etc. said the cashier. Most bought food products are things which need minimal cooking or can be made quickly like Maggi, ready to make upma, Poha, soups, McCain, etc. said the onfloor assistant. Others had similar answers.
- The reason for this they believed was the fast paced lifestyle where people didn't have time to cook and hence the sale was more of the convenience food. This mall also sold what was more in demand and hence this kind of food made up the largest subsection of the food section.
- They said that even outside malls, packaged food was dominating the market. People still used polythene bags after the ban. Years ago people used to stock grains instead of ready to make food which came in jute bags. Paper bags were also popular then. People carried their own bags which came back after the polythene ban.
- Most of the staff brought tiffin boxes for lunch. The lunch varied from sabzi roti to preserved food like biscuits. In breaks mostly everyone had tea or coffee and biscuits.
- They had a vague idea of the harmful effects of packaged products, but nothing had come to their notice that gave convincing enough evidence to make them believe it. It seemed like dispersed sources of information had left them confused. On the other hand the food product companies market everything as fresh and healthy.
- They seemed to know that plastic is harmful to the environment but they were unaware of how much plastic waste is being generated now and how critical the problem is.
- With the knowledge they had about the problem they said that the problem of plastic could be solved by recycling the segregated plastic and using alternative packaging (they couldn't suggest anything) to reduce the production of plastic for packaging.

Waste pollution outside the mall

Interviews with the customers

Casual conversation was carried out with a group of seven ladies who had come to big bazaar food section for shopping. Most of them had their trolleys filled with packaged food products and ready to make food products. The aim was to understand the need for packaged food products, knowledge about packaged food products, packaging, packaging waste and its disposal.

The conversations revolved around the following questions.

- Do you know about the plastic ban?
- Even after the plastic ban, why is about 95 percent food still packed in plastic?
- Is it the same plastic? What is the difference?
- What is the difference between cooked and processed food?
- What does your family's lunch comprise of?
- Do you know how people package and buy food product outside malls?
- How much waste do you think this plastic dominated food packaging industry generates?
- Do you believe that there is a problem? Do you believe it should be addressed?
- Why do you think the government has banned single use plastic? How is it different from all this packaging?
- What do you prefer: packed food or fresh food? Why?
- What effects do you think packaged food has over our bodies?
- Do you think our food habits have changed over the years? How?
- How has the lifestyle changed? How has that affected the food habits? Is it a good change?
- How do you think this packaging waste can be managed or reduced?

Following points were gathered from the discussion and observed.

- They were aware of the ban on single use plastic. When asked why other plastic packaging was not banned, one of them said that this was better quality plastic and could be recycled. That is why it wasn't banned. They did not know what happened to the segregated waste that was collected from the house or local bins. They had some vague idea about the landfills but did not know how the segregated plastic was recycled or what happened to the plastic that was not segregated.
- They knew about the harms of packaged food but not enough to prevent them from consuming them. Not all packaged products are harmful, some of them are processed in a healthy way. You can choose and buy only those, said one of them. She gave examples of masala oats, chocos, oats biscuits,etc.
- They prefered canned, refined, and packaged food because they believed it was hygienic and processed properly. Grains, sugar, oil, spices, etc were preferred packed. There is also this notion that packed grains, oils, spices, etc are unadulterated. They usually bought fruits, vegetables, etc in the local market because they had a notion that it is fresh in the local market.
- Convenience food makes up a large portion of breakfast and travel food when there is less or no time to cook. Sometimes even lunch and dinner are packaged food. During the conversation I found out that a balanced diet is seldom eaten and packaged food has become a large part of their kids' diet. They have observed lowered immunity in the

current generation compared to theirs and they believe their lifestyle is the reason.

- According to them the packaging waste can be reduced if we recycle all the plastic waste.
- There were other people who had some knowledge about the plastic being used and about the harmful effects of packaging. They had gathered this information from other people, over social media, read it in books, posters at doctors clinics, hospitals, etc.

c. Sector 21 Market, 14th and 15th Nov, 19

Initial observations:

- The market is large and spread out. It seems like economically more stable fruit and vegetable vendors have their carts at the centre of the market and as I moved outside I found other poor vendors selling nuts, cakes, biscuits, fruits, vegetables, etc.

Use of plastic in local markets

- Most of the consumers carry their own cloth bags and it is very common. But I saw a lot of people carrying polythene bags. Shopkeepers gave out plastic bags quickly and discreetly and were reluctant to talk about it. Polythene bags were well hidden at each cart.
- There were buyers or consumers at the center of the market who in spite of not having cloth bags, refused polythene bags and used handkerchiefs, laptop bags, helmets, pant pockets to carry vegetables and fruits.

Use of cloth bags in local markets

- The poorer vendors at the periphery of the market used paper to wrap the fruits and vegetables in case the buyer asked to wrap it. But most of them had polythene bags.
- There was an ice cream vendor who had no plastic packaging. He gave ice creams in waffles, in steel plates or on sticks.
- There were other vendors who sold fried items and nuts in magazine

paper cones, paper plates, pieces of paper, newspaper cones and reusable steel plates.

Interviews with the vendors sitting at the periphery

It was a group of four vendors, and for some reason one of them did not have polythene bags to give out. In a conversation with them I found out that,

- They had to sell their vegetables and fruits at lower price with less profit margin as most of the people who bought from them were poor. The profit was Rs 3-5 per sale and the guy who did not gave polythene bags said he could not afford them because they were Rs. 1 to Rs. 1.5 a piece and then he would have no money left for him. One of the other guys said that there are people who don't carry bags and they won't buy if they don't have a means to carry it and hence they had to keep polythene bags because they couldn't afford to lose a sale.
- I found out that there were over 200 vendors in the market and almost all of them used polythene bags when necessary. They told me they gave out at least 50 polythene bags everyday and they did not even have the most quantity of vegetables. If we assume that all of them gave out at least 50 bags each everyday then this market alone gives out over 10000 polythene bags every day.
- They also told me that for them the environment came second and their food for the day first. But if there was any other alternative that was cheaper, we would go for it.
- They did not eat much of packaged products;they ate biscuits sometimes as it was cheap and filled their stomachs and gave them energy.
- They had no idea how critical the problem of plastic packaging was as they had other problems that needed urgent attention.

Conversation with vendors at the center of the market

No vendor from the center of the market was ready to talk about packaging of any kind. They refused to give polythene bags to customers as long as I was nearby. As I went out of their sights they again started giving plastic bags. This shows that they weren't ashamed or hesitant because of moral reasons. They are only afraid of getting caught. It can either be because they don't know how critical the problem of plastic waste is, or they know and are still helpless and are waiting for alternatives as they can't afford to lose sales.

Interview of consumers (Who carried cloth bags as well as the ones who asked for polythene bags.)

- Many people who were walking with things bought in plastic bags, dodged the conversation around plastic bags. Some of them blamed the government for not coming up with an alternative. Some of them confessed that it was their fault as they had forgotten to carry a cloth bag or it was an unplanned event and now they were helpless.
- The most popular way for disposing this polythene was throwing it away in the dustbin with other waste, cleaning the vegetables and collecting the waste in the same polythene and chucking it in the dustbin, use the polythene as the dustbin and throw waste in it then throw it in community bin. Very few people segregated the bags.
- The fact that all kinds of plastic waste cannot be recycled together was not clear to many people and hence the segregation was not achieved

properly.

- All of them supported the fact that most of their day time food was packaged food and even though they knew it was harmful, they did not know how exactly and hence the believability of the information was less.
- According to some of them, it had become such a big part of their lifestyle that they could imagine there life any other way. The speed and convenience with which packaged food was delivered and consumed in this fast paced lifestyle made them a good option. People have changed their food habits and food to aid their lifestyle.

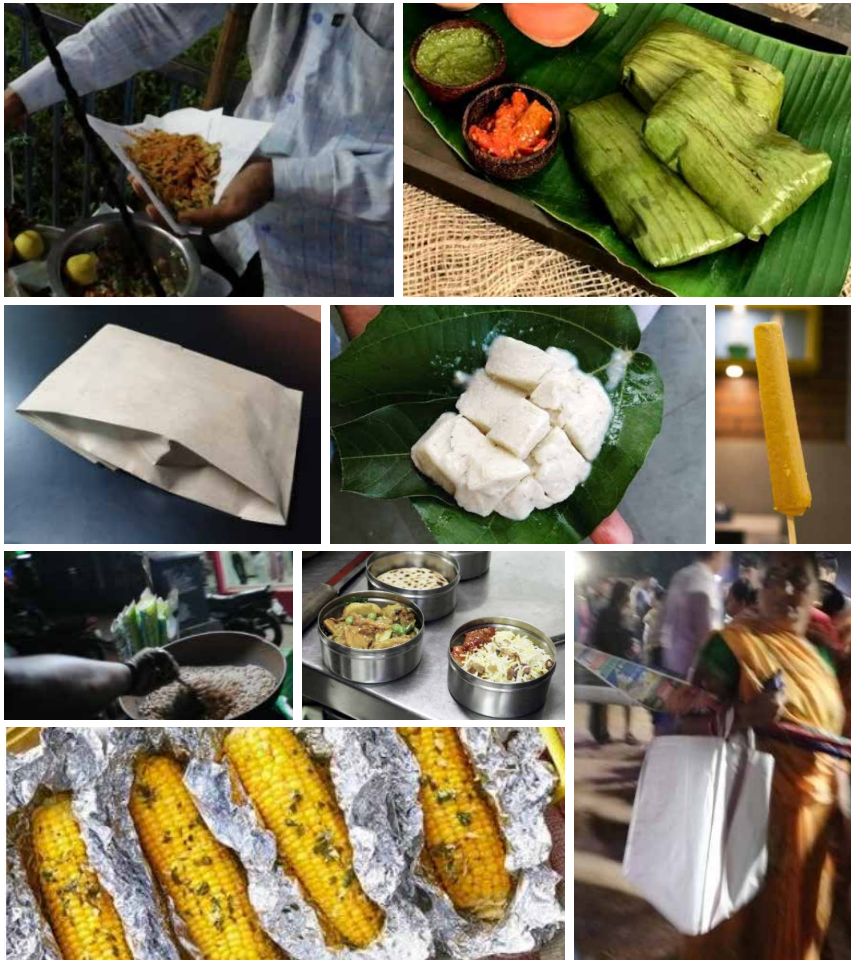
Another activity that was performed was to observe how rice was packaged and served at different places. And how it is packaged when you order from online delivery apps.

Examples of vernacular packaging used for serving rice

Examples of packaging used for orders from online delivery apps

- It was observed that the same product was packed in various ways.
- It was also observed that a lot of ways in which rice was packed, didn't use plastic or produced non-biodegradable waste. There were vernacular ways in which biodegradable waste or no waste was produced at all. But very few people were using it. A very large portion of the population used single use plastic packaging.

Another activity that was conducted was observing various kinds of packaging which did not include plastic packaging.



d. Analysis and Conclusion

- Plastic waste management is still a problem as the correct method of disposal and the entire process of waste management is still unclear.
- There is a lack of knowledge about various packaging materials used to package food, their impacts on food, their environmental impacts and disposal of the packaging waste.
- There exists this awareness amongst people about the harms of packaged food on our bodies but the information they have is not sufficient enough and/or efficient enough to actually inspired them to change their food habits and lifestyle.
- Vernacular ways of packaging are still used but on very small scale. The materials I saw which were being used for packaging were paper, cloth, leaves, jute bags, reusable metal and plastic boxes and cutlery and natural covers like coconut shells, corn cover, etc.
- There is a large part of the population that is using plastic for packaging food and waiting for alternatives on the one hand while on the other there is a small portion of the population that is still packaging without plastic.

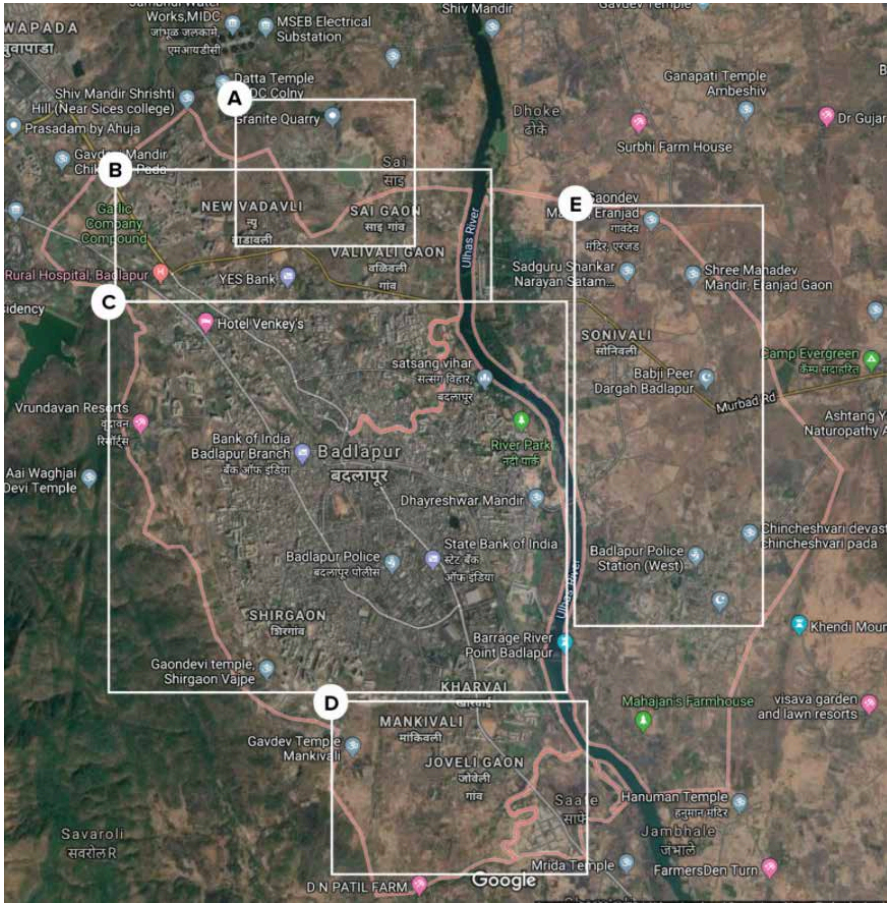
Many people use reusable containers to package food but a far larger number of people still depend on plastic packaging. The information regarding the plastic packaging being used, how it affects the food, its environmental impacts, and proper ways of disposing it should be disseminated in such a way that it inspires people to make change in their food habits and lifestyles as well as play their part in plastic waste management.

V. ii. Field report 2-3 (Badlapur waste management system analysis)

a. Introduction

Badlapur is a growing city in Thane district, Maharashtra state, India. It is a part of the Mumbai Metropolitan Region. Due to the population growth in nearby cities, people working in Mumbai have been moving to Badlapur for several socioeconomic reasons, including proximity to Mumbai via rail. Badlapur was recognized as a municipal town in Ulhasnagar tehsil, in 1971, as a municipal town in Ulhasnagar tehsil. The city has seen a rapid growth since the 1980s, with a rapid increase in population, due to its proximity to Mumbai by rail. As a consequence the area around the Badlapur railway station has developed faster than the old Badlapur village itself. Badlapur has an average elevation of 44 meters (144 ft). The region surrounding Badlapur is mountainous. The Ulhas River flows between Badlapur and Kulgaon. Floods frequently occur due to Badlapur's geographical location near this mountain runoff. Badlapur and Kulgaon are connected by two bridges across the river. The city is virtually divided into two areas, "East" and "West", by the railway line.

Kulgaon- Badlapur Municipal Council (KBMC) looks after the administrative affairs and is a Class-A Municipal council. Badlapur Municipal Council, with a population of about 1,74,226 (as per the 2011 Census) it is the least populous municipal council located in Ambernath sub district of Thane district in the state of Maharashtra in India. The total geographical area of the Badlapur



A. Badlapur dumping ground B. Badlapur village C. Badlapur town D. Industrial area E. Farmlands

Municipal Council is approx. 36 sq. km.

Kulgaon-Badlapur municipal council administratively comes under Thane in Maharashtra State, the total wards are 47. The total population in the study region (Census 2011) is worked out as 174226 out of which 90365 are male and 83861 female. The literacy rate statistics of the total population is worked out to 143480 (82.35%). Male literacy 76518 (53.33%), and female literacy is 66962 (46.67%).

Type of Industry	**Number of Units**	**Employment**
Cotton textile	32	9600
Ready-made garment and embroidery	1	300
Chemical/ Chemical based	118	11800
Rubber, Plastic & petro based	10	500
Metal based (Steel Fab.)	3	300
Engineering units	15	750
Electrical machinery and transport equipment	1	100
Repairing and servicing	22	1100
Others	3	300
Total	205	24750

b. Waste Generation at Badlapur

Different sources generate Municipal solid waste in large quantities which is difficult to manage. Any place where human activity is involved finds solid waste. Waste is generated in the form of vegetable remains & food waste, used plastic bags, plastic containers/ bottles, from residential areas. During celebrations of different festivals & events, such waste is generated in significant quantities with another additional pollutant- thermocol. This material has created a very serious disposal problem because of its long life span. Due to urbanization & the growth in population, many construction activities are seen in recent years resulting in the creation of construction/ demolition wastes or debris.For example, if the external surface of a building of 20 floors is repaired, the waste generated would be nearly 200 truckloads. So, one can imagine how much construction debris has been generated in recent years.

Currently, the total waste generated in the city is estimated to be around 68 TPD. The major proportion of waste, almost 80% is contributed by residential areas, followed by 12.5% from commercial establishments, 4.4% from fruit and vegetable markets and the remaining 2% is generated by hotels, restaurants, institutional areas, and hospitals. Kulgaon Badlapur produces 26 ML of sewage every day out of which 20 ML is treated and remaining reaches the Ulhas river untreated.

Almost all the mixed waste goes to the granite quarry converted into an open dumping ground which is situated at the edge of Badlapur city. Landfilling is one of the major municipal solid waste (MSW) disposal methods practiced worldwide. Though it is considered the most cost-effective means of waste disposal, poor management practices, especially in developing countries like India are the major causes of environmental pollution.

Recently several studies have been carried out to understand the effects of landfill pollution on human health as well on the environment. Toxic gas emissions from landfills pose a serious threat to the environment as well as on human health. Some studies have shown that toxic gases released from landfill sites are even responsible for lung and heart diseases in humans. Landfills also generate a toxic soup known as leachate, formed when waste is subjected to biological and physicochemical transformation. Leachate is highly toxic and causes land and groundwater pollution.

c. Waste collection in badlapur

The city produces around 60 tonnes of mixed waste every day. KBMC does not provide door to door waste collection service and hence segregation at source is difficult to achieve. On the one hand, many buildings do not have appropriate waste collection systems and neither do they segregate waste. On the other hand, there are other societies and buildings which segregate their waste. But all their efforts are futile as the KBMC waste transport vehicles do not support the transport of segregated waste. Buildings, societies, and townships hire various groups of people for a door to door collection. This collected garbage is then dumped at the nearest community bin which overflows very often causing it to rot and spreading diseases. KBMC vehicles then collect this garbage from the bins and transport it to the landfills.

For example, the Shashwat park, a township that has over 40 seven-storey buildings generates a large quantity of mixed waste. That is collected by a group of people who used to work as construction workers on the Shashwat park site. This group is made up of a few families who live in slums established in an area next to the site.

Waste collectors of Shashwat Park

Shilpi Mandal who provides a service of door-to-door waste collection in 3 of the buildings at Shashwat Park said "I am from Kolkata. I heard about this job and place from Indrojit. I was jobless and this job felt like a promotion. I have been working here for over 3 months now and this is my full-time job. I am responsible for collecting garbage from each house and dumping it in the buildings bin every day from where the garbage trucks pick it up. I get paid 7000 rupees for 3 buildings." She also adds that the waste is never segregated. She often falls ill, has fever and chest pains. She thinks she can power through it because she does not have other options.

d. Badlapur Dumping ground

Badlapur dumping ground

The KBMC waste transport truck does not support waste segregation. Even if a community, society, building or an individual gives out segregated waste, it is collected in a single container by the transport truck. All the wet, dry and hazardous waste, mixed together is then carried to the landfill at the edge of the city. At the landfill, all the waste is dumped and left to be. There is a fixed number of transport vehicles to which the job of transporting waste is assigned by the KBMC. These vehicles can do only a fixed number of trips to the dumping ground. Vehicles are logged in every time it comes

to the dumping ground by the KBMC supervisor. This is done to stop dumping by organizations or people other than KBMC.

At the dumping ground, the mixed waste is dumped and left to settle. A group of rag pickers who tirelessly work at the dump yard because of their poor economic condition, sort and segregate this newly arrived waste into things that they can sell for profit. Plastic bottles, thick plastic bags, hard plastic, glass bottles, other glass objects, metal objects, paper, cardboard, etc. are some of the categories in which the ragpickers segregate the waste. Even after the rag pickers are done with their job the waste is still a big pile of mixed waste which includes organic waste, fabric, plastic waste that cannot be cleaned and/or recycled, broken glass waste, construction debris, electronic waste, other hazardous waste, etc.

e. The Rag pickers

The rag pickers mostly come from Agripaada which is a village very close to the dumping ground. This dumping ground is fairly new. Before working here a lot of them worked on construction sites and granite quarries. With the introduction of machines at the quarries, as the machines were more efficient, the people got displaced. Then they found out about the dumping ground near them and because of their economic condition they had to take the job irrespective of their willingness. Families of all who work at the dumping yard also work at the dumping yard or are related to the business of waste in some way or another(drivers, ragpickers elsewhere, segregators at other places, sweepers, etc.). Even their kids come to the landfill in their free time to help their parents and family.

From Agripaada to the dumping ground

The work environment is intolerable by any human standard and to make a living and accomplish their task most of them have indulged in substance abuse. For them, this dumping ground has become their home. They have set up individual tents on the dumping ground where they rest during the break and eat food. This makes them even more vulnerable to the diseases that the garbage is capable of generating and spreading. Often the groups

Rag pickers at Badlapur dumping ground

work in shifts. They often come very early to sift through newly arrived trash to pick up everything profitable before anyone else does. Many rag pickers have also made a deal with the KBMC drivers who many times are their relatives. They go through all the trash even before the trash is dumped. Rag pickers work as individuals or sometimes as a complete family. All the collected material is segregated and kept in a pile which is sold at the end of the day to a middle man called sheikh who then sells it to the recyclers.

V. iii. Literature Review

When it comes to waste, most of us think that we know the basics of segregating our waste but do we even know where our waste ends up once it leaves our houses? More important question we need to ask is do we care? This attitude of a large population has been the problem due to which solid waste has become such a threat to the environment. Nowadays many problems faced due to environmental degradation are making news and are being talked about on social media. With increasing awareness amongst the population many initiatives were taken up and many measures were implemented by the government. The aim of this literature review is to study about different steps that were taken by different people using different media and analysing them to find out the strong points and shortcomings of different approaches.

a. The plastic ban:

India would phase out single-use plastics by 2022, announced Prime Minister Narendra Modi at the Sabarmati riverfront in Ahmedabad on October 2, 2019. A blanket ban though would not take place, contrary to expectations that were raised after the prime minister's mention of single-use plastics on August 15, 2019. In his speech on October 2, Modi said the phasing out was necessary not just for the welfare of the environment but also for aquatic life which was being affected by the consumption of single-use plastics. He also said the plastic blocked drains and roads,

creating many civic problems. “We have to build an Andolan (movement) to induce behavioural change which was at the heart of Mahatma Gandhi’s philosophy,” the Prime Minister said. A number of states have imposed a ban on plastic bags. However, notwithstanding the ban, the use of plastic bags has evidently continued with its presence among fruit or vegetable vendors handing out hundreds of plastic bags each, every day, and eventually ending up choking the city drains. This plastic ban does not stick around for various reasons like lack of knowledge about plastic and its ban, economic alternatives, lack of control over the production of plastic and lack of information about the immediate impacts of using plastic.

