“WASTE SEGREGATION MADE EASY”

PROJECT REPORT

Submitted for CAL in B.Tech –Introduction to Innovative Project -PHY1999

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June, 2021

CONTENTS

ABSTRACT

Solid waste management is a major problem in India, where urbanization, population growth, industrialization and economic growth have resulted in increased solid waste generation per person. The key to efficient waste management is to ensure proper segregation of waste at source and to ensure that the waste goes through different streams of recycling and resource recovery.

This project aims to develop a website that helps the user to segregate their waste into recyclable or non-recyclable. Deciding what category of waste a particular item falls into is difficult and our aim is to make this task easier. The user types in the name of the waste that they want to segregate and the website replies with “Organic or Biodegradable waste” “Dry waste ” and “Domestic Hazardous waste”. The website also aims to educate users about the proper way to dispose of various items, helping the users reduce the waste generated.

Pre - Project Discussions

List of 8 topics and Brainstorming details (Group discussion main points)

Meher Shrishti Nigam - Water Scarcity. India is suffering from its worst water crisis in its history. With access to a nearby sustainable, safe water source, communities can grow local agriculture and better raise livestock for food security.

Anas Ahmad Siddiqui - Domestic violence is deeply entrenched and widely prevalent in India. The more we talk about domestic violence, the more likely it becomes that we build awareness,

identify abusive behaviors, and take action to prevent harm to people in our communities who may be family, friends, neighbors, or coworkers.

Anosh Damania - Climate change, a very underrated topic because people don't realize the scale of the problem we are facing. If we don't take action soon then it may be too late as our whole energy systems and hence the whole economy is based on coal power plants and hence by nature is disruptive to the environment.

Sree Lakshmi - Period Poverty refers to lack of access to hygienic sanitary products or facilities. It has a negative impact both physically and mentally. The social stigma related to this should be essentially removed.

Shreya Ramarao - Waste Management. The situation has gone from something that could be done to something that must be done due to the increased rate of pollution nowadays. Managing wastes will help us lead a healthy life and would let the future generations also experience all the benefits nature provides us.

Gauthama - Traffic Congestion. The wasted fuel during traffic congestion increases air pollution and it can even lead to economic loss in a country. By making people aware of this issue and its countermeasures(planning & designing,road infrastructure,supply and demand) it may result in reduced traffic.

Vanisha - Gender inequality. It is the social process by which men and women are not treated equally. Even in progressive societies and top organizations , many examples of gender bias can be seen . Though many people notice it , most of them tend to ignore it.

Vagadeeshwar - Poverty. The high population growth rate is one of the major reasons for poverty in India. This further leads to a high level of illiteracy, poor health care facilities and lack of access to financial resources.

Final topic selected by the team along with justification

The final topic selected by our team was waste management.

India is a country experiencing rapid population growth and improvements in living standards and achieving sustainable development within such an environment is very difficult. In our everyday life we witness litter and unsanitary environments everyday, but feel helpless about them. There is a saying that charity starts at home. Everytime we are able to properly segregate waste and ensure it gets reused or recycled, then we are ensuring a cleaner and sustainable environment for the future. Thus we decided to build a website that would make the task of segregating wastes easier for everyone.

1. Introduction:

1.1 Objective and goal of the project

To recognize the main problems that cause waste not to be segregated and to make an efficient and user friendly solution that addresses the major issues regarding waste segregation.

1.2 Detailed literature survey

Following are the findings extracted from the literature relevant to our project.

Kumar S, Smith SR, Fowler G, Velis C, Kumar SJ, Arya S, R, Kumar R, Cheeseman C et al**[1]** explained in their paper "2017 Challenges and opportunities associated with waste management in India" that the fact that the current systems in India cannot cope with the volumes of waste generated by an increasing urban population, and their impacts on the environment and public health. They estimated the quantity and characteristics of Municipal Solid Waste (MSW) in India and forecasted future waste generation. They concluded that the quantity of MSW depends on living standards, the extent and type of commercial activity, eating habits and season. Waste generation rate depends on factors such as population density, economic status, level of commercial activity, culture and city/region. So they conclude that sustainable and economically viable waste management is necessary.