There have been multiple campaigns organized by the government for spreading awareness and securing people’s cooperation. We can say that these have not been successful as we can still see plastic waste on roads, piled up in dustbins and garbage containers along with other organic waste. Polythene bags are still rife even years after the ban on polythene was introduced. Other reasons that rendered these campaigns less impactful were that these were organized only in selected places and the campaigns disseminated knowledge about the problems and what should be done to manage it without considering what the actions of the people were. The campaigns failed to effectively communicate the link between people’s individual actions and environmental problems. The campaigns also focussed more on environmental impacts. The health, economic and social impacts that directly affect the population in the short term were not focused on. There were attempts to increase the reach by organizing campaigns in schools, colleges and communities. Even in this case, the reach was not so high as not all the schools, colleges and communities were addressed and it wasn’t at the convenience of the people.

One of the communication materials that were used in the campaigns. The material according to the people who attended them, were not engaging and sufficient.

b. Alternatives to plastic

There are other innovations going on in the field of packaging material. Designers are desperately trying to come up with a solution to the plastic problem. Scientists have come up with a solution called d2w (degrade to water). Ordinary plastic can be reused and recycled – however, if it gets into the environment it can last for many decades. Symphony Environmental Technologies PLC has found the solution to this problem by developing d2w additive, which is added during the production process - making it "oxo-biodegradable" or "oxo-bio" for short. D2w oxo-biodegradable plastic has a pre-programmed life. At the end of this useful service life, the process of oxo-biodegradation starts and the plastic will be eventually broken down into water, carbon dioxide and biomass. The plastic will degrade and then biodegrade in the dark or sunlight, heat or cold, land or sea, leaving NO fragments, NO methane and NO harmful residues, thus avoiding pollution and damage to the environment and wildlife. There is little or no extra cost and its strength and other characteristics during its service-life are the same as ordinary plastic. The degradation process is initiated at the time the polyethylene or polypropylene is extruded by the inclusion of a small amount of d2w additive, which works to break down the carbon-carbon bonds in the plastic leading to a lowering of the molecular weight and eventually, loss of strength and other properties. Stabilisers work to ensure that a sufficiently long useful life is provided for each specific application. For example, a refuse sack might require a useful life of say 18 months before beginning to lose its strength whereas a bread bag might only require a few weeks. Significantly, the d2w range does not need a biologically active environment to start degrading - this will happen even if the plastic is left in the open air or in the sea! This is very important if we are to address the serious litter problems caused by waste plastic. For this reason in particular, 'oxo-bio' plastic is preferable to 'hydro-degradable' e.g. starch-based plastic, which requires an active bio-environment before degradation will work.

People have started working on biodegradable packaging worldwide and are coming up with various solutions like:

Cornstarch packaging: Cornstarch is an organic material that has made in-roads into the eco-friendly packaging industry. Derived from the corn or maize plant, it has plastic-like properties, which can be used in many contexts that have traditionally relied upon plastics. From bottles to molded forms and loose-fill packaging, cornstarch packaging adds many additional uses to this crop. While a more environmentally sustainable alternative to petroleum-based packaging, cornstarch is not without its problems. As it is derived from the grains of corn, it effectively competes with the human and animal food supply, possibly raising the price of one of our dietary staples. It's best to weigh both the pros and cons of this option when considering it for packaging needs.

Mushroom packaging: Another cheap, eco-friendly packaging alternative that can be used to support smaller items is made from mushrooms. It uses cleaned and ground agricultural waste, which is then fused together by a matrix of mushroom roots, otherwise known as mycelium.

Seaweed packaging: From corn to mushrooms to seaweed, the gelatinous

substance agar, which is found in a variety of seaweed and algae, is already used in several applications. This is the case especially in the food industry, where it can be utilized as a thickener or a vegetarian alternative to gelatin. But now a team of designers has won a design award for prototyping its use as a packaging material. Being made from a plentiful and sustainable raw material, seaweed packaging could be the next big thing in eco-friendly packaging alternatives.

Organic fabric: Plastic bags have been a staple in impacting the environment. A large percentage of businesses use plastic bags which end up polluting the environment. An eco-friendly alternative is organic fabrics for reusable bags. There are a bunch of different organic fabrics on the market now including hemp, organic or recycled cotton, tapioca, palm leaves, and many more. All of these materials even if throw out can biodegrade in around 100 days compared to the 10,000 years it takes for a plastic bag to biodegrade. There are also many other uses for these fabrics besides bags if you can get creative.

Biodegradable plastic and Bioplastic are coming about as an alternative to plastic. These are growing slowly because of many reasons. First, the process and technology are fairly new and costly as of now. As long as there are other cheaper alternatives on the streets, there is a very low probability that people will switch to bioplastic. More than that, as these are newer alternatives, it is too soon to predict their adverse effects. Other problems with it are the use of chemicals that are needed to treat it. Based on how the bioplastic is obtained or the chemicals used for making plastic degradable, the conditions in which these plastics degrade are different. Some bioplastics biodegrade with oxygen and ultraviolet radiation, so litter left out in the sun will degrade. However, it still doesn't completely decompose and the process takes years. Some plastics are designed to biodegrade when composted, which does not do any good if the consumer does not compost. This results in a lot of confusion for consumers. Other than that, the decomposition of bioplastics releases methane, which is a more harmful greenhouse gas than carbon dioxide.

"Biodegradable is a vague term, if you think about it. It has no defined time frame under which the material will breakdown. Given enough time, all matter will eventually biodegrade say, 500 years for conventional plastics. In contrast, compostable plastics are designed to completely biodegrade under controlled conditions within 180 days. Their quality and claims are regulated by a set of standards and certifications such as ASTM International, European Norms, DIN Certo etc...

.. Bioplastics arguably have a lower carbon footprint than conventional plastics due to their reliance on biomass and their potential to 'close the loop'. However, the current use of carbohydrate-rich crops as feedstock and possible pesticide/fertilizer contamination has been a bone of contention amongst critics. According to them, bioplastics have the potential to compete for arable land and aggravate food insecurity. This burden on land can be reduced drastically by commercialising innovative secondary and tertiary feedstock such as seaweed, organic waste, sunlight, microbes etc. Such innovative sourcing can validate agri-residues and waste.

Despite these benefits, one major limitation against their feasibility in India is their unique disposal requirements. Compostable bioplastics require controlled conditions (pH,

temperature, humidity, etc) that can only be found in industrial composting facilities. Moreover, these materials take longer to break down as compared to the preferred compost feed (organic waste) and may add toxicity to the resulting compost. The high rate of contamination of these compostable plastic waste streams by conventional plastics further diminishes their credibility." (Can bioplastics save us from drowning in our own waste?, DownToEarth.org.in)

The government has still not clearly defined the single-use plastic it has decided to phase out by 2022. There are no clear guidelines or timeline explaining how the phasing out is going to be achieved. This lack of crucial information has resulted in chaos in plastic industries and consumers. This has been the case every time the government has tried to ban plastic. Lack of knowledge has led to a lack of enforcement. Lack of affordable alternatives has added to the problem. This may accelerate the influx of biodegradable alternatives into the market, which will invariably, given the present waste management systems in the country, add to the plastic conundrum.

c. Initiatives by a local NGOs:

A local NGO, eCoexist initiated work on cloth bags through a campaign called UseMeAgain in Pune. This campaign aimed to encourage people to switch to the use of cloth bags from plastic and to buy or make bags that they could use again and again, hence the name. This approach came from the understanding that unless the Use and Throw attitude was replaced by a Reuse attitude, we would continue to generate waste of all kinds.

In this campaign, they involved residents of Kalyani Nagar, students from the two schools in this neighbourhood, shopkeepers and vegetable vendors. They went from house to house and shop to shop speaking to people about the need to replace plastic bags with cloth bags and to help them make a beginning, offered free cloth and newspaper bags. Beyond raising awareness, they also realized that unless there is a steady supply of natural alternatives materials such as plastic could not be replaced. This was the beginning of their brand of cloth bags which they named, the UseMeAgain bags.

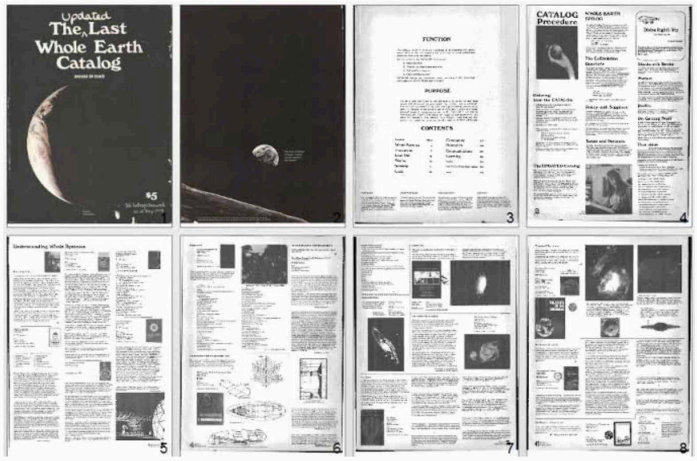
Other NGOs like Greenyatra, Stree Mukti Sanghatana, etc are also working locally along the same lines. These NGOs have been more successful because of the participatory design model and more localized yet holistic approach towards the problem. It took time for the campaigns to show results. The main reason because of which it worked was that the people got time to adapt to the change. Another crucial point that worked was that it was interactive and both the producers and consumers were addressed. Even though the solution was local the idea or the model they used to generate employment and reduce plastic waste can be applied elsewhere. The propagation of that idea can prove useful.

In order to correct something, we have to realize that it is wrong. Even though solid waste management is a global phenomenon, it was observed that the knowledge, amongst the youngsters and middle-aged people, regarding the issue of solid waste management is very limited. With this limited knowledge, all the actions around solid waste management, be it correct or incorrect, have eventually become a part of everyone's lifestyle such that they are no longer questioned. Other than convenience, another

reason why we are unable to reject plastic is that the consequences of using plastic and its improper disposal are long term, be it on our health or the environment. Their impacts on everyone's health are not quick and direct and hence people don't understand the urgency of the problem, nor are able to link their day to day actions to the consequences of plastic pollution. This is why the resistance to change their habits is more. Other reason is that nature, as observed, is much lower on people's priority list than some of their other day-to-day problems.

d. The whole earth catalogue

The Whole Earth Catalog (WEC) was an American counterculture magazine and product catalog published by Stewart Brand several times a year between 1968 and 1972, and occasionally thereafter, until 1998. The magazine featured essays and articles but was primarily focused on product reviews. It was like the bible for the people from the counterculture (the hippies). It focused on self-sufficiency, ecology, alternative education, holism and the idea of doing everything yourself. It acted as a link between the hippies and the tools and information needed to achieve and sustain such a lifestyle. In true sense it was a guide on how to live on your own. It came out before the Internet and at that time, print media had a good reach. It was edited and republished several times but there were months between two issues. It would have been much quicker to update and get feedback from the users.



Picture Credits: https://medium.com/the-long-now-foundation/we-50th-f254b39da659

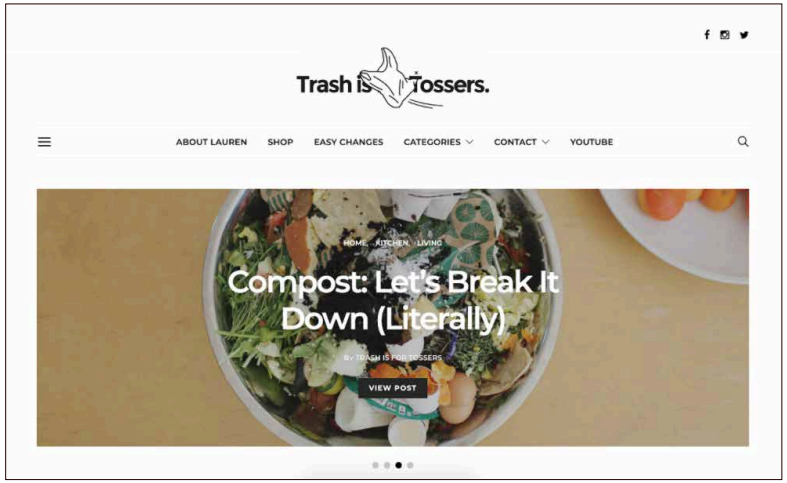
Over 34 editions of the Whole earth catalog were published between 1968 and 1998.

e. Blog: Zero waste home by Bea Johnson and other blogs like trash is for tossers by Lauren Singer and companies like Bare Necessities founded by Sarah Mansoor

It is a blog started by Bea Johnson to share with the world her experience of switching to and living a zero-waste lifestyle. Bea Johnson has inspired millions of people worldwide with her stylish, waste-free life. She reduced her household waste to an astonishing one kilogram per year and now she helps people reduce their waste through various videos and her blog. Inspired by her, Lauren Singer has also started her own blog and making

videos on how to reduce waste. The steps and solutions are generalised for the entire population and the information is in bits and pieces for free. Information, in more complete sense, is available in their books. The reach of print media is less. Moreover, the information is not free and hence cannot be shared offline. The information is not in detail and the consequences of the actions of humans is not properly linked with the actions in the book and the blog. The suggestions are very generalised, but if specific data is used for specific locations a more tailored aid can be made. The blogs have become more about the person than the cause. Interaction between the readers is not possible which is very important to facilitate discussions amongst the population and propagate the idea.
In case of Bare Necessities, the website has become more about the products they sell and less about people's responsibilities. The consumerist attitude of this throw away culture is not addressed. Through this site people buy green products instead of plastic products but the problem is not solved from its roots. Even in this case the information is not free.

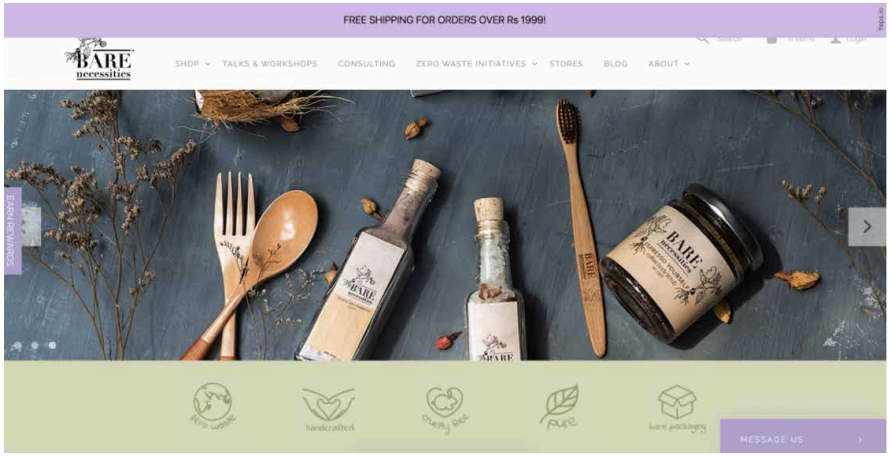
It does much more than other websites do. Even though this website sells products, the focus on the environment is evident. A lot of the information is free but in scattered form.



Picture Credits: http://trashisfortossers.com Homepage of Trash is for Tossers by Lauren Singer

The homepage itself looks like that of an online shopping website. The focus is all on how to sell the products rather than the effect on the environment. They consult and organize talks and workshops but the information is not for free.

The following is the homepage of Bea Johnson's website which focuses on her and her family's experience of the zero waste lifestyle. The website can be used to book her for a talk or to buy a number of books written by her on the subject. The books on topics like how to live a zero waste life are also available on various online shopping websites.



Picture Credits: https://barenecessities.in The website of Bare Necessities

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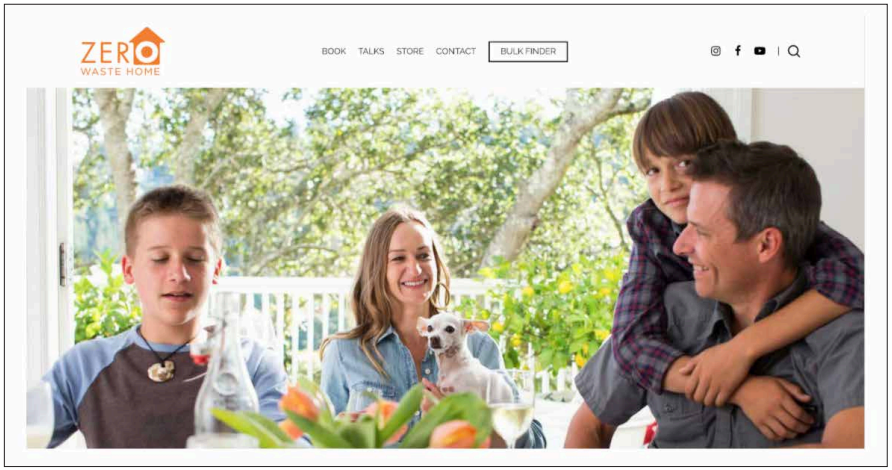


Picture Credits: https://zerowastehome.com

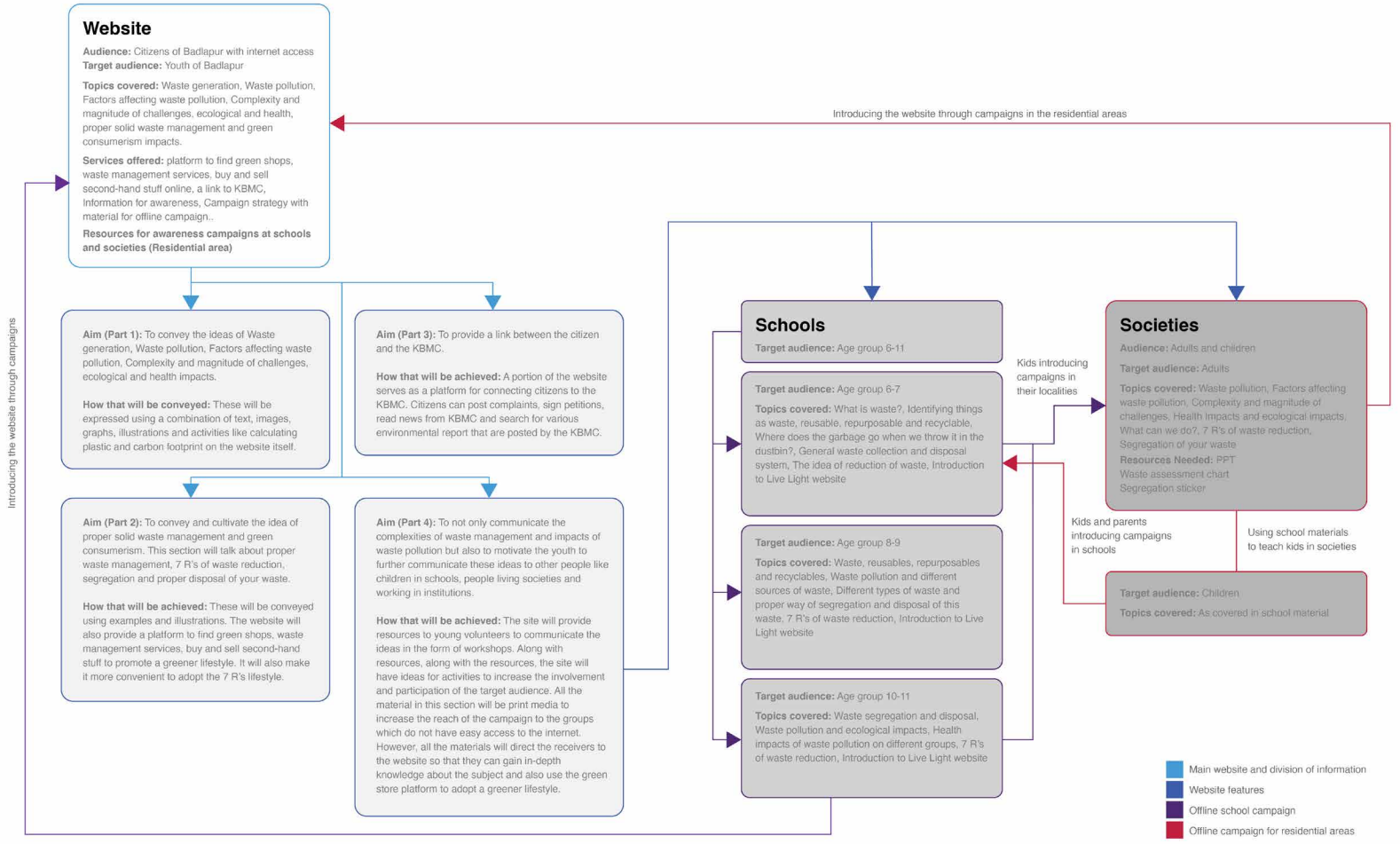
It was seen that most of the information is not free. The environmental consequences of good and bad decisions of people is not communicated through any of the websites. The information is general and fragmented. It needs to be tied together so that the entire narrative tells how one can become a green consumer step by step. The information should be local and specific to work better.

After analysing some of the existing measures following were the observations regarding what can be a potential solution:

1. Potential communication solution must have a great reach amongst the population of the country. That means it should be something that is easily accessible at the convenience of the people, easy to share, should cross language and platform barriers and be quick when needed.

2. It should effectively communicate how each small action of the people is linked to or responsible for the bigger picture. The strategy should not just be about telling everyone what is the right thing to do. It should aim at building better habits in which the first step is realization. Everyone should realize if and how they are wrong themselves in order for everyone to have the enthusiasm and will to even try to change their habits. Hence the solution should be interactive and based on learning, understanding and contributing.
3. It should support other measures and initiatives that have similar goals and ideas rather than competing with them.
4. The solution should be participatory, should connect people and be able to propagate good ideas forward. People should not only gain information but must also be able to contribute to it. It should facilitate a dialogue. People should be able to question and discuss the information provided by the system.
5. It should be accurate and clear in terms of the information it provides. The information shared by the people should be moderated as per some guidelines so that the communication channel can be monitored for misuse.

VI. Campaign Strategy and Design



Concept diagram of the strategy

VI. i. Online Campaign Strategy

With my research, I have discovered several reasons behind the disinterest in developing solutions to the excessive waste generation and its mismanagement. One reason is that these green habits seem to be at odds with the fast-paced urban lifestyle. It needs a significant change in behaviour and thinking, and change is always difficult. An equally important reason is the lack of media coverage and information along with the social stigma around waste collection and disposal. However, one of the most important reasons is that the waste disposal system has been completely separated from the rest of society. The waste collected is sent to dumping grounds, where it is hidden from the public eye. Most people are unaware of the functioning of the disposal system, along with the issues it is facing. Due to this secretive nature, society is unaware of the significance of waste production and the efforts of waste handlers.

What is needed to fix this problem is awareness. With the use of the internet, this information can be spread easily to one group in particular: the youth. As the first generation that has grown up with the internet, they are one of the most knowledgeable groups, having the most reach when it comes to communication. They are also the first generation that will have to face the consequences of waste mismanagement. More than anything else, starting early is an excellent way to develop good habits, empathy and a sense of ownership. For the above reasons, the youth of Badlapur was selected as a primary audience.

My secondary target audience is school children. At such a young age, their minds are incredibly flexible. Being young means the ability to accept new ideas and learn to think in a particular way. The difference between learning and changing is that changing your habits is a lot harder than simply doing something new. Ideas are readily accepted, and therefore, children can be taught to understand the importance of waste management and the contributions of waste handlers. In turn, they can teach their parents the same ideas and make changes beginning from their own houses.

Website:
It is the primary medium through which the entire concept of waste and waste management will be conveyed. The high reach of the internet, endless possibilities of the platform and familiarity of the target audience with the medium makes it the best possible medium.

Aim (Part 1): To convey the ideas of Waste generation, Waste pollution, Factors affecting waste pollution, Complexity and magnitude of challenges, ecological and health impacts.
How they will be conveyed: These will be expressed using a combination of text, images, graphs, illustrations and activities like calculating plastic and carbon footprint on the website itself.

Aim (Part 2): To convey and cultivate the idea of proper solid waste management and green consumerism. This section will talk about proper waste management, 7 R's of waste reduction, segregation and proper disposal of your waste.

How they will be conveyed: These will be conveyed using examples and illustrations. The website will also provide a platform to find green shops, waste management services, buy and sell second-hand stuff to promote a greener lifestyle. It will also make it more convenient to adopt the 7 R's lifestyle.

Aim (Part 3): To provide a link between the citizen and the KBMC.
How it will be achieved: A portion of the website serves as a platform for connecting citizens to the KBMC. Citizens can post complaints, sign petitions, read news from KBMC and search for various environmental report that are posted by the KBMC.

Aim (Part 4): To not only communicate the complexities of waste management and impacts of waste pollution but also to motivate the youth to further communicate these ideas to other people like children in schools, people living societies and working in institutions.
How they will be conveyed: the site will provide resources to young volunteers to communicate the ideas in the form of workshops. Along with resources, along with the resources, the site will have ideas for activities to increase the involvement and participation of the target audience. All the material in this section will be print media to increase the reach of the campaign to the groups which do not have easy access to the internet. However, all the materials will direct the receivers to the website so that they can gain in-depth knowledge about the subject and also use the green store platform to adopt a greener lifestyle.

A part of this entire campaign was designed to increase the reach to the secondary target audience, which doesn't have easy access to the internet. School children form the most important subgroup of the secondary target audience. The aim was also to increase community participation and establish the presence of the symbol and the idea it represents and to make green consumerism a way of life. Following are the strategy and resources that were planned and developed, to be made available for download on the main website.

VI. ii. Offline Campaign Strategy

The current waste management practice in India collects waste from a community collective bin system. It transports it to a low-lying landfill system with intermediate processing of Municipal Solid Waste (MSW). Open dumping is inducing several problems such as pollution and health hazards, affecting surface water, and especially groundwater. These procedures are not ideal, leading to the solid waste management crisis.

There is a curious naturalist in every child. School teachers and parents can nurture this love for the environment. Environmental education must be a significant part of the school curriculum for all classes, with seminars, field trips, and competitions on environmental themes encouraging them. If they're taught cleanliness, conservation, and wise use of resources when they're young, it becomes a part of them their entire life.

Each school should have clubs, which can promote the message of a clean environment. The site can assist any concerned citizen who wishes to make a change.

Step 1: Gathering other volunteers
The free downloadable posters on the website can help in making a successful event or to find volunteers to help start a club. The users can add contact details for other volunteers, and can be circulated through social media or pinned up on notice boards.

Step 2: Gathering new members for the club
Similar to the previous step, the site offers free downloadable posters, which can be customized with contact details, a topic for that week's meeting, registration procedure, etc.

Step 3: Framework for the club activities
Guidelines for holding meetings, topics to be discussed, list of materials that can be used to convey correct information to students, exercises that you can perform for each age group are compiled into one document and is available for download.

Topics:
1. Resources and waste
2. Segregation of waste
3. Impacts of resource exploitation
4. 7 R's
5. Reducing waste and consumption
6, Redefining waste

Activities that the club can organise:
**Note: These activities are some of the many activities that can be performed with the kids to make them understand the concepts better. These can be modified to fit and work for the target audience.

'Resources and waste' activities:
Step 1 - LEARNING : After discussing resources and waste, ask all the kids to select two things that they consider resources and two things that they consider garbage. Ask all the kids to paste the actual objects they chose, a picture of it or draw it on two papers named Resources and Waste.

Step 2 - QUESTIONING : Encourage the students to ask at least 20 questions about each object that they choose and find out the answers to them in the coming week. Then, in the beginning of the next section, ask them to write the answers next to their objects. Help them with the type of questions they can ask by giving them some examples. Objects can have some common questions.
Some of the questions are provided here as examples. These can be shared with the students to get them started.
1. What is this object made of?
2. How long does it take to make it?
3. Who makes it?
4. Who uses it and how often?
5. What happens to it when we throw it away?
6. Is it harmful to the environment, and if so, how?
7. Can we do without this object?
8. How long does it take to decompose?

'Segregation of waste' activities:
This activity is to teach the students about different kinds of garbage like Recyclables, Compostable, Hazardous waste, inert waste, E-waste, Biomedical and sanitary waste. After a discussion on the mentioned topic, the following activity can help you to clarify the concepts further.

Step 1 - LEARNING: Ask the students to read the information written by them next to each waste object and use that information to classify it into Recyclables, Compostable, Hazardous waste, inert waste, E-waste, Biomedical and sanitary waste. Encourage the students to ask questions like:

1. Why is it classified as it is?
2. Why does it matter?
3. What if we do not do it?
4. What happens after classification?
5. What does the kabadiwala do with all this waste?
6. Why do we still use things that are harmful to us and the environment?

Discuss the correct classification and check if a student has classified object(s) differently along with the reason for it. Then, once everyone is on the same page, ask each student to select two waste objects and write their classification next to them with the reason behind the classification.

Step 2 - APPLICATION AND MAKING IT INTO A HABIT : Using the above knowledge, urge the students to start segregation at home. You can download and print out the waste segregation and analysis chart from the Live Light website and hand it out to the students to aid them in segregation of the waste at home everyday. Discuss this waste segregation and analysis chart of each student to get a sense of how the student is learning. Over a period of time, once you are sure that the student has made segregation into a habit, you can stop asking them to use the waste segregation and analysis chart.

Step 3 - LEARNING, APPLICATION SPREADING THE WORD: Organize a trip to the dumping ground and get the kids to meet the ragpickers working there. Before going to the dumping ground, ask the students to make a list of questions around the health impacts of working in the landfill, ragpicking, local recyclers and recycling, the waste problem, the role of each citizen, etc.

Then, team up with the ragpickers and study the present scenario of the segregation in school or a particular locality. Organize an awareness campaign for the citizens of that locality about the need for and proper way of segregation with the help of rag pickers. During this campaign itself, set up a network through which the citizens will be able to hire these ragpickers to achieve segregation at the building, society, or any other source.

'Impacts of resource exploitation' activities:
This activity is to teach the students to inspect the sources of different objects they use and how it affects them and the environment. You can perform these activities with the students, after a discussion on how things are made (Resource extraction, Manufacturing, packaging, delivery) and how the process impacts the environment.

Step 1 - LEARNING : The activity can include the students picking up one object from the list and then track down the origin process of the object and its impacts on the environment. Ask them to add the information to the page next to the object.

Step 2 - DESIGNING AND APPLICATION: Select a specific waste problem that is a result of increased generation of a particular kind of waste. It can be paper, MLP packaging, car, charger, phone, etc. Describe the problem to the students and together with them, try to come up with an alternative solution.

You could take up the problem of absence of a household hazardous and medical waste collection and disposal system in Badlapur.

Divide the students into groups and assign different conditions and parameters to each group. One group can come up with a design of a transportation system (Vehicles, precautions, routes, etc.) that can accommodate and facilitate the collection and delivery at the disposal plant. The second group can come up with ideas for a disposal plant which caters to the needs of Badlapur and the kinds of biomedical and hazardous waste it generates. The third group can try to design solutions that will help reduce this kind of waste to a minimum by coming up with substitutes or alternatives to different materials and objects.

Step 3 - SPREADING THE WORD: In this way, you could take up a problem and divide it into parts and then let different groups of students tackle them. In the end, all solutions may be modified to work together as a complete practical solution. Select a platform on which you can upload this solution and other people can see and comment on it. This will not only motivate the students with more such solutions but also inspire others to do the same.

'7 R's' activities:
Refuse, reduce, reuse, repair, refurbish, repurpose and recycle are the 7 R's which need to be followed by everyone to minimise the amount of waste one generates. All the R's are explained on the site. Different activities can be conducted for different R's according to the availability of resources and the target audience. Two activities for repair and repurpose are outlined and visualised, for example. Similar activities and structure can be used to conduct activities for the rest.

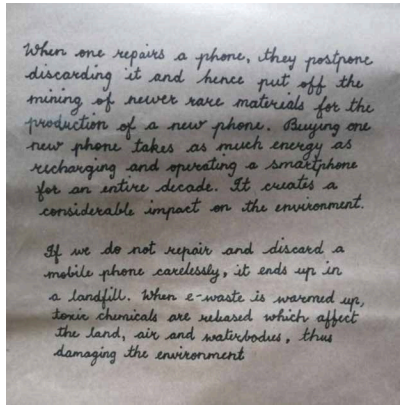
'Repair' activity:
Keeping in mind the life of the students and things they use, interact with, and break, a session can be organised on a Saturday where 13 to 15-year-old students get to learn to repair something they use. The students can learn how to stitch and fix different kinds of tears, fix their footwear, fix their bags, bottles, equipment and devices they use.

The second part of the activity can be conducted on the next day (Sunday) where the old kids teach stitching, fixing tears, fixing footwear and bags, etc. to the younger students. The activity can end with the younger students fixing something they own using the skills they just learned.

Step 1 - LEARNING: Gather students from the age group 13-15. Arrange a one-day workshop for them in which they learn how to repair some basic electronic devices, clothes and footwear.


Demo images to show how the workshop might look like

Step 2 - APPLICATION: Give them an assignment at the end of the workshop. Ask the students to select one item that needs repair, and repair it. Ask them to take a before and after picture of the item and write down how their action helped the environment by not sending the old device to the landfill and not buying a new one.

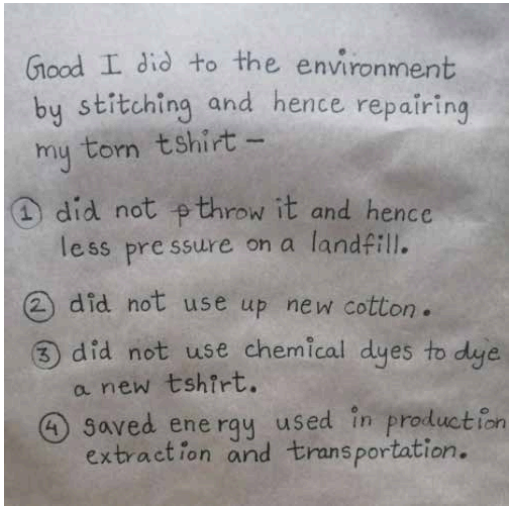


Example of how the note might look like

Step 3 - TEACHING AND SPREADING THE WORD: Get these students of the age group 13-15 to come together and conduct a similar workshop for the age group of 6-8 where they teach them how to repair their clothes, bags and footwear.

Demo image to show how the workshop might look like

Step 4 - APPLICATION AND CONTINUING THE CHAIN: Ask the students of the age group 6-8 to select one item that needs repair, and repair it. Ask them to take a before and after picture of the item and write down how their action helped the environment by not sending the old device to the landfill and not buying a new one. After this workshop, ask the students to convey the message to their parents, friends outside school by conducting similar workshops outside the school.



Example of how the note might look like

Step 5 - TURNING IT INTO A HABIT : Repairing must become a habit and for that the motivation must last. Give the students a platform where they can upload their work and things they repair. Encourage them to learn to repair new things and upload how they learned it too. This will not only keep the students motivated but also inspire others to do the same.

'Repurpose' activity:

The main idea here is to get the students to think creatively to repurpose things that cannot be refused, reused or recycled. As a volunteer, you can ask the students to choose anything they consider waste, or you can select a waste product that everyone will repurpose into ten different products. (things made do not have to be functional)

E.g. MLP waste cannot be avoided as it is a necessary part of food packaging industries. The fact that makes it worse is that it cannot be recycled. It can be repurposed, but the companies who do that are very few, and most of the MLP ends up at dumping grounds polluting the air, water and land. As a part of this activity, you can ask the students to repurpose their chips bag (or any MLP) into ten different things. The things made may or may not be functional. The idea is to get them to create something that will increase the value of the chips bag and prevent them from ending up at the dumping grounds.

Step 1 - LEARNING : Meet the students one week before the actual meeting and ask them to collect all the MLP they generate in the coming week and bring it to the meeting. Discuss how the MLP is necessary for packaging (cannot be avoided) and cannot be recycled. Hence the only way in which one can make a difference is by reducing the use of MLP where possible and repurposing the MLP waste.

Step 2 - DESIGNING AND EXPERIMENTING : In the meeting, ask them to repurpose this MLP waste into ten different products. The products can be anything that will prevent the garbage from ultimately ending up in the dumping ground. The fact that this waste should be reduced first and repurposed when it is unavoidable should be stressed enough.

Collected MLP waste

Step 3 - SPREADING THE MESSAGE FORWARD : After this workshop, ask the students to convey the message to their parents, friends outside school by conducting similar workshops outside your school. Ask them to get together with other kids outside school and find out who around them repurposes MLP waste. They can also organize a multilayered plastic collection drive in which they collect MLP waste from peoples' houses along with telling them about why MLP should be reduced and repurposed.

Examples of what the MLP can be repurposed into

Step 4 - EXTENDING THE IDEA TO OTHER WASTE AND MAKING IT A HABIT : Ask the students to make a list of things they use that cannot be recycled. Give them a platform to post this list and ask them to update the list as they start refusing, reducing and repurposing the waste.

The platform can also be used to share alternatives, and repurposing ideas. This will keep them motivated and also inspire others.

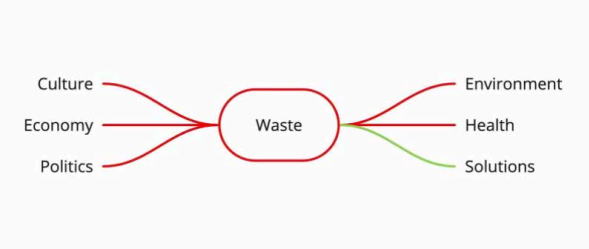
Note for other R's: The activities should be planned in a way that the students should incorporate the things the students learn into their lifestyles. Along with this, there must be a way to quantify the change students make. Hence you can target a particular area which generates waste and measure the change the students make. It can be their own houses, the school canteen, the xerox centre, etc. Introduce them to the methods by which they can analyse the waste they generate so that by the end of the entire campaign, they have a good idea of what change they have produced.

E.g. One the first day, ask the students to maintain a diary in which they note down all kinds of waste they generate, every day. As the students go through different lessons on waste and the 7 R's they will learn about different things they should avoid, various alternatives to harmful products, different ways of repurposing waste, etc. In this way, by the end of the campaign, they will have a track of the waste they have reduced and good habits that they have cultivated. This information will help them calculate the positive impact that they have created on their environment.

VI. iii. Developing Information Architecture

a. Initial Information Architectures

During my first field visit to Badlapur, I realized that the generation of waste is an inherent part of our lifestyles and hence cannot be dealt with outside a context. The aim of this project is not to communicate solid waste generation as a single problem that needs to be tackled but as a phenomenon that is linked to various other aspects of life. After a brainstorming session, the information was structured around the following concept map:



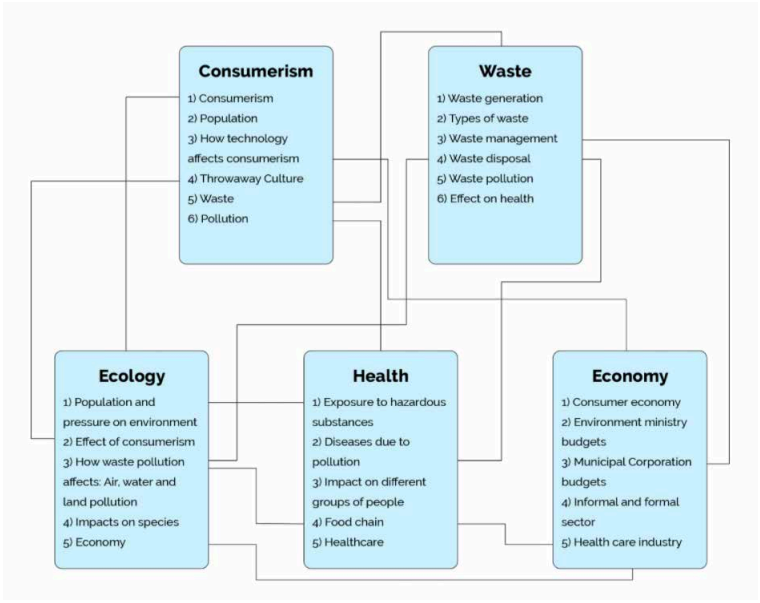
Concept map 1

After my fieldwork and additional reading on how the generation of waste has been looked at by various countries, organizations and people, and adding more information to the existing concept map I realized that the current information architecture lacked the following:

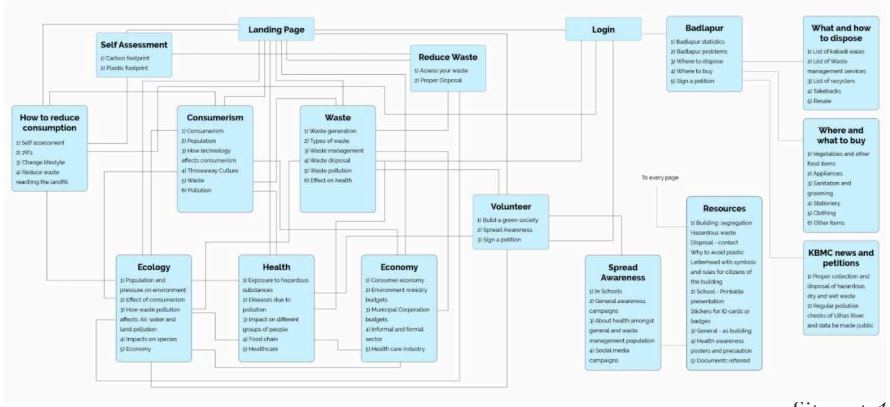
1. The information architecture did not take into consideration human behaviour concerning waste.
2. The relationship of waste with different groups of people.
3. The problems faced by people who handle waste.

4. Impacts of waste pollution other than ecological and health.
5. Information about local waste management services and green shops.

All these aspects are an essential part of the information architecture as the problem of waste is not one dimensional. The points mentioned above define how the waste moves in our society, who it affects, and how it is perceived by everyone. Studying waste holistically with all its interconnections with the lives of different groups of people is the first step towards sensitizing people toward this issue and developing an efficient solution. After considering all these points I structured the information in the following way:



Information architecture 1



Site map 1

After reading Dan Brown's 8 Principles of Information Architecture (IA):

1. The principle of objects

This principle means viewing content as a living thing, with its own lifecycle and featuring behaviours and attributes. The architect needs to define and understand the nature of these when embarking on a structure.

2. The principle of choices

Create pages that offer meaningful choices to users, keeping the range of choices available focused on a particular task and, therefore, relevant to the user. Too many options can be worse than too few as users can become bogged down, and even paralysed with indecision is overloaded with choice.

3. The principle of disclosure

Only show users what they need to decide if they want to delve further. Once they appreciate the nature of the option they can pursue it or not as desired.

4. The principle of exemplars
If some of the category options are not self-explanatory use some examples of the content to show users what they will be accessing. Images can be especially useful and expressive in this context.

5. The principle of front doors
Not all users will enter your site at the home page so don't construct your site for just those that do. Give people who arrive at other pages the chance to view useful information and navigation aids from wherever they come on board and try to make your site accessible from wherever they land.

6. The principle of multiple classification
Provide different ways for users to search the content on your site. Using search and top-level menus are two ways of doing this, but some users might wish to browse or move through the hierarchy so make sure your information architecture meets their need.

7. The principle of focused navigation
Keep your navigation aids consistent. Make sure your menus relate to the same areas and don't mix subjects and confuse the user. If you are producing a menu of product types don't drop other services into it or if the menu is for navigational purposes don't include functional or marketing items.

8. The principle of growth
The content you start off with will only be a small fraction of the content you will acquire so your site needs to be scalable. Give it room to grow and develop organically and by addition.

After reading this I realised that one more thing that was missing was the users' perspective and behaviours. When designing a government service, always start by learning about the people who will use it. If you don't understand who they are or what they need from your service, you can't build the right thing. To incorporate this into the design user personas were built after interacting with a small group of potential users.

b. User Personas

User personas, in user centered design are fictional characters created based upon the user research to represent the different user types that will use the services and the website. Creating personas help us understand the users, their needs, experiences, knowledge, behaviours and goals.
Two main types of needs define any product or solution that people use: Business or solution needs and user needs. The successful design helps us maintain a balance and fulfill both types of needs as efficiently as possible. In this case the solution needs are reduction in the use of disposables, and with proper waste management, ultimately reduce the amount of waste reaching the dumping grounds. The user needs are a little complicated as the user target audience are all the citizens of Badlapur.

Following personas were built after talking to and observing 50 citizens of badlapur from different walks of life.

These user personas were taken into consideration while making the final concept map, I made sure that the navigation was easy, keeping the number of choices to a minimum at each step and that the entire system accommodated growth in information.

College going student

He belongs to upper-middle class. He is used to a fast-paced, carefree lifestyle where he has access to almost everything. He does not worry about the environment as long as the impacts are not immediate or direct. He likes to keep updated in terms of technology and fashion and hence shop online a lot. He is used to throwing away things he does not need. He does not carry a lunch box or a water bottle. He orders food online too and buys plastic water bottles when he is thirsty. He has a maid who takes care of the waste at home, which is why he is not bothered about where the garbage goes once it leaves his house.

Knowledge about internet technology:

Knowledge about Ecological and health impacts of waste:

Knowledge about proper ways of waste management:

Willingness to change his lifestyle for the environment:

Business owner

He owns a business and a shop. He cannot avoid the packaging that comes with the products he sells. As a large portion of his customers are middle class, plastic is a very cheap alternative and hence sells the most. He tries to push his customers to buy eco-friendly products and packaging, but as they are comparatively more expensive, they do not sell much. He is environmentally aware and wants to go green and does not how to go about it. He urges the customers to bring their own bags but has to sell plastic bags when customers do not have their own bags.

Knowledge about internet technology:

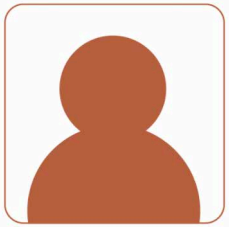
Knowledge about Ecological and health impacts of waste:

Knowledge about proper ways of waste management:

Willingness to change his lifestyle for the environment:

Daily wage labourer

He belongs to a meagre income group and works for daily wages, especially as an unskilled labourer. He wakes up every morning, packs his food and water and sets out in search of work. Many times he ends up picking up recyclables from the waste bins or dumping ground and selling it to a local kabadiwala for money. He buys food for him and his family on his family from the local market on his way back. He does not shop much, and when he does, he can only afford second-hand. He owns an old and cheap phone which does not have internet access. His and his family's survival is his top priority. He keeps falling ill because of the conditions he works in.



Knowledge about internet technology:

Knowledge about Ecological and health impacts of waste:

Knowledge about proper ways of waste management:

Willingness to change his lifestyle for the environment:

Working woman

She comes from a middle-class joint family. She works in a multinational company. Even though she is not tech-savvy, she can use the computer and the internet very well. She does not shop much and does not like to shop online as she likes to check the item first before buying. She carries a lunchbox and a water bottle with her always. She also carries a cloth bag with her to shop for vegetables, fruits, groceries, etc. on her way back from office to home. She does not care about the environment as long as the impacts are not immediate or direct. Providing for her family and their health have higher priority than nature. The main kind of waste she produces is sanitary and biomedical waste.