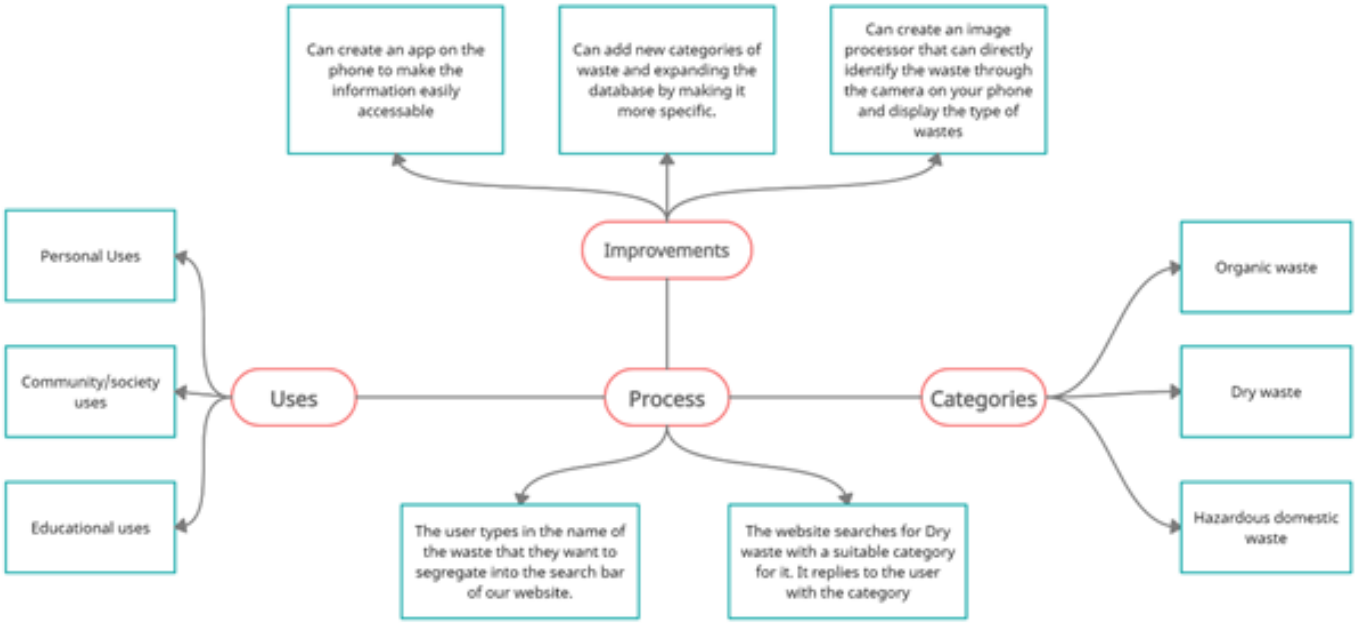
Abhishek Nandan , Bikarama Prasad Yadav , Soumyadeep Baksi , Debajyoti Bose et al**[2]** explained in their paper "Recent Scenario of Solid Waste Management in India" that industrialization is very significant for developing countries like India which has a large population. Waste segregation is described as the biggest obstacle for effective solid waste management. Segregation is common in developed countries like the U.S., Europe and Japan; but countries like India most often collect MSW in a mixed form. A formula for determining the energy content of MSW was verified "HHV (kJ/kg) = 53.5 (F + 3.6 CP) + 372 PLR" where, F is food, CP is cardboard and paper, and PLR is plastic, leather and rubber, all expressed as mass percentages. Waste was segregated into further types.