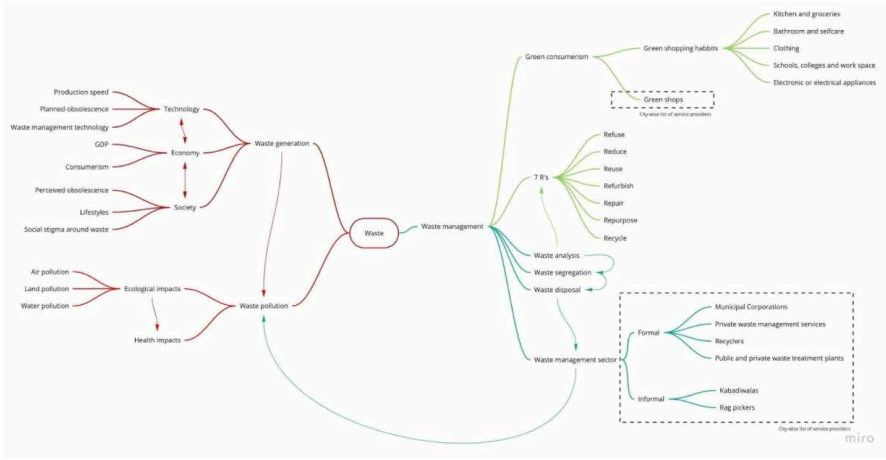
Knowledge about internet technology:

Knowledge about Ecological and health impacts of waste:

Knowledge about proper ways of waste management:

Willingness to change his lifestyle for the environment:

c. Final Information architecture



Concept map 2

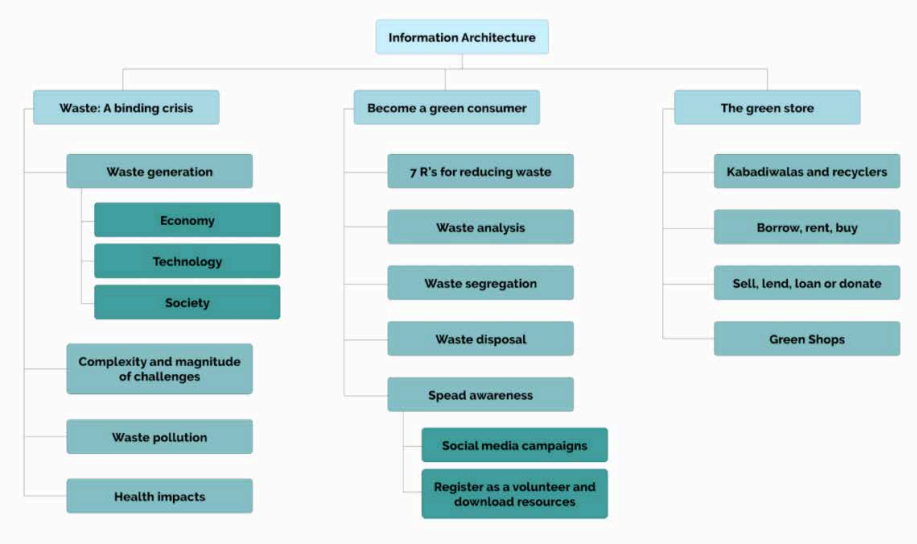
According to Peter Morville and Louis Rosenfeld (Information Architecture for the World Wide Web, 3rd edition) the IA of a website needs to address different user needs. They distinguish 4 main types of needs as:

1. Known-item seeking: Users will come to the website to search for something desirable and known.
2. Exploratory seeking: Users will come to the website looking for inspiration. They're looking for something desirable but not sure what exactly.
3. Exhaustive research: Users are in a process of extensive research. They

want to find as much information as possible.

4. Re-finding: A user needs a desired item again and is trying to find it.

The last information architecture lacked easy navigation. The new architecture was created keeping the interconnectedness of the topics intact and making the navigation easier.



Information architecture 2

VI. iv. Final Campaign Text (using final IA)

a. Waste Pollution: A binding crisis

The garbage we generate each day ends up in landfills adding to tonnes of waste that the landfill receives everyday. The relatively privileged people in our society, sit comfortably in their homes thinking that they are protected from disease as they have access to vaccinations and water purifiers. This is unfortunately not the case. This crisis of litter affects all sections of the society; it is what Assa Doron calls a binding crisis in his book, Waste of a Nation. He says that a binding crisis does minimum damage and generates maximum response as all sections of any society are affected equally and the only way to emerge out of it is to improve the lives of everyone.

Separation of the desirable from the unwanted, the valuable from the worthless, and indeed the worthy or cultured from the cheap and meaningless is an obsession in a circular model of recycling in India. People may value different things or value the same things differently, but all cultures insist on some distinction between what is valued and that which is valueless. Similarly in many Indian communities there is a distinction between what is pure and that which is impure. In many families handling dustbins after bathing is avoided even today. To interact with waste is ritually polluting, potentially contaminating and physically risky. The same mindset in many cases is extended over people who proceed to handle this waste. In India, garbage, refuse and waste are commonly identified with the people who handle them, usually in haphazard, unsystematic ways. The value of objects that are classified as valuable or waste is a function of many variables like technology, society, economy, potential for use, etc. To understand the concept of waste and reasons which drive us to discard objects we need to understand a few of the above mentioned variables.

Economy:
The idea of economic development in India and many other countries can be defined by the gross domestic product (GDP), the single standard indicator used across the globe to indicate the health of a nation's economy. This number is heavily dependent on consumers spending on finished goods and services. However, this number does not take into account informal and illegal trades, that is, the grey and the black markets and free products, it therefore provides us with a notional view of the economic health of the nation but may not be an accurate reading.

However incorrect, this number has governed the financial policies and the mindset of producers and consumers in India. Linking prosperity to consumables has made us obsessive shoppers. All our festivals, ceremonies and special occasions are all marked with extravagant shopping. Amazon and Flipkart with its online shopping facility has hastened the impulse, speed and desire, tempting consumers to replace a new phone with a newer one.

India's consumer spending has increased from 4469.88 billion rupees in the first quarter of 2004 to an all time high of 21111.41 billion rupees in the first quarter of 2019. The Numbers may not make sense, but another way to look at it is if all of the citizens of India did not spend their money for one day, India would save enough to sponsor over FIVE trips to Mars!
The act of buying does not seem to pose as a big problem as it is the lid that covers the garbage bin. Let us look at one of the simplest ways in which we damage the earth - a disposable plastic spoon. It gets delivered to a nearby store from a distant factory for which fuel gets burnt, an irrecoverable loss for the earth. The plastic is synthesized from crude oil and natural gas, with the hazardous chemicals used to treat it posing a threat to the factory workers and us as well. The crude oil, extracted from mining sites, poses a serious problem of deforestation. When we toss that spoon into the trash, all the damage suffered is now in vain. The planet is mercilessly thrashed for each product we buy, whether it is a need or a whim. The ever increasing population of the country increases the plight of the planet exponentially.

We generate more waste when we buy new disposable things after disposing old ones. The UN-Habitat says that 99 percent of all things we buy end up in the trash in less than 6 months after its purchase. While half of it rots in sky-high landfills, the rest still remains. 17 to 20 percent of this waste includes plastic (lifetime in centuries), 3 to 5 percent of it is generated through e-waste (which amounts to 20 lakh tonnes per year), and 12 to 15 percent is hazardous waste. The core problem is that the 6 months' duration that we use these products are just a blip in their lifetimes. This waste lives for ages, eventually making their way into the air, food and water that we come in contact with.

Technology:
Rapid advancements in science and technology, along with industrialization and globalization, has enormously increased the speed of production, delivery and consumption. According to Ivan Illich, Austrian philosopher, speed has become the most important thing and most important factor that governs the innovations and value of objects. One thing that saves even a

few seconds is far more valuable than a thing that does not. For decades, design has peddled speed, most of the time surreptitiously and uncritically. Faster seems better. The 'disposables' are a result of this need for speed like countless other things that are now turning out to be detrimental.

Most things today are made to be thrown, only to be replaced by other things. A big part of the economic activity today constitutes selling products "designed for the dump." This excessive consumption of disposables has led to a throw-away society that is strongly affected by consumerism. The term consumerism describes a critical view of overconsumption and excessive production with a short shelf life over what can be fixed and re-used. It is not hard to see why this works. Selling new products frequently makes more money than those that are long-lasting, repairable and easy to upgrade. This is called planned obsolescence, or built-in obsolescence. In industrial design and economics, it constitutes a policy of planning or designing a product with an artificially limited useful life, so that it becomes obsolete after a certain period of time with reference to durability, technology or style. This generates long-term sales of volume by reducing the time between repeat purchases. All of this adds to the GDP and reflects economic development.

Society:
The value of different objects are often dependent on society, current trend and fashion attach certain ideas and values to objects. Owning certain kinds of objects or brands is considered to be a symbol of status. This phenomenon is exploited by the producers and marketing agencies to increase production, sales and results in profits. This is called perceived Obsolescence; when a customer is convinced that they need updated products, for reasons of style rather than need and functionality.

Today, the world uses a linear economic model, This means that resources turn into products, which are sold and thrown away after they're used. This, clearly, is not sustainable. The future needs a circular economy, where everything has a use and a productive place to go.

The nature of a circular economy is sustainability and finding a use for everything. Used coffee grounds become fertilizer, glass is recycled endlessly and working chips in old phones are reused. It depends on local hub economies instead of a national or global economy, which means that the cost associated with shipping and transport is almost negligible. This allows them, especially food economies, to quickly move into a circular model of sustainability.

The key to switching from a waste-heavy to a circular system is finding a use for all resources and developing segregation systems globally. These resources can be grouped into two categories: biological nutrients and technical resources.

It is easy to picture biological nutrients and materials being used in a circular path, with solutions like compost pits and biogas farms being taught in every school. On the other hand, technical resources such as energy, metals, and elements that need to be mined pose a threat to the environment and human health. Our current methods of obtaining raw materials for industrial

manufacturing are not sustainable and cause significant environmental damage and human health costs. The system looks at short-term profit and loss, rather than resource sustainability or secondary costs to obtain materials. Fixing this system will need creative recycling and repurposing, along with a paradigm shift in thinking. We need to think of recycled material as a material resource that can reenter the production system.

But we already have a recycling industry. As we move toward developing circular economies, it will be at the forefront of the new paradigm thinking. Everything needs to be recycled and enter the biological or technical production system as a resource somewhere along its circular path. We're just beginning to think carefully about how we're using natural resources. Now we need to think about how to reuse, and reuse again, and let our natural systems move organically into sustainability.

Complexity and magnitude of the challenges

Never in history have so many people had so much to throw away and so little space to throw it in as the people of India in the second decade of the 21st century. The complexity of waste and the problem is acute in India because of multiple reasons. China's population (1.4 billion) was more than India's population (1.27 billion) in 2016 but the situation in India is more critical as the population density of India (445/sq.km) was 3 times that of china's (147/sq.km). If we talk about waste, America produces far more waste than India. America produces 250 million tonnes per year compared to 65 million tonnes in India but America's population density is 35/sq.km. These numbers underline the complexity and magnitude of India's challenges.

India generates 1.5 lakh tonnes of solid waste every day, out of which 90% is collected by municipal corporations. 80% of the collected waste i.e. 1.08 lakh MT is dumped in the dumping grounds all over the country each day. 400 lakh tonnes of waste ends up in dumping grounds every year. That's more than half of the population living in the second most populated country. The environment ministry has stated that India will, in another couple of decades, generate nearly three times the waste it currently does–"1650 lakh tonnes by 2030 and 4500 lakh tonnes by 2050". Our waste management system cannot even handle the current amount of waste we generate.

According to an estimate published in The times of India in 2018, India requires 1250 hectares or 12.5 sq.km annually to dump the waste that is collected. This area is 28.4 times the area of the smallest country in the world, Vatican City and 6.18 times the second smallest country which is Monaco. This area does not include the illegal dumping grounds, unmonitored roadside dumps, marine dumping and open incineration of waste. This problem is further complicated by the apathy of privileged groups in society towards waste and its waste handlers.

The formal sector of waste management is made up of local municipal corporations, workers employed by these municipal corporations, private waste management services, waste treatment plants and professional recyclers. The informal sector is a denser network of ragpickers, local kabadiwalas, dealers and informal recyclers. Waste handlers (Municipal corporation workers and informal ragpickers) are at the lower position on the waste chain. These are the people who scrape a living largely by dealing

with the expelled materials of fellow citizens. Urban India in 2011 had 3.5 million people handling waste everyday and these calculations (these figures do not include the manual scavengers who clean dry latrines). The income of people who collect varies. Some are completely independent - they find what they can in the streets, around rubbish dumps, and around the skips or dumpsters at street corners of towns and cities. They confront feral animals (pigs, stray dogs, monkeys, and rats, to name a few), the police, and better-resourced competitors for items of value. People that are better-off collectors may often be full-time employees of local governments and enjoy some benefits, including regular wages. Other collectors may be employees of contractors who work for local governments or for recyclers. These people are the first but not the only ones who are affected by the waste pollution.

Waste pollution

Waste is not just a social or economic problem, it causes environmental problems and has damaging health impacts. An appropriate method of collection and disposal of this MSW is the responsibility of the local municipal corporation. About 80 percent of the waste collected lands up in dumping grounds. Mumbai's Deonar, that started in 1927 is today in its 93rd year of its existence, it has thousands of waste pickers scavenging its heights each week. It gained international attention early in 2016 when its smoldering fires burned with a greater intensity than usual and shrouded portions of the city in smoke and haze for weeks. The "technology" of these uncontrolled dumps is based on hope rather than science. Originally, the landfills were sited at a distance from settlements and began with the wistful belief that nature would take its course and degrade the waste; birds, animals, and the very poor people might come to pick through it, and biodegradable materials would lapse back into nature. The hope also lay in believing that everything else would be covered by new layers of waste, and eventually the whole area might be enclosed and help reclaim swampy land. That was Mumbai's hope in the late nineteenth century. But unfortunately that was not to be the case, as demonstrated in the University of Arizona's Garbage Project. Dumps grow and regurgitate toxic material buried long ago and bubble up to cause trouble years later.

Growing towns and cities reach a point where the production of waste each day exceeds the capacity of the dump to accommodate it, so what might have begun as a hole or a patch of swampy ground becomes a mound, then a hill, and eventually, as Deonar and Kolkata's Dhapa did, a small mountain. Citizens' complaints about vermin, smells, and the fires from ignited methane gas that the bubbling cocktail produces force local governments to act.

Unregulated dumps violate the Solid Waste Management Rules of 2000 and 2016, which carry the authority of a directive of the Supreme Court. The 2016 rules state that "existing landfill sites…shall be improved in accordance with the specifications given in this Schedule." Schedule 3 runs to thirty-three paragraphs and 1,900 words of excellent direction on how to construct a "scientific landfill" and how to dismantle an existing dump. The 2016 rules contain detailed regulations for different categories of waste, including plastic, construction and demolition, medical, and hazardous waste.

There are well known examples all over the world where technologies for renovating existing dumps and building scientific, or sanitary, landfills have been implemented. The sites are carefully prepared. They are excavated, surveyed, and divided into cells that are filled one by one. A cell is lined with a layer of hard clay over which is laid a blanket of tough plastic (HDPE) to contain the polluting liquids that leach out of suppurating material. Pipes are installed to capture the leachate, which is poured back over the contents of the cell so that constant evaporation prevents leachate from escaping to contaminate groundwater. This toxic waste does not leave our land and water. Improper decomposition of organic materials in mixed waste leads to the formation of leachate. It usually contains both dissolved and suspended material. The formation of leachate is caused principally by precipitation, percolating through waste deposited in a landfill. Once in contact with decomposing solid waste, the percolating water becomes contaminated, and if it then proceeds to flow out of the waste material it is termed leachate. Additional pipe lines draw off the methane gas that decomposition produces, and this methane is burned, sometimes to create electricity. Filters at the end of the chimneys capture toxic emissions from the burning. In the ideal situation, the cell into which material is dumped is covered each night to minimize access to birds and rodents and to save neighbors from annoying odors and wind-blown rubbish. Although the technology is straightforward, implementation is complex and expensive, and maintenance requires unremitting, daily attention. Landfills require space, in India it is something that is painfully in short supply.

Waste be it collected or not has adverse impacts on the environment. 80 percent of the collected waste is dumped in the waste grounds every day. Waste impact as indicated depends on waste composition and disposal practices, burnt in the open or left there to rot it releases a long list of toxic gases hazardous to human health and the environment.

Waste consists of several types of substances, particularly toxic waste coming from the last phase of industrial activities: copper, arsenic, mercury, polychlorinated biphenyls, hydrocarbons, etc. Disposal practices are equally important and include illegal burying in areas that are not legally designated for the purposes such as cultivable areas, roads, buildings and construction yards. Illegal waste burning by residents around their homes to burn and continuous landfill fires have all contributed significantly to an increase in environmental pollution, particularly from dioxins, which are exceedingly toxic gasses.

Leachate from a landfill varies widely in composition depending on the age of the landfill and the type of waste that it contains. Additional leachate volumes are produced during the decomposition of carbonaceous material producing a wide range of other impurities including methane, carbon dioxide and a complex mixture of organic acids, aldehydes, alcohols and simple sugars. This leachate may contaminate the groundwater and other neighboring surface water bodies. Ingesting this polluted water can cause serious health complications. Leachate also pollutes the soil around the dumping ground causing it to become infertile.

Environmental pollution of waste dumping affects health through both

short and long-term effects. The short-term effects are congenital anomalies, asthma and respiratory infection; general symptoms such as stress, anxiety, headaches, dizziness, nausea, eye and respiratory irritation are also included. Long-term health effects related to waste exposure include chronic respiratory and cardiovascular diseases, cancer and brain, nerves, liver, lympho-hematopoietic or kidney related diseases.

Some of this waste is released into the atmosphere when burnt in open spaces, releasing oxides of carbon, sulphur and dioxins, the latter being known for forming the most toxic compounds. The rest of the solid waste moves around in the environment until it is consumed by animals, finding its way into the food chain.

Uncollected waste on the other hand goes into the ocean and releases toxins and pollutes the water, affecting the marine ecosystem. Billions of pounds of plastic can be found in swirling convergences that make up about 40 percent of the world's ocean surfaces. At the current rates plastic is expected to outweigh all the fish in the sea by 2050. Thousands of seabirds, sea turtles, seals and other marine mammals are killed each year after ingesting plastic or getting entangled in it. Endangered wildlife like the Hawaiian monk seals and Pacific loggerhead sea turtles are among nearly 700 species that eat and get caught in plastic litter.

Scientists have found plastic fragments in literally hundreds of species, including 86% of all sea turtle species, 44% of all seabird species, and 43% of all marine mammal species. Ingesting these fragments is often fatal.

Animals can starve when they ingest too much plastic that they cannot digest. When animals ingest plastic waste, it blocks their digestive tracts. The toxic chemicals in plastic can harm an animals' health - people as well can ingest these chemicals as these creatures make their way up the food chain.

People throw away tons of products every day like single-use cups, containers, styrofoam (or polystyrene foam) and other plastic products we use for a few minutes. They pollute our oceans and rivers and threaten wildlife for centuries.

Organic waste like leftover food, kitchen waste, flowers, twigs, leaves, pet waste, etc. decomposes and integrates into the soil. When it goes to the landfill, because of the compact nature of waste the oxygen from the bacteria is cut off and the waste undergoes the process of anaerobic decomposition. This releases methane, a greenhouse gas 20 times more potent than carbon dioxide, into the atmosphere causing a rise in local as well as global temperature.

Waste is considered hazardous if it is explosive, oxidizing, flammable, irritant, harmful, toxic, carcinogenic or has harmful effects on the environment and human health. It could also be classified as hazardous when it displays one or more radioactive properties. It not only poses risks to the surrounding air, water, and soil, but also causes harm to the ecological environment and human health through diversified channels. Scientists have evidence of E-waste pollution to be a potential agent of genetic mutation capable of inducing cytogenetic damage within the general population that is exposed to the pollution.

The problem increases exponentially when this waste is not segregated. Mixed waste cannot be composted nor can it be recycled. When this mixed waste is dumped in the waste grounds it creates several problems. When water percolates through waste, it helps the decomposition through the bacteria and fungi. This releases by-products of decomposition and rapidly uses up any available oxygen, creating an anaerobic environment. In actively decomposing waste, the temperature rises and the pH falls rapidly, resulting in relatively insoluble metal ions at neutral pH dissolving in the developing leachate. This leachate could seep into reserves of groundwater, and through rain as a conduit into surface water. This water, if consumed, causes chest pains, blood related disorders, nausea, bleeding stomach disorders, convulsions, renal failures, diarrhea, etc.

Waste piles continue to increase in height and volume throughout the country, with several grounds bursting to capacity. Deonar, the largest dumping ground of Asia, has outlived its lifetime of 30 years 4 times over. The government's attempts at setting up bio-mining and energy plants have had their own share of challenges, and the problem is far from being solved. Such is the havoc caused by the waste that is collected, which should ideally be under control.

Even the massive mountains of trash in distant landfills will crumble in the face of time with toxins seeping into the earth and our food produce. This future is not far away, lest we take care of what we have and restrict our needs to the essential.

Health impacts

Plastic, one of the most preferred materials in today's industrial world, is posing a serious problem in several direct and indirect ways. Exposure to harmful chemicals during manufacturing, leaching in the stored food items while using plastic packages or chewing of pacifiers and plastic toys by children are linked with severe adverse health outcomes such as cancers, birth defects, impaired immunity, endocrine disruption, developmental and reproductive effects etc. It is not just plastic; we are surrounded with that is a hazardous material. Batteries, CRT screens, flame retardant materials, circuit microchips, etc. all of which have toxic chemicals in them which when not disposed of correctly, enter the atmosphere and harm the ecosystem. These materials not only have adverse effects on our bodies while in use but also after they are disposed. Taking e-waste as an example... According to the Global E-Waste Monitor 2017, after the US, China, Japan and Germany, India ranks fifth among e-waste producing countries it generates about 2 million tonnes (MT) of e-waste annually. In 2016-17, India treated only 0.036 MT of the 2 Million tonnes of its e-waste.

About 95 per cent of India's e-waste is recycled in the informal sector in a crude manner. It is collected by local kabadi walas who (unprotected) break open the devices to collect everything that is easily recyclable. The rest of it, which is the hazardous part, is dumped at landfills or burnt in the open. In addition to its damaging effect on the environment, researchers have now linked e-waste to adverse effects on human health, such as inflammation and oxidative stress – precursors to cardiovascular disease, DNA damage and possibly cancer. A rise in infertility and healthcare costs can be observed over the past few years.

Rag pickers, they walk through the garbage, climbing mountains of filth segregating recyclables from the rest. They are responsible for a large part of recycling and material recovery that takes place in the country. They are the superheroes without masks, risking their lives in exchange for our indifference.

As comic-book characters stand glorified on movie screens, the real men and women work in inhumane conditions. The least we can do, honoring the Indian tradition, is give them the respect they deserve and assist them in every way possible.

b. What can we do?

Natural resources are limited. Just understanding this can greatly influence the choices one makes in one's everyday life. When you feel an urge to buy something that is not a necessity, remember the words of L.N. Smith, "Every dollar you spend or don't spend is a vote you cast for the world you want to live in."

Use it Up, Wear it Out Make it Do or Do Without

Analysing your waste is the first step towards living a greener life. Identifying the things you throw away not only helps us segregate but also find out the areas where we can make changes. For example, assessing your waste might show you that you go through a large number of plastic water bottles. To reduce this, you could consider purchasing a reusable water bottle that will last, such as stainless steel or glass.

In 2020, we still lack the technology to recycle and treat all the waste that we produce. Waste that cannot be recycled or treated, needs a resting place, and that is usually an engineered landfill in developed countries. India has only one engineered landfill. These dumping grounds lack protective linings, causing all the pollutants to seep into the ground and groundwater. (See sanitary landfills) These pollutants when exposed to cause diseases like chest pains, blood related disorders, nausea, bleeding stomach disorders, convulsions, renal failures, diarrhoea, etc. (See health impacts) While everyone tries to reduce waste, the waste going to landfills too needs to be reduced. Segregation and an appropriate disposal of waste becomes

necessary. Segregation is the first in the chain of events and one of the most important activities that we need to promote and enforce for effective waste management in urban areas in an attempt to reduce the size of landfills gradually. Segregation of waste components should be encouraged at source, the new MSW rules of 2016 do that. What we need is to build the capacity at the municipal level to enforce and implement source segregation. If source segregation is done in homes but gets mixed up in the collection vehicle along the route to the landfill it serves no purpose. Hence, till we insist the KBMC to provide proper waste transportation, treatment and disposal, we have to do that ourselves. For that the following information will be useful.

Remember the 7 R's when segregating dry waste

1. Refuse. Ask yourself these questions: can you do without the object? Is it disposable? Is it made out of plastic or any other harmful substance? Is there a greener option? If the answer to any of these is a yes, Don't buy it.
2. Reduce. Reduce your consumption. Unless it is an absolute necessity, you don't need it.
3. Reuse. Can you reuse it? If yes, keep it.
4. Refurbish. If you don't have use for it, could it be used by someone else? Donate it or sell it. It works the other way too. Shop second hand or refurbished products. Think of them as tried and tested products at a low price.
5. Repair. If it isn't working, repair it. If you have no use for it, still repair it. You can always donate or sell it to someone who might use it.
6. Repurpose. Can't repair it? Make it into something else and use it again. Upcycle it.
7. Recycle. If you think none of the things mentioned are possible, let recycling be that last desperate attempt at not letting the thing end up in the dustbin.

Different types of waste and ways to dispose of them

In order to do that the refuse needs to be segregated as not all of it is trash. Even though the Solid Waste Management Rules, 2016 recommends segregating waste into 3 categories (Dry, Wet and Hazardous waste), a more efficient way would be to segregate the refuse into 6 categories namely compostable, recyclables, sanitary waste, hazardous household waste, debris/rubbish and E-waste. The following information will help us to map the waste from old categories to the new ones and also help us dispose it appropriately.

Dry waste:

1. It includes non-biodegradable recyclables and non recyclables. Paper, plastics, metal, glass, rubber, thermocol, Styrofoam, fabric, leather, rexine, wood – anything that can be kept for an extended period without decomposing.
2. Sub-categories:
3. Food packaging or any material that has come into contact with food should be cleaned, dried and segregated according to their materials. Soft plastic, hard plastic, plastic bottles, Multi Layered Plastic, paper, cardboard, rubber, glass, wood and metals. Apply the 7 R's. If it comes down to recycling then refer to the list of kabadiwala who will come to

your home to pick up the materials.

4. Old clothes, old bed linen, mattress, pillows, shoes, handbags, belts, toys, tools, etc. don't need to be recycled. You can rent or sell them on popular apps like OLX and quikr. They can also be donated to NGOs or be exchanged for utensils. You can find their contact details, in the table below. They can also be exchanged for cashbacks in large offline and online stores like H&M and Myntra.
5. Old furniture, broken glass tables, old crockery, non-stick pans can be reused, refurbished or recycled if not broken. Otherwise, they have to be thrown in a 'debris/rubbish' bin as debri and inert waste.
6. Old brooms, floor cleaning mops, dry mops, bathroom cleaning brush: only the plastic and metal parts can be recycled, if clean and dry.

Hazardous waste:

E-waste or electronic waste consists of batteries, computer parts, wires, electrical and electronic equipment of any kind, electrical and electronic toys, remotes, watches, cellphones, as well as bulbs, tube lights and CFLs. If they are in working condition (repaired if possible) You can rent, sell or donate them on popular apps like OLX and quikr. You can also exchange old working devices in return for new devices at many electronic shops (Listed below).
If they are broken and cant be repaired then they need to be sent to e-waste recyclers authorized by the government. E-waste should never be sold to local kabadi walas as they break open the devices, keep the parts they can recycle and the rest of it is incinerated or dumped in landfills and causes air pollution. The remains of the e-waste that these local recyclers get rid of by burning and dumping contain the most amount of hazardous substances polluting the air.

Biomedical waste includes used menstrual clothes, sanitary napkins, disposable diapers, bandages and any material that is contaminated with blood or other body fluids; used syringes, expired medicines, thermometers, used cosmetics, etc. This type of waste is infectious and hazardous to animals and people who come in contact with it, especially the MC workers and ragpickers. Even the environment in which this waste is housed can transmit the infection and hence the waste needs to be disposed of regularly by using scientific methods to not adversely impact the health of living things and the environment. Should be segregated in a separate container and delivered to Bio medical waste disposal facilities. List of such facilities is given below.
Substances such as paints, cleaning agents, solvents, insecticides and their containers, as well as other chemicals are toxic and need to be disposed of safely at hazardous waste disposal plants.
Local MCs have to provide appropriate methods for the disposal of e-waste. If your local MC, like KBMC does not provide this facility, citizens need to demand it. You can sign a petition on our website for the same.

Wet waste:

1. Wet waste consists of kitchen waste – including vegetable and fruit peels and pieces, tea leaves, coffee grounds, eggshells, bones and entrails, fish scales, as well as cooked food (both veg and non-veg), Fallen leaves, trimmed branches, lawn trimming, weeds, etc. All of this waste must be composted. Composting can be done at home or at community composting sites. Compost bins for composting at home can be found

at: amazon.in, flipkart.com
2. Proper way of composting can be found on the website and composter can be made from things already available at home.

If composting at home is too much then addresses of local composting pits are listed below.

Basic Science of the Composting Process

Composting is the conversion of solid organic material into a humus-like substance by controlled biological decomposition. Composting is the process of letting mother nature transform organic matter into a material with environmentally beneficial applications.

The process is aerobic, meaning it requires oxygen. The process uses naturally occurring microorganisms such as bacteria, actinomyces and fungi to break down the organic compounds into simpler substances in addition to larger creatures including worms and insects.

Composting is a viable process of treating solid waste for beneficial use and destroying pathogens, diseases and undesirable weed seed during the process. By properly managing air, moisture and nutrients, the composting process can transform large quantities of organic material into compost in a relatively short time.

The process starts with the shredding of the green arisings, which not only reduces the particle size, but also increases the materials surface area for the microorganisms to work on, whilst homogenizing the materials constituents. During composting, the microorganisms consume oxygen while feeding on organic matter. Active composting generates a considerable amount of heat, and large quantities of carbon dioxide and water vapor are released. The carbon dioxide and water losses can amount to half the weight of the initial organic materials, so composting reduces both the volume and mass of the raw materials while transforming them into a beneficial humuslike material. Composting is most efficient when the major parameters, oxygen, nitrogen, carbon, moisture and temperature, which affect the composting process, are properly managed.

How to Create and Maintain an Indoor Worm Composting Bin

1. A worm composting bin, known as a vermicomposter, can be fairly inexpensive and easy to maintain. Below are instructions on how to build one kind of worm composting bin designed to be used inside. Let's divide the process into five steps.
2. Materials needed: Two plastic bins, A drill, Screening material, Screening material, Waterproof glue, Shredded paper, A little bit of dirt, A little bit of water, Worms, A trowel, Food scraps container.

Preparing the Bins:

1. Drill a 1-inch hole about two inches from the top of the taller bin (15 inches deep, 20 inches wide and 15 inches tall) on one side. Drill another hole on the opposite side. Drill eight ⅛ inch holes near the bottom near the corners of the bin.
2. Cover each of the holes with screening and glue the screening in place

with the waterproof glue. Be sure the glue is completely dry before continuing to the next step.

3. Place the tall bin inside the short bin (15 inches long, 25 inches wide and 5 inches). Do NOT drill any holes in the short bin.
4. Preparing the Paper, Soil, Water Medium and Adding the Worms
5. Combine shredded paper, soil and just enough water to dampen everything. Put the mixture into the tall bin and fill the bin about three inches deep. Add your worms to the mixture and let them get used to it for a day before feeding them. Make sure the mixture is very moist, but not forming puddles of water.

Feeding the Worms

1. Collect food scraps, such as vegetables and fruit scraps, bread, tea bags, coffee grounds, and cereal in your food scrap container as you prepare and clean up after meals. Do not include any animal by-products (fat, bone, dairy, meat, waste). Also, it may take the worms longer to process woody or dry items like stems or the outer layer of onions. Worms will eat paper as long as it is thin or cut into small pieces, but they will not eat plastic or fabric tea bags, coffee filters or the labels placed on produce by grocery stores.Once a week, do the following:
2. Take the scraps to the worm bin.
3. Gently use a trowel to create a hole to put the scraps into.
4. Throw in a small handful of shredded paper.
5. Add all the food scraps on top of the paper.
6. Cover ALL of the food scraps with dirt and moist paper. Exposed food attracts fruit flies, but covered food scraps don't. Add dirt and moist paper to the bin until the worms have made enough compost to use to cover the food scraps.
7. Notice what the worms are eating and what they are not. Remove any scraps that your worms have not eaten for a while as they may not like that type of food (e.g., some worms will not tackle a whole potato or citrus rind, but may eat them if they are cut up).
8. Put the lid back on the worm bin.
9. Wash out the food scraps container for the coming week.

Maintaining the Bin

1. Once every few months, scoop the liquid out of the lower container and use it as fertilizer outside on soil near plants, or water it down to use on indoor plants. When the worm bin is full (i.e., when the compost reaches the bottom of the top holes you drilled), do the following:
2. Feed the worms on one side of the bin for a couple of weeks in order to draw the worms to that side.
3. Once all the worms are on one side, harvest the compost on the other side and use it in pots, your garden, or sprinkle it across your yard. You can also scoop compost and worms onto a newspaper and sort them out, but this is a bit messier. Be sure to harvest compost at the end of the week, before you feed the worms again.
4. If there are too many worms in the worm bin, share extras with friends and family or release some with the dirt in your yard.

c. List of Kabadiwalas and Recyclers

Name	Waste handled	Type	Pickup	Phone Number	Email ID	Address
M/s. Eco Recycling Ltd.	Recycler/refurbisher	E-Waste	No	7738896967	accounts@ecoreco.co	Eco House, Near Top Glass Enclave, Bhoi Pada, Sativali Road, Vasai (E), Dist: Thane
M/s. Ecocentric Management Pvt. Ltd.	Recycler	E-Waste	No	9820040710	hemal.damani@ecocentric.co.in	Plot No. 17, Universal Industrial Estate, Vill. Sajgaon, Tal. Khalapur, Dist. Raigad
M/s. ECO Friend Industries	Recycler	E-Waste	No	9821151069	sneha.kadam@raoagroup.com	Plot no: A-205, TTC Industrial Area, MIDC Pawane, Navi Mumbai-400710
M/s. Evergreen Recylekaro (I) Pvt. Ltd.	Recycler	E-Waste	No			S.no: 63/4, vill: Varle, Tal: Wada, Dist : Thane
M/s. Arihant E-waste Recycling Pvt. Ltd.	Recycler	E-Waste	No	9820350406	infi@arihantinfo.com	Gut no: 307/1, shahda Road, Dondaicha , Dist : Dhule
M/s. E-Incarnation Recycling Pvt. Ltd.	Recycler	E-Waste	No			Plot no: J-56, MIDC Tarapur, Dist: Thane
M/s. Earth Sense Recycle Pvt. Ltd.	Dismantler	E-Waste	No	7738389404	ewastemumbai@earthsense.in	A-7, Gala No: 1, 2 & 3, Ground Floor, Prerana Complex, Anjur Phata, Dapoda

						Road, Village: Val, Bhiwandi, Dist: Thane
M/s. Green world Recycling	Dismantler	E-Waste	No	9320657658	sales@gwr.co.in	Pritesh complex , Building no: B-12, Gala no: 7-8, Anjur Phata , Dapoda Road, Val: Village, Tal: Bhiwandi, Dist : Thane
M/s. R.T. Corporation	Dismantler	E-Waste	No			S.no. 377, Hissa no: 2, Village: Palsai, Tal: Wada, Dist: Thane
M/s. Envirocare Recycling Pvt. Ltd.	Dismantler	E-Waste	No	9820094450	info@envirocareindia.co.in	Unit no: 8 /C-I Actual Industrial Complex , Uchat, Road, Village : Magathane, Tal : Wada Dist : Thane
M/s. Green Valley E-waste Management Pvt. Ltd.	Dismantler	E-Waste	No	9821285840	sarfaraz@gvewaste.com	Pritesh Complex, Bldg no: A-7, Gala no:7, Anjurphata Dapoda village: Val, Tal: Bhiwandi Dist : Thane
M/s. Clean Tech	Dismantler	E-Waste	No			B/8, Gala no: 3, Parasnath indl Estate, Anjurphata Road, vill: Val, Tal: Bhiwandi Dist: Thane
M/s. Spas Computers Pvt. Ltd.	Dismantler	E-Waste	No	8898899899	spascomputers@gmail.com	7 & 12, Hema Industrial Estate, Premises, Cos Ltd. Sarvodaya Nagar, Rajmata Jijau Road, Jogeshwari E, Mumbai

M/s. Envirocare Recycling Pvt. Ltd.	Dismantler	E-Waste	No	9820094450	info@envirocareindia.co.in	Unit No. 8/C-1, Actual Industrial Complex, Uchat Road, Vill. Mangathane, Tal. Wada, Dist. Thane
M/s. Mukesh Metal	Dismantler	E-Waste	No	9819893595	info@mukeshmetal.net	Sr. No. 93, Hissa No. 1, Behind Deepesh Lodge Gotegar Uttarshiv, Mumbra Road, Dist. Thane
M/s. Amiable Electronics Pvt. Ltd.	Dismantler	E-Waste	No	7667568801	vipul.g@electronicsbazaar.com	Plot No. D-141, Shirawane, TTC Industrial Area, MIDC Shirvane, Nerul, Navi Mumbai
M/s. J Choudhary & Company	Dismantler	E-Waste	No	9869063886	jchoudharyandco@gmail.com	SURVEY NO 67/3, PIPEWELL LANE, MOHAMMADIYA ESTATE, PIMPRI, OLD MUMBAI PUNE ROAD, Tal: Thane
E-Incarnation Recycling Pvt. Ltd.	Recycler	E-Waste	No	022 6625 1300		Unit No. 1304, Lodha Supremus, Opposite World Towers, Senapati Bapat Marg, Lower Parel West, Mumbai, Maharashtra 400013
Navi Mumbai Corporation		Biomedical waste	No		mwml@ramky.com	M/s. Mumbai Waste Management Ltd.,

						P-32, MIDC, Taloja, Tal. Panvel, Dist. Raigad
Mumbai Corporation		Biomedical waste	No		smsenvoclean@gmail.com	M/s. SMS Envoclean Sewree, Mumbai– 12
Thane Municipal Corporation		Biomedical waste	No		envirovigil@indiatimes.com, 1971.prasad@gmal.com	M/s. Enviro Vigil, Chhatrapati Shivaji Mah. Hospital Compound, Kalwa, Thane
Kalyan-Dombivli Municipal Corporation.		Biomedical waste	No		smsenvoclean@gmail.com	M/s. SMS Envoclean Sewree, Mumbai – 12 (Presently temporary)
M/s. Saurabh Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No. 143 Plot No. B/4 At. Sapronda, P.O. Kudus Tal. Wada, Dist. Thane
M/s. Sharda Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No. 434, Dinkarpada, Vill. Kondle, Tal. Wada, Dist. Thane
M/s. Oswal Resins Pvt. Ltd.	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot No. M-58, Additiona Murbad MIDC, Murbad, Thane
M/s Krishna Metal Refinery	Lead Acid Battery Plates and Lead	Hazardous Waste	No			Plot No. 143/1-2, Sapronde Village P.O. Uchat, Taluka – Wada, Distt.

	Scrap					Thane – 421 030
M/s. Sharshi Metals	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			S.N. 28/1, Part Village Sharshi, Taluka – Wada, Dist. Thane
M/s. Ranchal Industries	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No.49, Village-Gunj (Kudus), Post-Kupari, Taluka – Wada Distt.Thane-421 312
M/s. R.K. Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No.293 & 294, Village-USAR, Kondla Road, P.O.-Kudus, Tal. Wada, Distt. Thane - 421 312
M/s D.K. Metal Works	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No. 100, At: Kondla Road Village-Kudus, P.O. Kudus Taluka-Wada Dist. Thane 421312
M/s Kothari Metallurgical Export Pvt. Ltd.	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			56 At. Post – Chaindvali Wada – Shahpur Road, Taluka-Wada, Dist. Thane – 421 303
M/s Shakti Metal Industries	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			S.No.261, Village-Abidghar, Taluka: Wada Distt. Thane

M/s Ajay Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No.390/6, S.No.1060, Village-Kondhle, Post-Kondhle Tal.Wada, Distt. Thane
M/s. S. S. Enterprises	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No.98, Kondla Road, Village-Kudus,Taluka – Wada, Distt. Thane - 421 312
M/s. Deshmukh Lead Pvt. Ltd	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			S.No.63/4/1B, Wada – Manor Road, At Post Varale, Taluka – Wada, Distt. Thane – 421 303
M/s. G.N. Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Survey No.125, Ghonsai Tal. Wada, Distt. Thane – 421 312
M/s. Indore Metal Corporation	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Survey No.397/p, Dinkar Pada, Kondla Road, KUDUS Taluka– Wada, Distt. Thane
M/s. Samrat Udyog	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot No.147, Village – Sapronda, Post: Kudus, Tal: Wada, Distt: Thane
M/s. Samico International	Lead Acid Battery	Hazardous Waste	No			Plot No. 155, Village Sapronda, Post
	Plates and Lead Scrap					Kudus, Tal. Wada, Dist. Thane
M/s. Sarita Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No:53, Village: Supande, Post: Kanchad, Tal. Wada, Dist: Thane
M/s. S.H. Metal Works	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot no: 4, Gut no: 495 & 498 Village: Kondale, Post: Kudus, Tal: Wada, Dist: Thane
M/s. Raj Metal Refiner	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut no: 143, Plot no: 5, Uchat Road, Village: Sapronde, Tal: Wada , Dist: Thane
M/s. S. K. Metal Works	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot No. 5, Gut No. 495 & 498, Village Kondale, Post Kudus, Tal. Wada, Dist. Thane
M/s. Welcome Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gut No. 420, Village: Usar, Post: Kudus, Tal. Wada, Dist.Thane
M/s. Nobel Metals Processing (I) Pvt. Ltd.	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Sr. NO. 225, Plot No. 05, Village Bilavali, Tal. Wada, Dist. Thane

M/s. M. D. Industries,	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			G. No. 409 & 411, Vill. Usar, Motyachapada, Tal. Wada, Dist. Thane
M/s. Hans Enterprises	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			1 Meera Golani Complex Opp. Vasai Vajreshwari Road Vasai (East), Dist. Thane - 401 208
M/s. Simplex India	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			4 Sativali Nagar, Khakhami Indlustrial Complex Ahmedabad Bombay Highway Vasai Dist. Thane
M/s. N.V. Metals and Alloys	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot No. 310, Near Shri Hari Fabric Village,Umroli, Taluka Palghar (Palghar Baiser Road), Dist. Thane - 401 404
M/s. Nikhil Metals Works	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			At. Village Umroli, Taluka Palghar, Boisar Road, Plot No. 313, Near Shri Hari Fabrics Dist. Thane
M/s. Jarsons Metal	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			18 Ganesh Industrial Estate, National Highway No. 8, Walive Tungar Fhata, Post Sativali Vasai

						(East), Dist. Thane – 401 208
M/s. Mahalaxmi Metal Works & Alloys	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Plot No.127, Savroli, Tal. Talsari, Distt. Thane
M/s. Shanti Metal Refinery	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Near Service Station, Kaman Road, Sativali, Vasai(East), District – Thane – 401 202
M/s. Mahalaxmi Metal Works & Alloys Pvt. Ltd	Battery Scrap, Tin All types of Lead and Lead alloys scrap, Antimony & Aluminium	Hazardous Waste	No			S. No. 108, Village Pali, Tal. Wada, Dist. Palghar
M/s. MRJS Lead Pvt. Ltd.	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			GAT No. 72 Village Dhanore, Behind PCS Industries Ltd., Alanddi - Markal Road, Tal. Khed, Dist. Pune-412 105
M/s. Chloride Metal Ltd.	Lead Acid Battery Plates Lead Scrap Lead Ashes and Residues	Hazardous Waste	No			Gat No.1241, 1242, Markal Taluka-Khed, Distt. Pune- 412 105

M/s. Sakshi Auto Parts Pvt. Ltd.	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			Gat. No. 1427/1-2, Shikrapur, Tal. Shirur, Dist. Pune
M/s. S.K. Naik and Sons	Lead Acid Battery Plates and Lead Scrap	Hazardous Waste	No			S.No. 50/15, Narhe Viallge, Tal: Haveli, Dist: Pune
M/s. Pranam Enterprises,	Lead Acid Batteries	Hazardous Waste	No			S. No. 286/1/6, Next to Bodhe Warehouse, Village Vavli, Devachi, Tal. Haveli, Dist. Pune
M/s. Tandon Metal Pvt. Ltd.	Lead Acid Battery Plates Lead Scrap Lead Ashes and Residues	Hazardous Waste	No			Gat No.1242, Markal Taluka-Khed, Distt.Pune Maharashtra-412 105
M/s. Shah Battery Industries	Scrap Lead Acid Battery	Hazardous Waste	No			Plot No. C-16, MIDC Baramati, Tal. Baramati, Dist. Pune
M/s. P. B. Melters,	Scrap Lead Acid Battery	Hazardous Waste	No			G. No. 123, Kurli, Mohiroad, Tal. Chakan, Dist. Pune
M/s. Sigma & Electric Manufacturing	Copper Scrap / Druid	Hazardous Waste	No			Unit 1, Gat No. 154/155, Mahalunge Chakan- Telegaon Road, Chakan, Tal. Khed, Dist. Pune

Corporation Pvt. Ltd.						
Jagdambe Old Paper Mart	Paper, Cardboard, Magazine, E-Waste, Old Containers, Metal, Electrical devices, Jute bags, Plastic bags, Bottles, Plastic milk bags	Recyclables	Yes	7057376268, 8600902818		Mohanand nagar, Badlapur-West
New Mahalaxmi Old Paper Mart	Paper, Cardboard, Magazine, E-Waste, Old Containers, Metal, Electrical devices, Jute bags, Plastic bags, Bottles, Plastic milk bags	Recyclables	Yes	8805375584, 7498695912		Valavli, Badlapur-West

Jay Ambe Metal and old paper mart	Paper, Cardboard, Magazine, E-Waste, Old Containers, Metal, Electrical devices, Jute bags, Plastic bags, Bottles, Plastic milk bags	Recyclables	Yes	9172759771		Belavli, Badlapur-West
Dharti Tower Old Paper Mart	Paper, Cardboard, Plastic, Iron, Steel, Aluminium, Glass, E-Waste as separate materials	Recyclables	Yes	9004944923		Manjarli Chowk, Badlapur-West
Sahil Raddiwala	Paper, Cardboard, Plastic, Iron, Steel, Aluminium, Glass, E-Waste as separate materials	Recyclables	Yes	9766460564		Near Patil Mangal Karyalay, Badlapur-West
Tejpal Paperwala	Paper, Cardboard,	Recyclables	Yes	9004241201		Manjarli Chowk, Badlapur-West
	Plastic, Iron, Steel, Aluminium, Glass, E-Waste as separate materials					
Mahadev Old paper mart	Paper, Cardboard, Plastic, Iron, Steel, Aluminium, Glass, E-Waste as separate materials	Recyclables	Yes	9975671310		Gurushakti complex, Kulgaon, Badlapur-West
Shiv Nayan Yadav Bhangaar wala	Paper, Cardboard, Plastic, Iron, Steel, Aluminium, Glass, E-Waste as separate materials	Recyclables	Yes	9670310584		Manjarli Chowk, Badlapur-West
Pradnya Old Book depot and paper merchant	Second Hand books, waste paper	Recyclables	yes	9004322598		Railway Station, Badlapur-East
Pradnya Old Book depot	Second Hand books	Recyclables	No	9004322598		Opp. Baroda Bank, Station road, Badlapur-East
Vijay Joshi	Clothes	Recyclables	Yes	9511213550		Manjarli Chowk, Badlapur-West

d. List of green shops (Badlapur)