Madhanraj Kalyanasundaram, Yogesh Sabde, Kristi Sidney Annerstedt, Surya Singh, Krushna Chandra Sahoo, Vivek Parashar, Manju Purohit, Ashish Pathak, Cecilia Stålsby Lundborg, Kamran Rousta, Kim Bolton, Salla Atkins and Vishal Diwan et al**[3]** proposed in their paper

“Effects of improved information and volunteer support on segregation of solid waste at the household level in urban settings in Madhya Pradesh, India (I-MISS): protocol of a cluster randomized controlled trial” that segregation of household waste at the source is an effective and sustainable strategy for management of municipal waste. This paper describes the protocol of an 18 month two-group parallel,cluster randomised controlled trial in the urban setting of Ujjain, Madhya Pradesh, India. They concluded segregation at the source ensures that waste goes through different recycling and resource recovery streams, reducing waste and offering economic opportunities for households and communities. They concluded that waste segregation and its proper management can be one of the important determinants of creating healthy, and sustainable communities. The findings of this project added to understanding of households’ compliance and challenges of waste segregation. Inability to properly segregate waste despite general guidelines was a major issue. Waste has to be segregated properly for it to be fit to be recycled. For example, contaminated plastics are not recycled and thrown away in a landfill.

1.3 Mind mapping

Following is the multiflow mind mapping of our project



2. Methodology: Experimental/Simulation

We observed that one of the main reasons for people not being able to segregate waste material was their unawareness of under which category a waste would come if it has to be disposed of. So, we made a project that can help people to easily do this task, and also understand the importance of segregating waste correctly.

We decided to build a project that can be easily accessed from any device. Therefore, we decided to build a website that can be accessed from any browser.

We built a website that helps users to segregate their waste into “Organic or Biodegradable waste” “Dry waste ” and “Domestic Hazardous waste”. This is according to the Solid Waste Management Guidelines given by the Government of India. The user types in the waste’s name and the website outputs its type.

The UI of the website was supposed to be simple and easy to use and navigate through. Other alternatives we had was developing software, but we rejected it because it was not as easy to access a website.

Languages Used:

HTML - markup language to structure the webpage
CSS - style sheet language for styling the presentation of the webpage
JavaScript - programming language to make the page interactive and search through the dataset