Name	What?	Phone Number	Address	Green Offers
Aai mata kirana store	Kitchen and groceries, Bathroom and selfcare	8855918588	Manjarli road, Badlapur west	Loose groceries and reusable products. Bring your own bags.
Om market	Kitchen and groceries, Bathroom and selfcare	7776843288	Shop no 5/6 ramsheela apt, manjarli road, Badlapur west	Loose groceries and reusable products. Bring your own bags.
saraswati kirana store	Kitchen and groceries, Bathroom and selfcare	9689925152	Station road Badlapur west	Loose groceries and reusable products. Bring your own bags.
Jyoti supermarket	Kitchen and groceries, Bathroom and selfcare	9822199526	Manjarli road, Badlapur west	Loose groceries and reusable products. Bring your own bags.
Jyoti electronics	Electronic or electrical appliances	7498757844	Shop no 1-4 Lalitha, Heights.behind adarsh, College Badlapur east	LG brand washing machines, fridge. TV all LG products exchange offer with discount
Sai Geet home appliances	Electronic or electrical appliances	9225829244	Shop no 5 tulsi complex, new D P road, katrap Badlapur east	Washing machines, fridge, exchange offer with discount
Prabhat appliances	Electronic or electrical appliances	2512692115	Sai kutir, shop no 3 Gandhi chowk near post office Badlapur east	Mixer, microwave fan exchange offer with discount

			kulgaon	
Mateshwari steel	Electronic or electrical appliances	9975010501	Deepamani apt, railway gate Badlapur east	Mixer water filter, fan microwave oven exchange offer with discount
Sai Anjali home appliances	Electronic or electrical appliances	7208643796	Shop no 5, new d p road, katrap Badlapur east	Mixer, microwave oven, chimney, water filter, exchange offer with discount
Badlapur Electronics	Electronic or electrical appliances	7021128195	Sai trading corporation, shop no 27, behind Navratan hotel, opp railway station	Water purifier, inverter exchange offer with discount
Bhavani electronics	Electronic or electrical appliances	8007310088	Shop no 6, Nandini apt, near bank of india, katrap Badlapur east	Washing machine, fridge exchange offer with discount
Sumeet sales and services	Electronic or electrical appliances	9324983048	Shop no 1, dhule market, opp asha vihar society, hendrepada, Badlapur wes	LED TV exchange offer with discount.
Dhanalaxmi electronics	Electronic or electrical appliances	9890611248	Shop no 2, priyamanya apt, new d p road, katrap Badlapur east	Washing machines, fridge, tv exchange offer with discount
S K electronics	Electronic or electrical appliances	9422681912	Shop no 11, Datta prabhod apt, new d p road, katrap Badlapur east	
Pradnya Old Book depot and paper merchant	Schools, colleges and workspace	9004322598	Railway Station, Badlapur-East	Buy and sell secondhand books, and school and college accessories

Pradnya Old Book depot	Schools, colleges and workspace	9004322598	Opp. Baroda Bank, Station road, Badlapur-East	
A1 Stationery & Novelty	Schools, colleges and workspace	092841 68566	shop no 2 jai shree samarth apt near soham hospital manjarli road badlapur w, badlapur w, Maharashtra 421503	
Mehta Stationery	Schools, colleges and workspace	096738 18417	Shop no. 6, Siddhivinayak Apt, Behind Vaishali Talkies, Badlapur (west), Badlapur, Maharashtra 421503	
Yash Stationery	Schools, colleges and workspace	088560 62806	Bhagirathi Complex, Shop No. 9, Badlapur W))), Rameshwadi, Mumbai, Maharashtra 421503	
Rajveer Graphics Stationery	Schools, colleges and workspace	098508 76556	Shop No. 6, Bebika Palace, Opp Adarsh Vidhya Mandeer, Badlapur E, Mumbai, Maharashtra 421503	
Vipul Kirana Stationery & General Store	Schools, colleges and workspace	085528 07891	near Hanuman Mandir, Manjarli Gaon, Manjarli, Badlapur, Maharashtra 421503	
Shree Samarth Stationery	Schools, colleges and workspace	096576 32344	Shop No.5, Laxmi Narayan Apt, Badlapur, Mumbai,	

			Maharashtra 421503	
Sai Nath General Book Depot	Schools, colleges and workspace	098508 78422	Shop No 4, Sai Paradise Society, New D.P.Road, Opp Annapurna Medical, Badlapur East, Katrap, Mumbai, Maharashtra 421503	

e. Things you can do to reduce waste

Bathroom and self-care

1. Get rid of all the things you do not use regularly.
2. Avoid using disposable products.
3. Shop green products and buy things in bulk to reduce packaging waste. Green products are products that cause less environmental harm.
4. Shop package free items
5. Do not use sachets and shampoo bottles because it causes a great deal of plastic waste. Shop natural soaps and shampoos, if possible, make them at home.
6. Shop from places that say no to packaging and hence packaging waste.
7. Use reusable hygiene alternatives.
8. If using packaged products, recycle the package/s.
9. Save energy wherever possible. Use a 5-star rated geysers; better the rating ,greater will be the efficiency of the appliances and lesser will be the power loss.
10. Avoid using bathtubs or showers. Using buckets helps waste less water.

How to have a greener wardrobe?

1. Give away clothes you haven't not used for the last six months.
2. Shop second-hand clothes if possible. If not, prefer buying clothes from stores that recycle fabric.
3. Say no to online shopping. Online shopping produces three times more packaging waste.
4. Do not buy things if you do not need them.
5. Favor durability of the material over the cost and shop fewer times as

possible.

How to make your workspace, college or school environmentally sustainable?

Step 1- Assess your waste

Step 2- Think of ways to reduce waste production

Step 3- Segregate your waste and reuse or recycle accordingly.

How to assess your waste?

1. Ask yourself if you need what is around you.
2. See if a resource can be shared or borrowed instead of owning it.
3. Question yourself if things around you put the environment and hence your family in danger.
4. Check if you can switch any disposable items around you with reusable alternatives.

Converting your regular backpack into a 'Live Light' backpack:

Converting your regular backpack into a 'Live Light' backpack is something that will help you make a significant reduction in the amount of waste generated by you. This does not require you to buy a lot of new things. Most of us own and carry a bag while traveling (to school, college, workplace, markets, etc.) Following is the list of things that make up a 'Live Light' backpack.

1. Bag- If you already own a bag, you do not need a new one. If you do not, acquire one. Borrow, repair a torn one, or buy a second-hand one. This will avoid a significant amount of packaging waste that would come along with a new bag and its manufacturing.
2. Reusable bottle- Prefer a non-plastic reusable bottle. Having a reusable bottle will not only ensure that you have access to safe drinking water but also avoid the waste produced by packaged water.
3. Reusable tiffin box (with reusable spoon and fork): It has been a part of our culture for a long time. Consider this box as a low initial investment. It primarily promotes home-cooked food. It can also be used to pack processed food from outside shops and restaurants, further reducing food packaging waste.
4. Two cloth bags- If you do not already have them, cloth bags can be made from old clothes. Carrying these bags will help you reduce plastic waste due to an unplanned market trip.
5. A mug or a flask if you are a coffee/tea drinker.

Just by carrying these things in your backpack, you will be able to reduce plastic waste generated by food and water packaging, polyethylene bags, disposable items like plastic spoons, paper plates, paper cups, etc. everyday. You can check your plastic footprint here before starting and check again after a week to see how much waste you prevented from reaching the dumping ground.

VI. v. Website Name

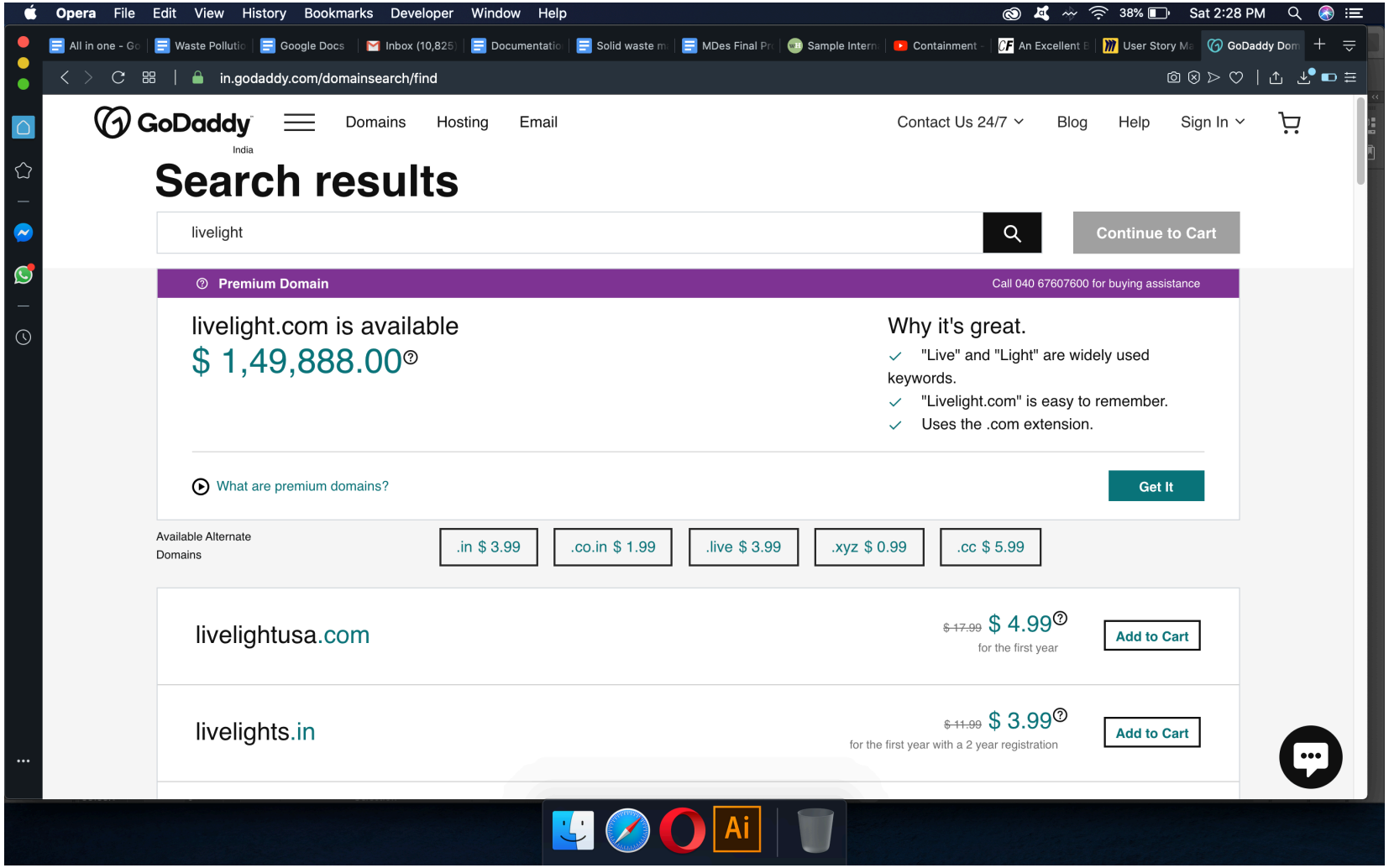
Expected characteristics of the name of the website were as follows:

1. Short and memorable
2. Direct enough to be considered as a statement or an instruction
3. Abstract enough to encompass the idea of time, the circularity of the problem and green consumerism

Following are some of the names that were thought of:

1. Consume with care
2. One with the Earth
3. Care, and act like it
4. Earth over plastic
5. No plan B
6. Let's talk trash
7. Reuse to revive
8. Less is more
9. Rethink, reduce, revive
10. Be smart, think trash
11. Want not, waste not
12. Paint it green
13. Part of the whole
14. The clean up act
15. Live light
16. Use, don't abuse
17. Live clean, consume green
18. Cut down consumption, not trees
19. Global warning
20. Buy less, trash lesser
21. Consume wisely

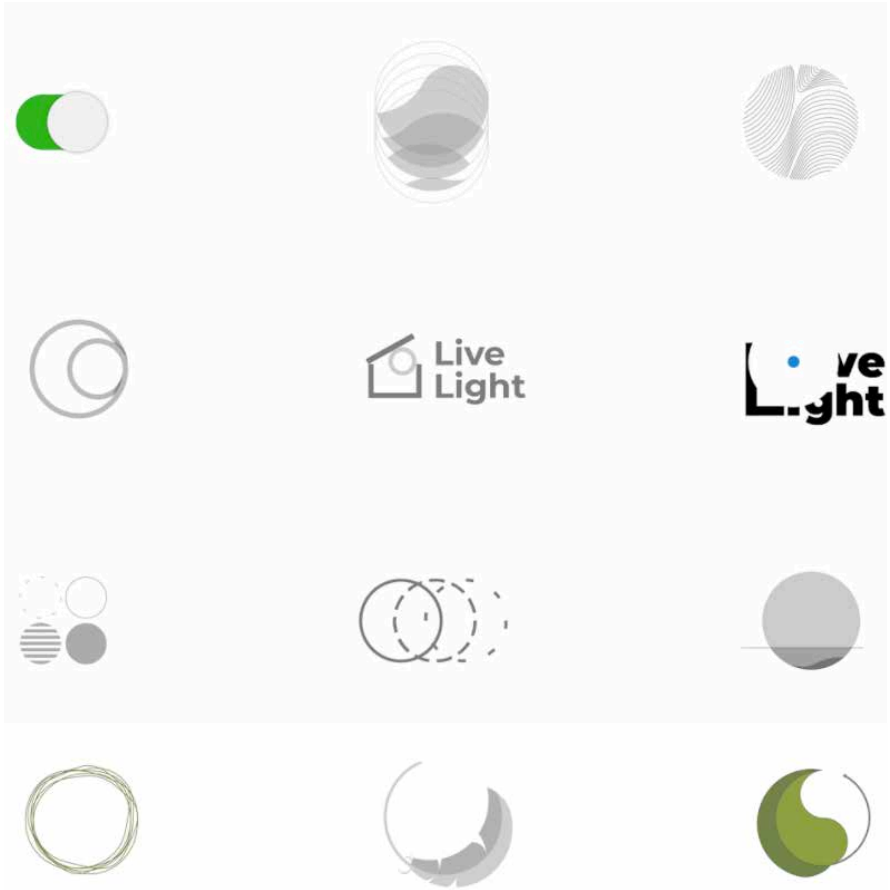
Out of these the name 'Live Light' was chosen.

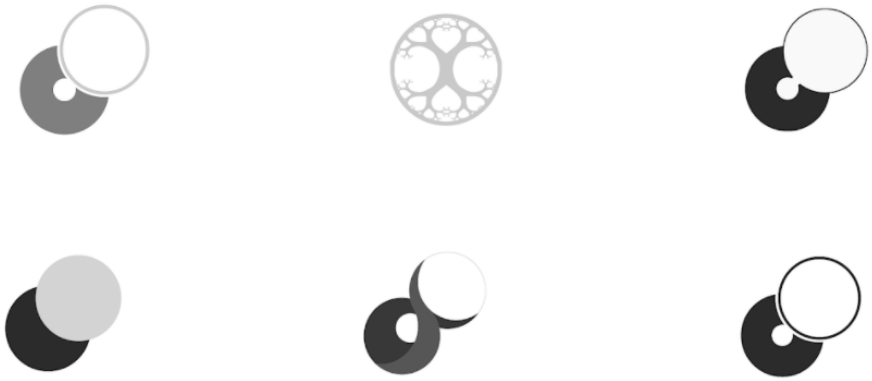


While selecting the name, it was made sure that the domain was available with both .com and .in extensions.

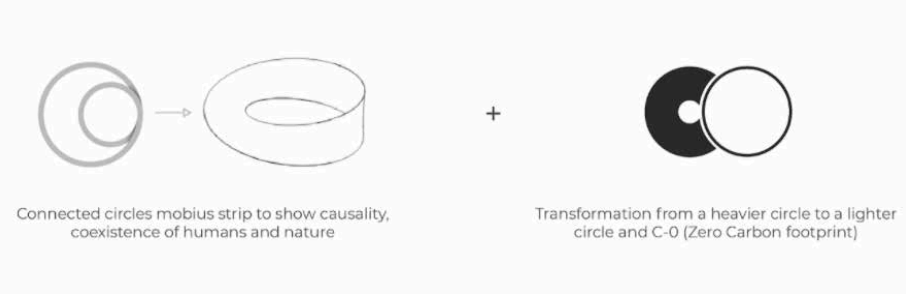
VI. vi. Symbol Design

a. Form exploration





The final symbol was made combining the following symbols. The final symbol was made by drawing the Mobius strip in the form of infinity. The Mobius Strip is an expression of non-duality. It reveals the unity of all polarities, creating a state of oneness, joining the whole and the part, the masculine and the feminine, expansion and contraction, spirit and matter, problems and solution etc. It is a representation of interconnectedness of problems and solutions. The infinity reiterates the never-ending and cyclic nature of time, life, our relationship with nature and the fight against the problem of waste. The symbol of infinity is made using two circles. The first circle is heavier (thicker outline) than the second circle, which is lighter (thinner outline). These circles represent the solution which is living light. Combined with the symbol of infinity, they represent one's continuous effort to live lighter.



b. Final Symbol

c. Experimentation with typography

I faced many challenges while integrating the type with the symbol. I needed a typeface that would convey the message while complementing the form of the symbol. Another problem I faced was deciding the placement of the text. It had to be such that it integrated well with the logo but also could be removed to use the symbol independently.

After experimenting with many conventional and unconventional placements of text, and trying different typefaces, I chose Roboto condensed. The reason behind selecting a condensed typeface was that it complemented the wide form creating visual contrast. Another reason for choosing a condensed font was that it occupied less space than regular font, which conveyed the idea of using only what is needed.

I used a heavier font for 'Live' and lighter for 'Light' much like the two circles that make the symbol. The final placement is shown below. This was finalized as it was visually resolved and had a good flow.

d. Colour Palette

We chose Terracotta and Aquamarine Blue colours in the Symbol to represent earth and oceans, respectively. These colours were chosen instead of Blue and Green to represent earth uniquely. This helped the symbol to stand out from the rest of the waste management and environmental symbols which use Blue and green as their primary colours.

The colour palette has Terracotta, Aquamarine blue, leaf green and their shades. The colours from Aquamarine Blue to leaf green are from an analogous group of colours found in nature. The colour of terracotta which is used to represent the earth balances the colour palette by adding warmth to it.

I desaturated these colours a little so that they are not too vibrant, do not overpower the colours of the images and illustrations used and do not irritate the eyes of the viewer when looked at for a longer duration of time.

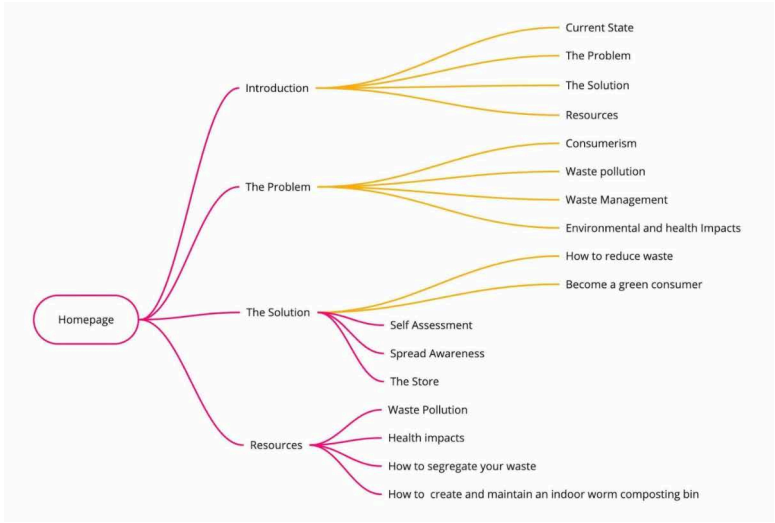
e. Final symbol

VI. vii. Website design

a. Wireframing

Wireframing is a way to design a website service at the structural level. A wireframe is commonly used to lay out content and functionality on a page which takes into account user needs and user journeys. Wireframes are used early in the development process to establish the basic structure of a page before visual design and content is added.

Following are the first iteration of Website Flowchart and Wireframe. These were made with respect to the first draft of information architecture. The website that was designed, had four main webpages: Introduction, The problem, The solution, and Resources.



Website Flowchart 1

The header of the website was designed to have the tabs that linked to the four main webpages. 'The solution' and 'Resources' tabs have drop down menus with links to other webpages like 'Self assessment', 'Spread awareness', 'The store', 'Waste pollution', 'Health impacts', 'How to segregate your waste' and 'How to create and maintain an indoor worm composting bin'.

Low fidelity wireframe screens (Iteration 1)

b. Wireframe testing

This wireframe was tested on a small sample group of internet users, and the observations and their feedback recorded were as follows:
The first drawback was the problem in Information architecture. This wireframe was made based on the IA, which did not consider the user's needs.
The wireframe failed to convey the urgency of the problem and the solution. There was ambiguity in the headings. The tabs failed to convey all the types of services that the website offered. This made it challenging to navigate through the website as the flow was terrible.

To fix the above problems following steps were adopted:
The IA was fixed by interacting with a small group of potential users and creating user personas, as mentioned earlier. Then the IA was developed to cater to the needs of these personas.
Open card sorting was performed with a small sample group to understand and get headings that people could relate and understand. The observations and result of this card sorting are given in the following sections.
After renaming a few of the parts of the new IA, user flows were created to have a clear idea of the needs of the user. This made it easier to design the final wireframe. The user Flows that were created are presented in the following sections.

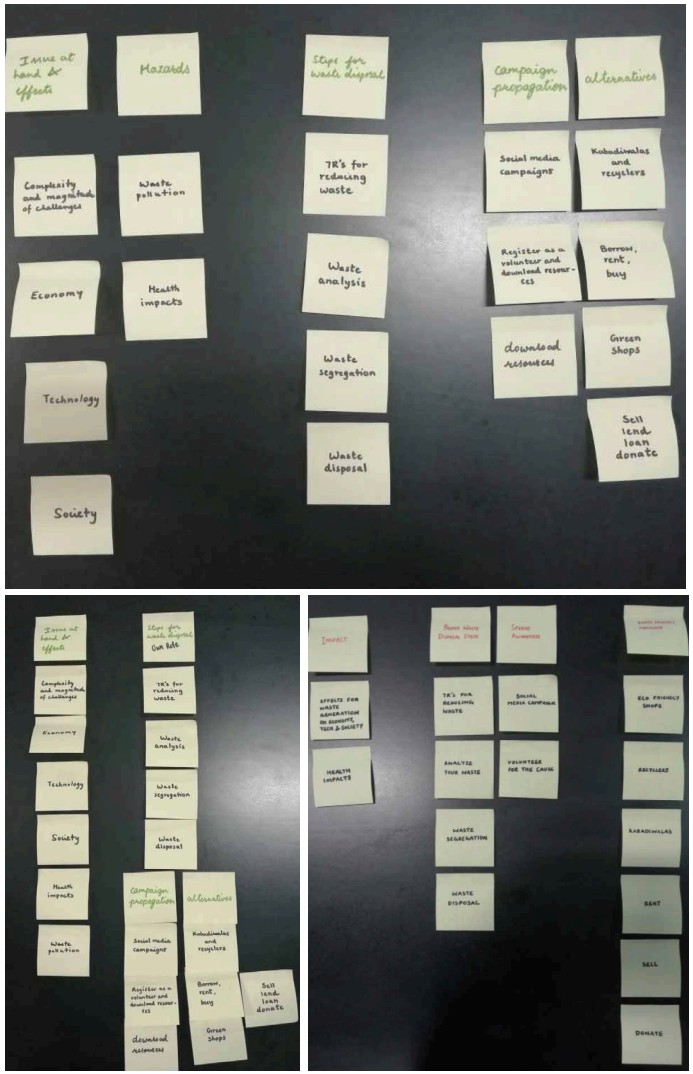
c. Open card sorting

Card sorting is a technique that involves asking users to organise information into logical groups. Users are given a series of labelled cards and

asked to organise and sort them into groups that they think are appropriate. Card sorting helps you to design an information architecture, workflow, menu structure or website navigation paths. Card sorting is a relatively low-tech and inexpensive method used to understand how a user would organise and structure content that makes sense to them. Card sorting can be conducted in several ways such as actual cards, pieces of paper, Post-It notes or online tools such as Optimal Sort, which allow you to conduct the research remotely.

This insight allows you to understand how users would expect to see content grouped on a website and how they might see these groups labelled. While card sorting might not provide you with final information architecture or menu for your site, it can help to identify trends and how many potential categories there could be.
One of the ways is open card sorting. In this, the users are asked to organise cards into groups that they feel is appropriate to them. They are then asked to name each of the groups they have created with a label that best describes that group. This method is commonly used for new/existing information architectures or organising products on a site or when starting to create a new IA from scratch.

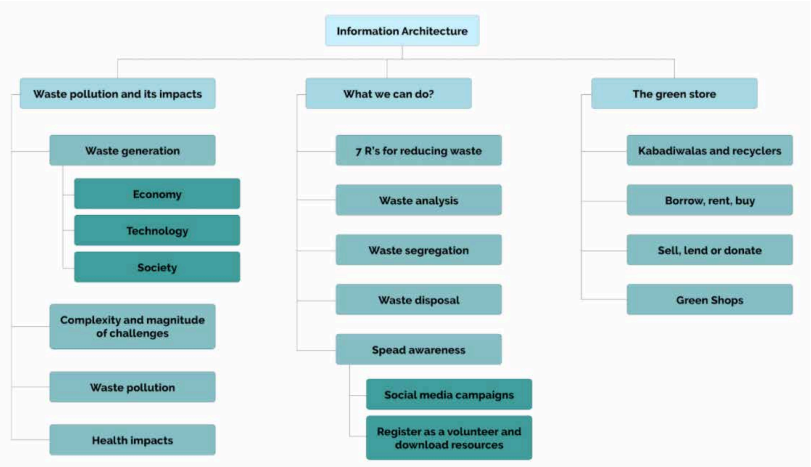
This was performed with a small sample group. The most common ways in which the information was sorted are given in the pictures.Users are asked to organise cards into groups that they feel is appropriate to them. They are then asked to name each of the groups they have created with a label that best describes that group. This method is commonly used for new/existing information architectures or organising products on a site or when starting to create a new IA from scratch.



Low fidelity wireframe screens (Iteration 1)

The results of card sorting were:

1. Most of the people from the group divided the information architecture into three main parts: one that described the problem, second that represented the solution and the third that was a platform for hiring waste management services, buying and selling things locally and locating green shops.
2. The headings given by me were not able to convey what the section held. Some of the titles that were provided by the people from the sample group were: Waste pollution-A binding crisis → Waste pollution and its impacts, Becoming a green consumer → What can we do, etc. A new sample group was shown both the IAs (one with old names and one with new names) and about 80% of them were more comfortable with the second IA.
3. The division of all the information into three categories was retained as most of the sample users found it easy to navigate through the website,



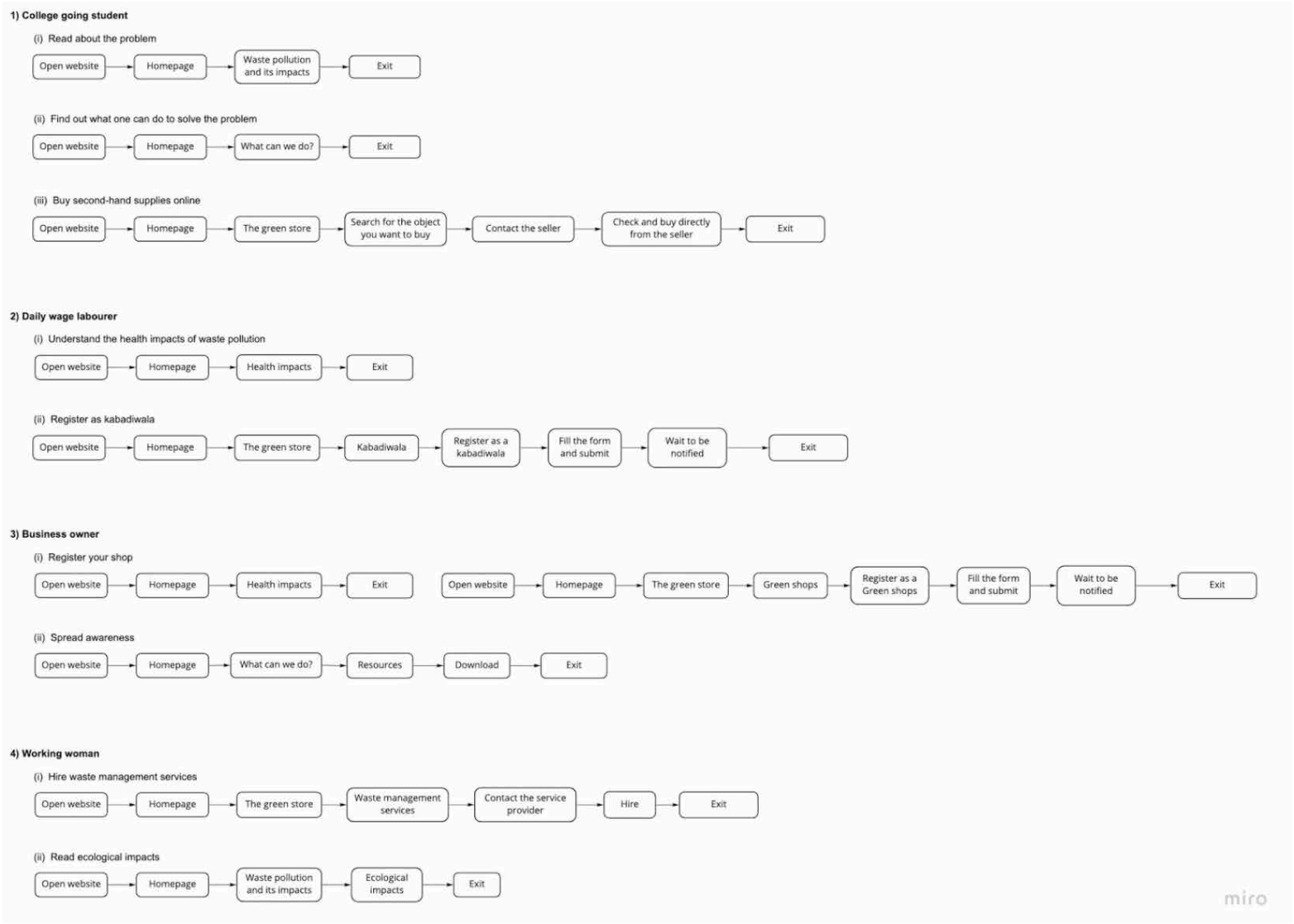
d. User flows

User flow is the path taken by a prototypical user on a website or app to complete a task. The user flow takes them from their entry point through a set of steps towards a successful outcome and final action, such as purchasing a product. The user flow is the basis for content requirements on web pages or app screens. Beginning with an understanding of user needs helps the product team build a user flow and experience that is designed to meet those needs.

For each user flow, the questions you need to consider are:

1. What is the user trying to accomplish?
2. What is essential to the user, and what will give them the confidence to continue?
3. What additional information will the user need to accomplish the task?
4. What are the user's hesitations or barriers to achieving the task?

The answers to those questions will inform how you design the pages, and determine what content and navigational links to include. If a user's primary goal is to browse various items, your page or screen will offer a different design and functionality than it would have if their primary goal is to purchase a product and move on.



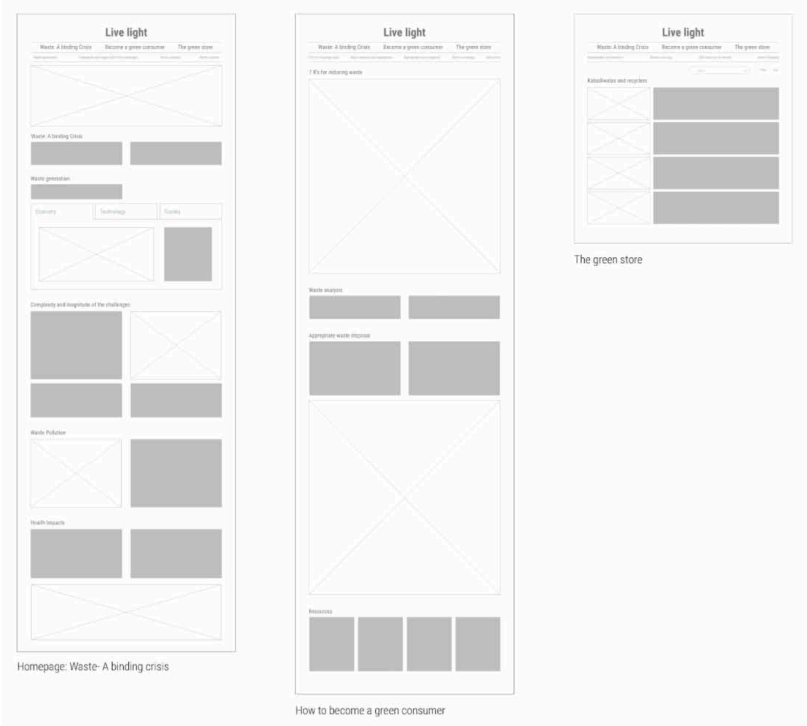
User flows were designed for the user personas

e. Final wireframes

From the user flow, the following website flowchart was developed, which made sure that each task was initiated in less than or equal to three steps.

Final Website flow

The website has been divided into three sections so that all the sections are reached in less than three clicks. The information is broadly divided into two sections. The website to work efficiently, it was found in conversations with various internet users that the website needed to be divided in terms of information and action to facilitate easy navigation for repeated users. Hence to accommodate that and the information architecture, I decided to divide the website into three sections. The first section (Waste pollution and its impacts) as its name suggests talks about the problem of waste and how it impacts our lives and the ecosystem. The second section (What can we do?) describes the things we can all do to minimize the amount of waste generated and the amount of waste reaching the landfill. The third section (The green store) is an online platform which can be used by people to sell and buy second hand stuff, shop green, and even hire people who provide waste management services like the kabadiwalas, recyclers and disposal and treatment plants.



Low fidelity wireframe screens (Iteration 2)

After usability testing we found that having just three pages worked well. A new thing that I tried was to have two navigation bars. The first one with the three main categories: 'Waste pollution and its impacts', 'What can we do?' and 'The green store'. The second navigation bar has all the topics that are on the page selected from the first navigation bar. Hence, on one hand if the search for information is exploratory, one can scroll down to read everything one after the other on the other hand, if the search is specific, the user can click on any of the topics to jump directly to that topic on the page. This made all the parts of the website accessible in less than or equal to three clicks. A login page was added for people to give them filtered results according to their location on 'The green store'. I also decided to have a button to switch between various languages.

After another round of wireframe testing was carried out amongst the same group as before, and after a lot of discussion it was seen that am important feature of communication with KBMC could be added to the website. It was seen that there was lack of communication between KBMC and a large portion of general population. Hence this new feature will provide a platform for people to file complaints, discuss problems and demand essential service from the KBMC. It will also provide a platform for KBMC to respond to peoples' concerns and to post reports of various environmental surveys and tests.

f. UI design

Header:

I used the header that was found to work the best while testing the wireframes in the final UI design. It has two navigation bars at the bottom. The top one is fixed with four main headers and the tabs of the second navigation bar change depending on the tab selected from the first bar. Headers with all the combinations of navigation bars are given below.

Navigation bars with 'Waste pollution and its impact' tab selected

Navigation bars with 'What can we do?' tab selected

Navigation bars with 'Kulgaon-Badlapur municipal corporation' tab selected

Navigation bars with 'The green store' tab selected

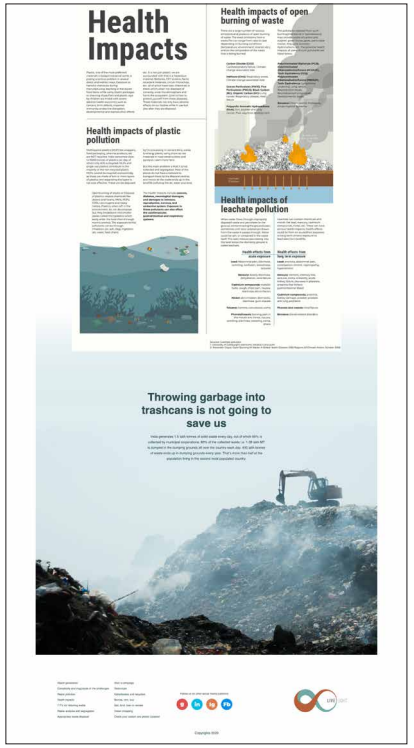
The top part of the header has three buttons: ENG (Language), Sign Up, and login. It also has the logo of the website at the center which is a link to the homepage.

Footer:

Footer has links to all the social media accounts that the the site is active on. The footer also has links to all the main topics that are covered on the site and copyrights.

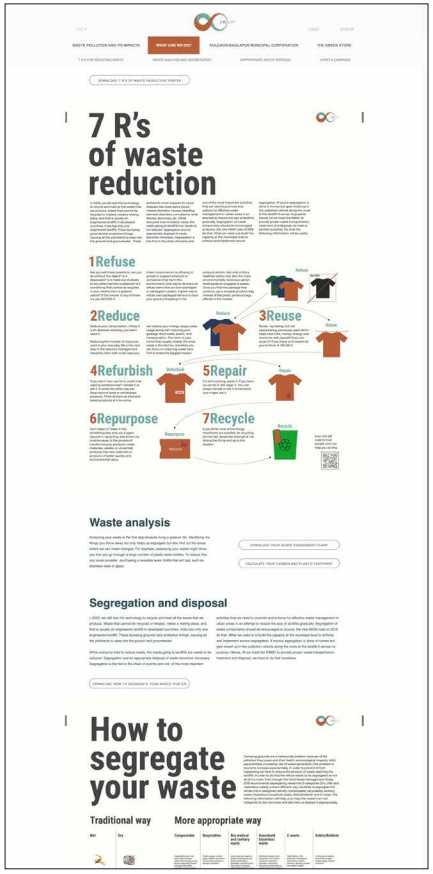
Footer

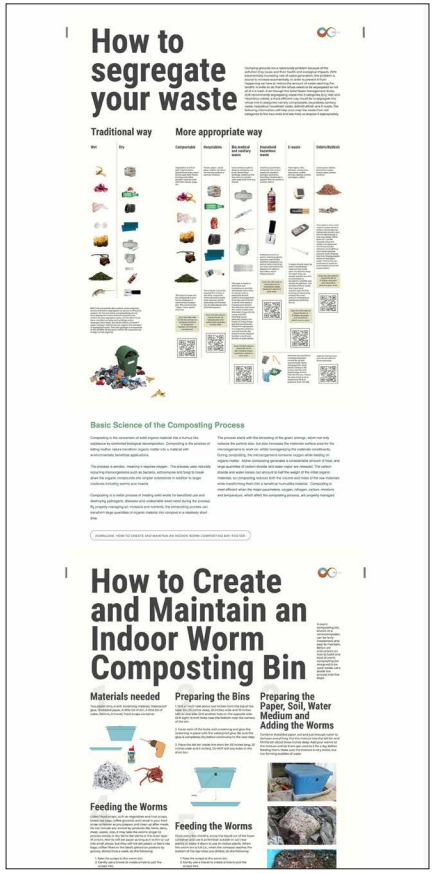
Homepage (Waste pollution and its impacts):
The first thing on the screen on the homepage the user sees is the header and a slider with images showing how the waste is piling up and forming high mountains with a counter that shows how much waste has been dumped in the landfills since 12 midnight, last night. This page talks about the waste pollution and its impacts in detail through images, infographics, graphs, statistics and text.

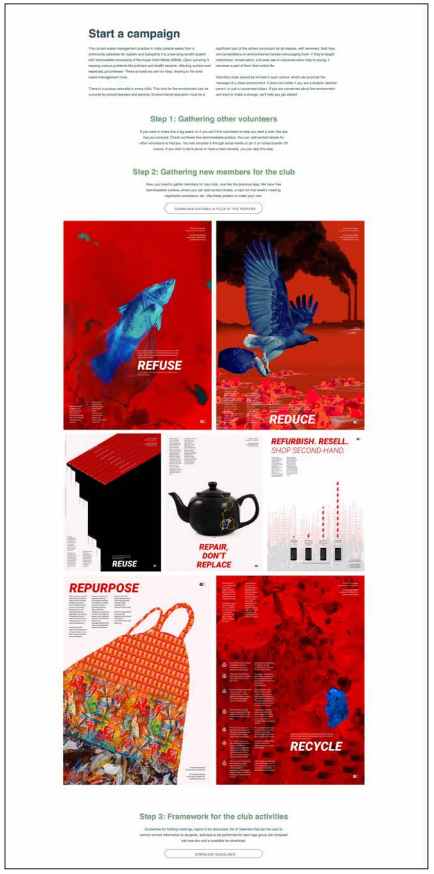


Page 2- What can we do?:

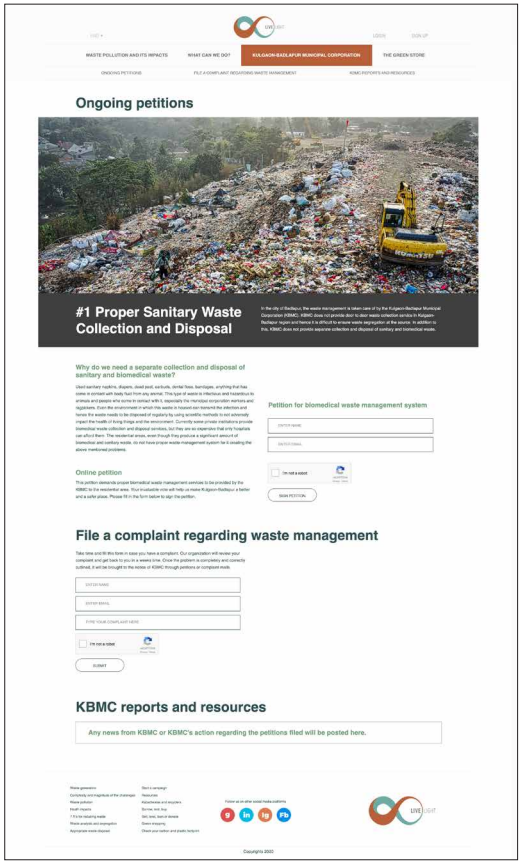
This page contains the different ways in which waste can be prevented from reaching the landfills. This page contains topics like: 7 R's of waste reduction. Waste analysis, Waste segregation and disposal, and Resources.





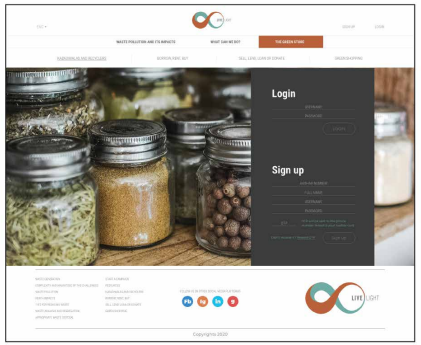


Page 3- Kulgaon-Badlapur municipal corporation:
This page is reserved for filing complaints with the KBMC, signing ongoing petitions and KBMC reporsts and news.

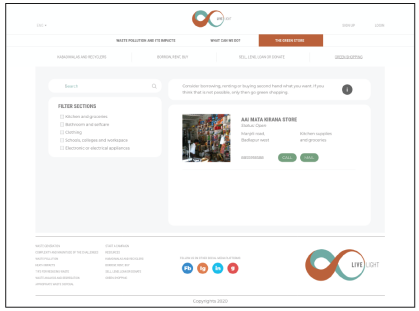


Page 4 - The green store:
This is a platform that is provided by the website using which the user can hire waste management services for himself/herself, their society or for an event. It can also be used to hire kabadiwalas, dismantlers and recyclers. Currently the website is built specifically for Badlapur and its citizens and hence can do without a login page as no matter who opens it, it will only show stores and services in badlapur.

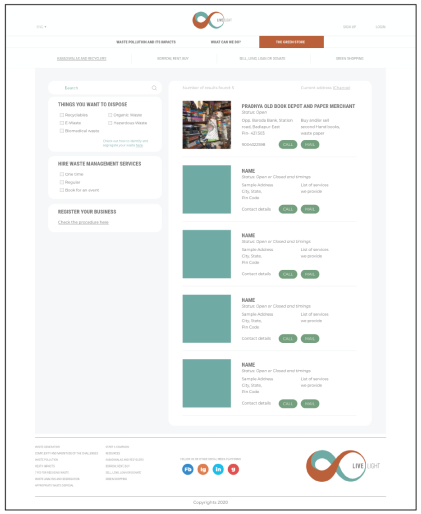
In future we can further develop it in such a way that the platform uses the location of the user to list down green shops around them and gives tips on how to shop green. The green store can also be used to buy, rent, borrow and sell second objects locally. To use this service, the user will have to register and then log into the website using a mobile number and an E-mail ID.



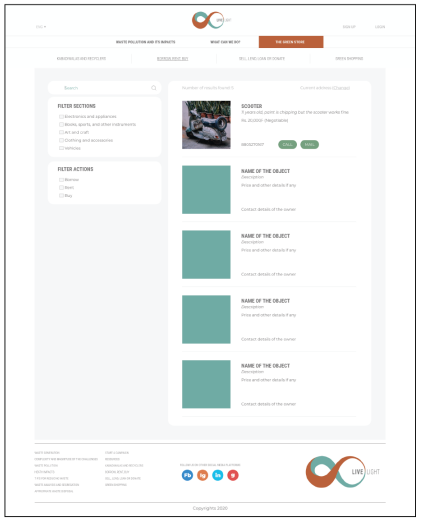
Login page



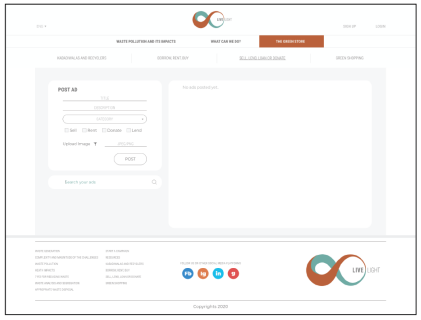
Shop from local shop that are going green



Hire waste management services



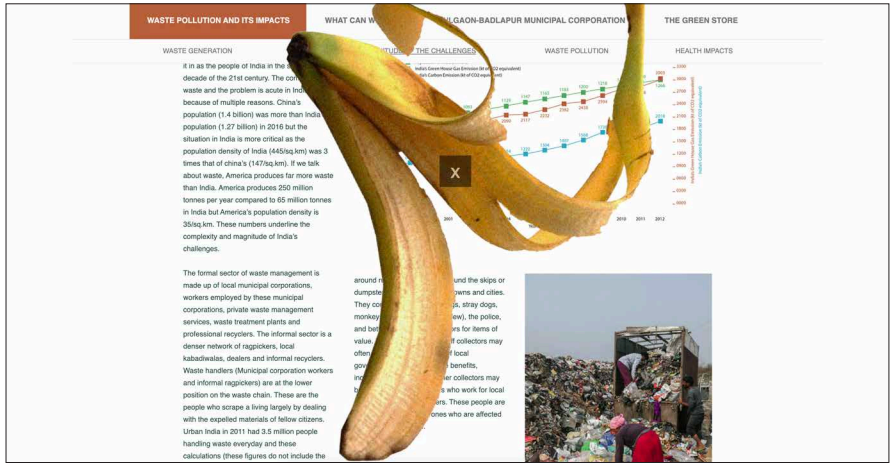
Buy Second-Hand objects



Post Ads and sell things you no longer want

Aditional UI elements:

After all the functionalities were designed into the website, the next challenge that was faced was the representation of the magnitude and impacts of waste pollution. Then it was decided that a layer of waste be put on top of the website to hinder the regular use of the website. This was done to mimic the problems the waste poses in our day to day life. This also represents the idea that the production of waste is inevitable and ignoring it is not helpful. The only way to get rid of the waste is to deal with it. This is what the user has to do on the site too.



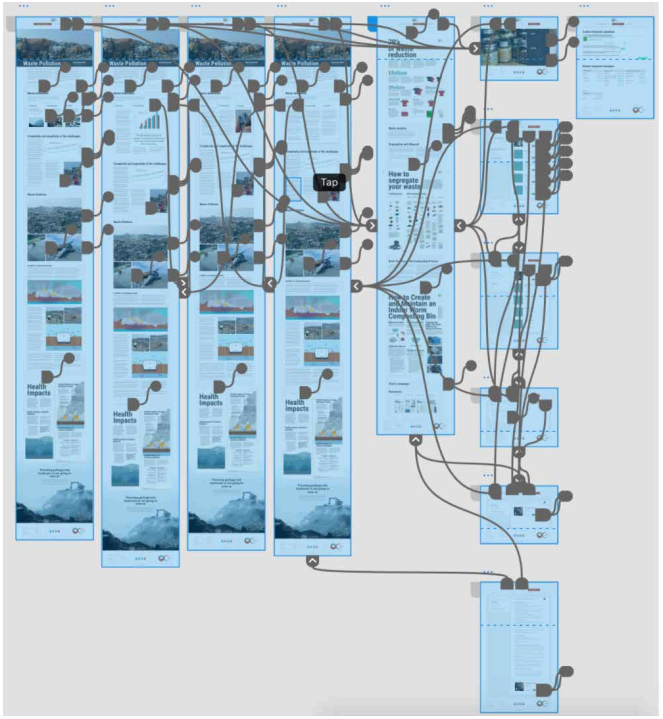
Organic waste on top of the website

To read what is written under the waste user has to click the ‘x’ on it. When the cursur rolls over the image of the waste, information about condition of the disposal system for and the impacts of that waste is displayed.

Information displayed on rollover

g. Prototyping

Prototyping of this website was done on Adobe XD using live links and animation. The prototype was then tested on people to study the user experience on the website. It was observed that the flow of the website worked well but the font size and buttons were not optimum (large enough). The changes made in the typography after these observations are mentioned in the next sextion.



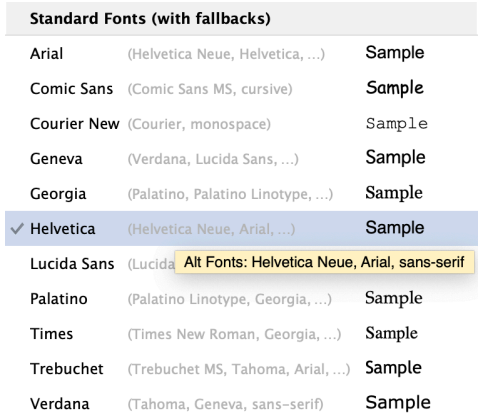
Prototype links

h. Typography

The typography of a website plays an integral role in the user experience of a site–just as much as other elements such as navigation, color palette and use of images do. Whether one prefers serifs or sans serifs (or a combination of the two), the main objective when choosing typefaces for design projects is readability. To facilitate viewing on low resolution screens, I decided to us a sans serif font family.

Helvetica font family was selected for two main reasons.

1. It is a large font family with over 9 fonts with different weights.
2. This family belongs to a larger family of standard fonts. All the fonts in this family are used as fallback fonts. The font-family property should hold several font names as a "fallback" system, to ensure maximum compatibility between browsers/operating systems. If the browser does not support the first font, it tries the next font.



Website Body

Heading 1 (80 pt)

Sub heading 1 (50 pt)

Sub heading 2 (34 pt)

Body text (15 pt): Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Navigation Bar

HEADING 1 (14 pt)

SUB HEADING 1 (14)

VI. viii. Website development

HTML (HyperText Markup Language) is the most basic building block of the Web. It defines the meaning and structure of web content. Other technologies besides HTML are generally used to describe a web page's appearance/presentation (CSS) or functionality/behavior (JavaScript).

"Hypertext" refers to links that connect web pages to one another, either within a single website or between websites. Links are a fundamental aspect of the Web. By uploading content to the Internet and linking it to pages created by other people, you become an active participant in the World Wide Web.

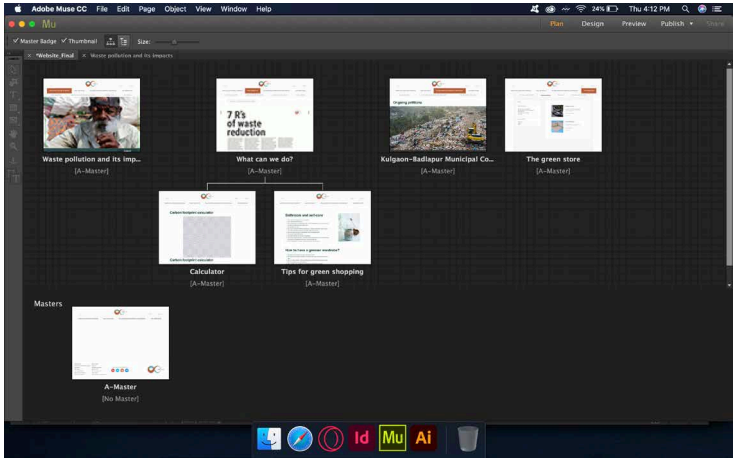
HTML uses "markup" to annotate text, images, and other content for display in a Web browser. HTML markup includes special "elements" such as <head>, <title>, <body>, <header>, <footer>, <article>, <section>, <p>, , , <img>, <aside>, <audio>, <canvas>, <datalist>, <details>, <embed>, <nav>, <output>, <progress>, <video>, <ul>, <ol>, <li> and many others.

HTML CSS
Cascading Style Sheets, fondly referred to as CSS, is a simply designed language intended to simplify the process of making web pages presentable. It allows you to apply styles to web pages. More importantly, CSS enables you to do this independent of the HTML that makes up each web page.

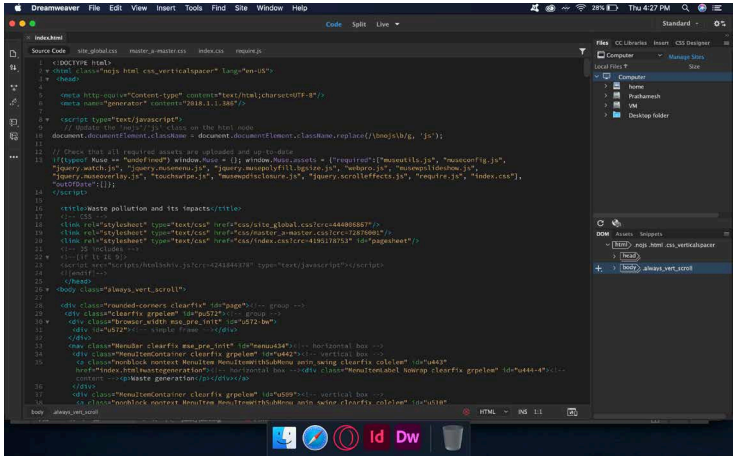
This programming language was chosen because of the following reasons: Coming from an Electronics and Telecommunication background I had basic knowledge of HTML and CSS.
HTML is basic and the most fundamental language used for front end web development.
Adobe Muse, which is a web development software with graphic user interface (GUI) for convenient web development, also can export in HTML. All browsers, irrespective of the versions, support HTML pages as it is one of the first languages used for web development.

The site was then built on Adobe Muse GUI. The site was then exported into .html format toh make some minor adjustments. Html codes of third party carbon footprint and plastic footprint calculator were also embedded on the website and due credits were given. A counter that counts the total weight of waste dumped into landfills worldwide since the beginning of the year from the site https://www.theworldcounts.com, was also embedded. All this was done using the softwares Adobe Muse and Adobe Dreamweaver.

Screenshot of the Sitemap (Plan View) in Adobe Muse



Screenshot of GUI of Adobe Muse



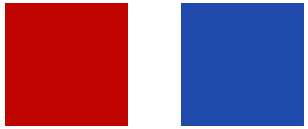
Screenshot of the website's code opened in Adobe Dreamweaver

VI. ix. Poster Design for offline campaign

The 7 R's that were defined earlier were used to talk about various problems that Badlapur as well as the world faces through the posters. Posters have been conceptualized and designed as a strategy to initiate and kick start local efforts in schools, residential areas and for NGO's who wish to work on the issue to sensitize smaller groups on waste generation and management. These posters are meant to announce events and discussions to bring about local changes in generation and handling of waste. The posters are of A2 size.

a. Colour palette

Highly contrasting primary colours Blue and Red were chosen as the main colours for the palette. The aim was to arrest the attention of the viewer using graphic, simple and memorable illustrations which depict the severity of the problem. Reduction and simplification of form and colours was done for maximum impact.



c00400 1f49aa

Open files of all the posters for editing the contact details are available for download on the website. One of the posters was also made in Marathi which is the local language of Badlapur for demonstration.


Be a part of the solution.
Be a part of the Live Light Club.
Mr Prathamesh Siddhesh
Contact details: 08805270167
p.siddhesh@somaiya.edu
The 26-km-long Thane Creek, which covers a ground area of 1,690 hectares, has suffered an environmental catastrophe over the past 14 years. 58 of the 69 marine species in its waters have become extinct during this period.
REFUSE
what you cannot reuse. Prevent these one time use plastic from reaching our oceans.
Recent studies have revealed marine plastic pollution in 100% of marine turtles, 59% of whales, 36% of seals and 40% of seabird species examined.
Asian sea bass, Hilsa (herring), black tiger prawn, small crab and lobster are among the 11 surviving marine species in the brackish waters of the Thane Creek.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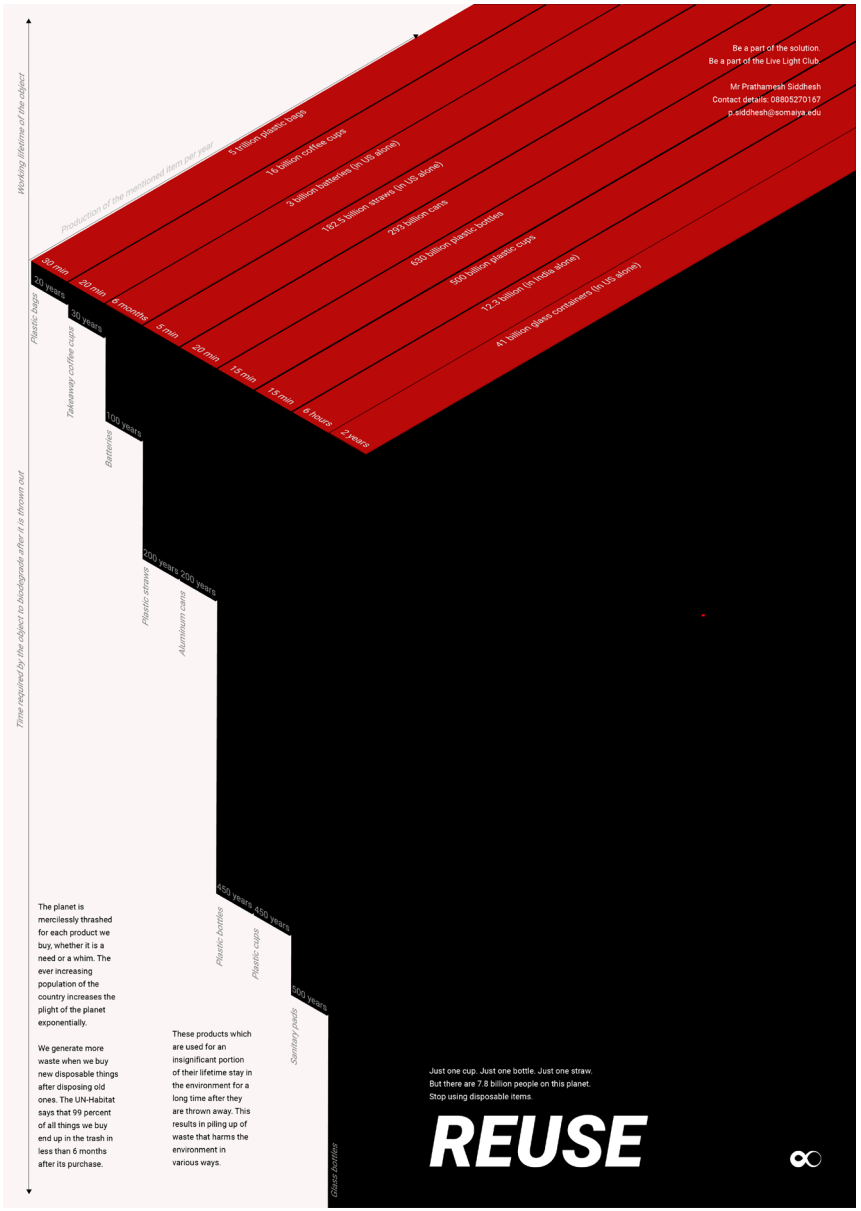
Reducing and reusing products cuts down on manufacturing pollution, just as the use of recycled instead of virgin materials prevents pollution in industrial processes. Reducing the amount of waste you generate is a great step to take towards helping the environment. There are several things that you can do.
Use tote bags or bins when shopping, say no to the plastic shopping bag.
Select packaging that does not have a lot of excess waste.
Use dinnerware that can be washed instead of paper plates and plastic wate. Only buy things that you will use in the immediate future.
Every day approximately 8 million pieces of plastic pollution find their way into our oceans. There may now be around 3.25 trillion macro and microplastic pieces floating in the open ocean. Weighing up to 269,000 tonnes.
REDUCE



When a bowl, teapot or precious vase falls and breaks into a thousand pieces, we throw them away angrily and regretfully. Yet there is an alternative, a Japanese practise that highlights and enhances the breaks, thus adding value to the broken object. It's called kintsugi, or kintsukuroi, literally golden ("kin") and repair ("tsugi"). Kintsugi, or gold splicing, is a physical manifestation of resilience. Instead of discarding marred vessels, practitioners of the art repair broken items with a golden adhesive that enhances the break lines, making the piece unique. They call attention to the lines created by time and rough use; these aren't a source of shame.

This traditional Japanese art uses a precious metal – liquid gold, liquid silver or lacquer dusted with powdered gold – to bring together the pieces of a broken pottery item and at the same time enhance the breaks. The technique consists of joining fragments and giving them a new, more refined aspect. Every repaired piece is unique, because of the randomness with which ceramics shatters and the irregular patterns formed that are enhanced with the use of metals.

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Kintsugi

REPAIR, DON'T REPLACE

REPURPOSE

While recycling is a beautiful practice that has a positive impact on the environment, repurposing materials is even more effective when it comes to saving energy. Recycling can be a very energy-intense practice, depending on how one does it. Repurposing, however, takes far fewer resources to complete, making it a more energy-efficient process.

In many cases, when materials and equipment are no longer needed, we throw them in the trash and move on. It's all too easy to dispose of the items and forget about them, but unfortunately, our landfills are filling fast, so reducing the amount of trash is essential. Repurposing takes usable items, including raw materials, and turns them into things that people can use, keeping the pressure of the landfills and disposal areas. Multi-Layered Plastic (MLP) is one such material that is used a lot and cannot be recycled. All the MLP waste eventually ends up in the dumping grounds. There are very few companies which repurpose this MLP waste.

Visit the Live Light website to find out which organizations that process and repurpose multi-layered plastic waste around you.

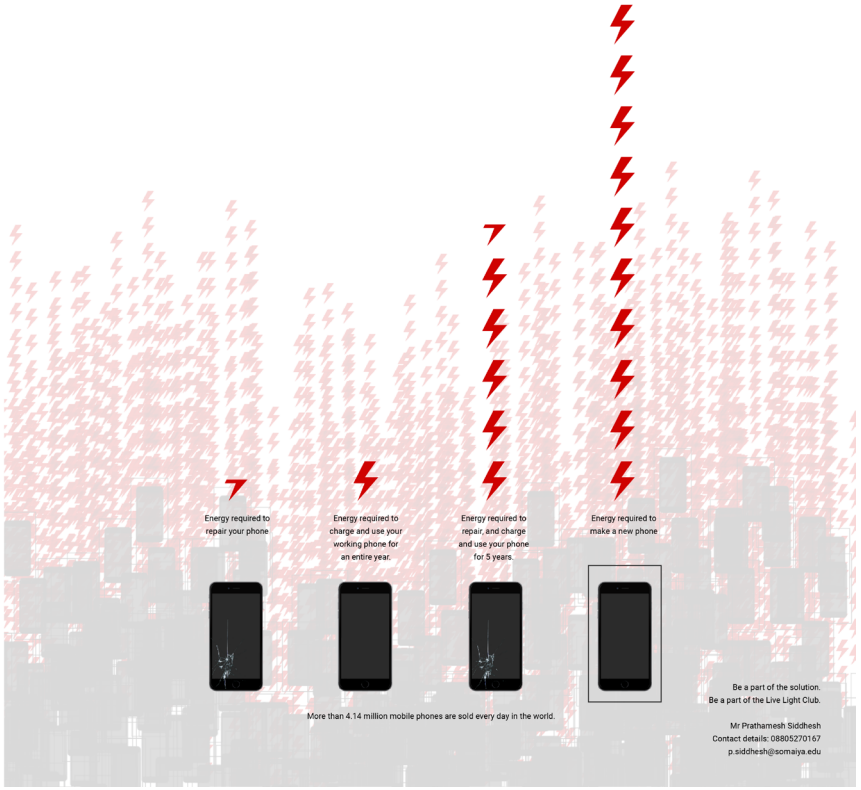
Be a part of the solution.
Be a part of the Live Light Club.

Mr Prathamesh Siddhesh
Contact details: 08805270167
p.siddhesh@somaiya.edu

REFURBISH. RESELL.

SHOP SECOND-HAND.

A new study from researchers at McMaster University published in the Journal of Cleaner Production analyzed the carbon impact of the whole Information and Communication Industry (ICT) from around 2010-2020, including PCs, laptops, monitors, smartphones, and servers. They found remarkably bad news. Even as the world shifts away from giant tower PCs toward tiny, energy-sipping phones, the overall environmental impact of technology is only getting worse. The carbon footprint of 1% of ICT has already tripled and is on its way to exceeding 14% by 2040. That's half as large as the carbon impact of the entire transportation industry.



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जेव्हा एखादे वाडगे, चमचा किंवा मौल्यवान फुलदाणी पडून हजारो तुकड्यांत विखुरली जाते, आपण ती रागाने किंवा खंत करून फेकून देतो. जपानी संस्कृती मध्ये याचर एक उत्तम पर्याय आहे जो या तडांवर प्रकाश टाकत तुटलेल्या वस्तूंचे मौल्य वाढवतो. या प्रकाराला किंत्सुगी किंवा किंत्सुकुरोई असे संबोधले जाते. शब्दशः सोनेरी जोड.
किंत्सुंगी किंवा सोन्याची जोडणी हे लवचिक तेचे भौतिक परिमाण आहे. तुटलेली भांडी फेकून न देता अनुभवी कलाकार सोन्याच्या मदतीने तुटलेले सांचे आकर्षक बनवून दुर्मीळ वस्तू घडवतात. कालांतराने आणि कशाही वापराने पडलेल्या भेगांची इथे शोभा वाढवली जाते. जे लाजिरवाणे मुळीच नाही.

पारंपरिक जपानी कला मौल्यवान धातू, सोन्याचा, रंदीचे द्रव्य किंवा लाख मध्ये मिसळलेले सुचण इत्यादीचा वापर करून फुटलेली मडकी जोडून त्या भेगांचे सौंदर्य वाढवतात. फुटलेले विविध तुकडे जोडून त्यांना एक नवीन रुप देणारे हे सौंदरात आहे. अशा प्रकारे जोडलेला प्रत्येक नग हा दुर्मीळ असतो कारण यामध्ये असले ली भिन्न तुकड्यांची अनिय. मितता आणि जोडीला धातूंची चकाकी !

Be a part of the solution.
Be a part of the Live Light Club.

Mr Prathamesh Siddhesh
Contact details: 08805270167
p.siddhesh@somaiya.edu

जोडा, बदलू नका

VII. Future scope

This website contains sections that need to be moderated and updated regularly. It needs to be a moderated website and hence is designed a static way with some components that are dynamic. It can be moderated by non governmental organisations.

Extensibility: This website is extendable in many ways. Its modular structure will help update the website and the IA easily. New features can be embedded in the same webpages or can be introduced as new webpages by the institute that is moderating it.

Reusability: IA and the structure of the website can be reused to make a similar website for different geographical locations which may or may not be connected to each other.

Devices: Right now the the website is made for 1366x768 as it is the most used screen. But it can be later developed to make it into a responsive website. It can also be made into a mobile web app using device queries.

Language: Currently the website is in English but can be developed in different languages as required in future.

VIII. Conclusion

Despite new technologies that are emerging for solid waste disposal and management, dumping of waste into open spaces is a urban habit and disaster that has caused tremendous health and environmental issues. Thus, a safer and more sustainable approach may to minimize the amount of waste we generate and send to the dumping grounds. It is about time we started making better and more informed choices throughout the process of producing and consuming products. In the wake of the Covid 19 pandemic, as waste becomes more and more hazardous due to discarded medicines, masks, gloves, equipment, etc. it is imperative that we started turning proper waste management actions into habits.

This project represents the idea that like everything else, even waste management starts at home. It was designed and developed to fulfill the aim of developing a sense of responsibility and ownership in each individual towards their environment. The campaign aims at addressing all the citizens of Badlapur who can and wish to contribute to the solution; and it hopes that the interested few would be able to convert all citizens into caring individuals. It not only aims at developing good habits but aims at providing the necessary information and means to sustain a green lifestyle and hope to build a better civic sense in everyone that is environmentally conscious too.

I hope if and when the project is implemented and is live, it manages to reach a large population and that it can propel some change. I hope that the link that the project can provide to the local government helps build a responsible society with a responsible and transparent **system**. That the green store helps the community to come up with many more green stores

and as consumers make more informed decisions. I also hope that being able to hire Kabadiwaalas and ragpickers to segregate waste at the source not only helps the citizens to manage waste better but also the ragpickers and kabadiwalas by providing them with financial support and better working conditions than a dumping ground.

This project, from the beginning, was a huge task and still is. But Prof. Binita Desai's constant support and design process helped me turn this idea into a tangible product. I am glad that she made me go through the process. Even though the project was supposed to be an application of the skills I had learned in one and half years of the course, I cannot even count the number of things I learned along the way.

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