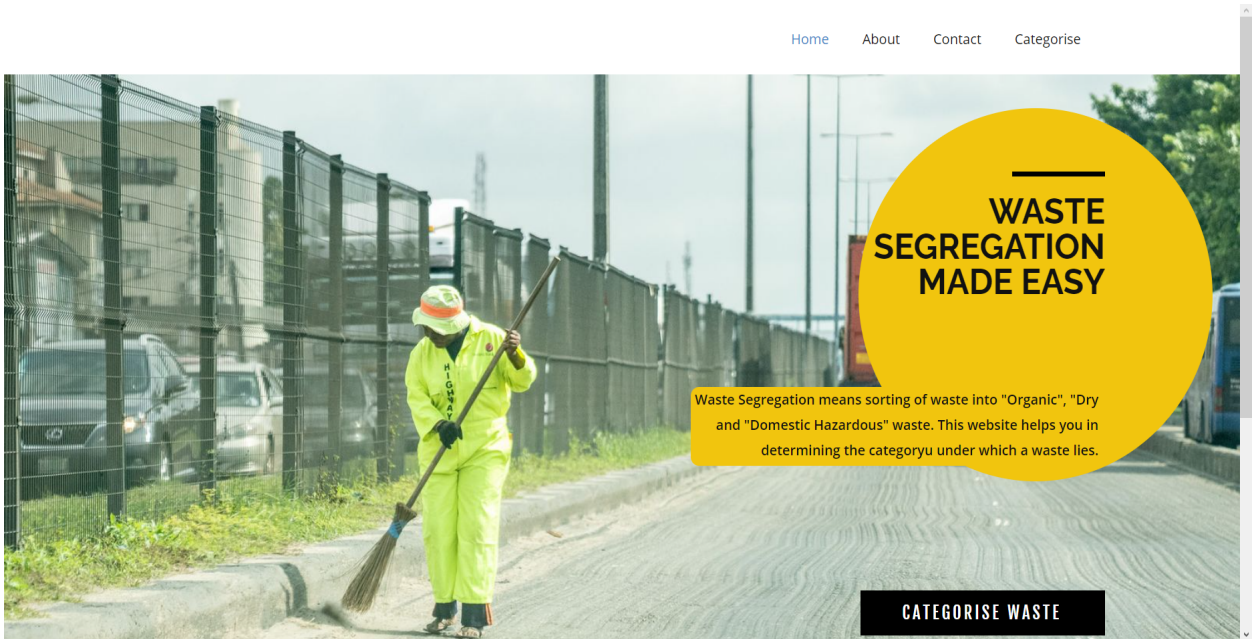
Project Type: A responsive webpage

Data Set:
The dataset contains upto 500 different everyday household items that might be disposed of. We searched the web for reliable websites and government websites for accurate information about disposing of different wastes.

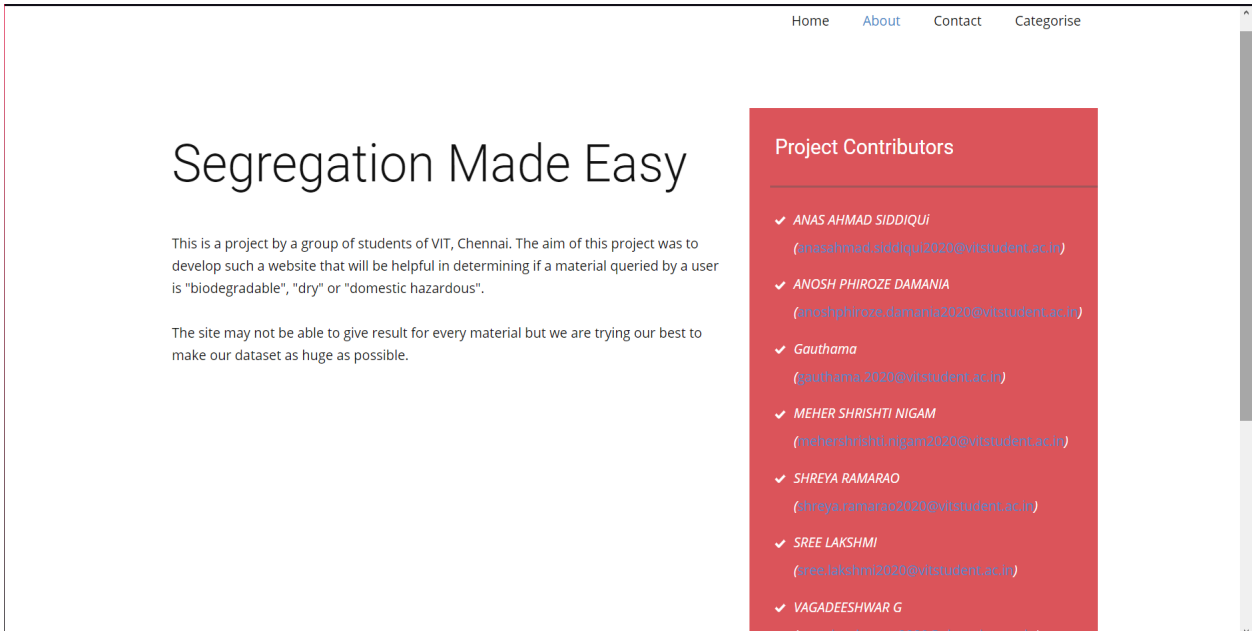
The first column contains the list of items and the second column corresponds to their category. These websites we took information from have been linked in the references below. [5], [6], [8].

The webpage front-end was developed using **HTML** and **CSS**. It is a 4 page website including the home, about, contact and categorize page.

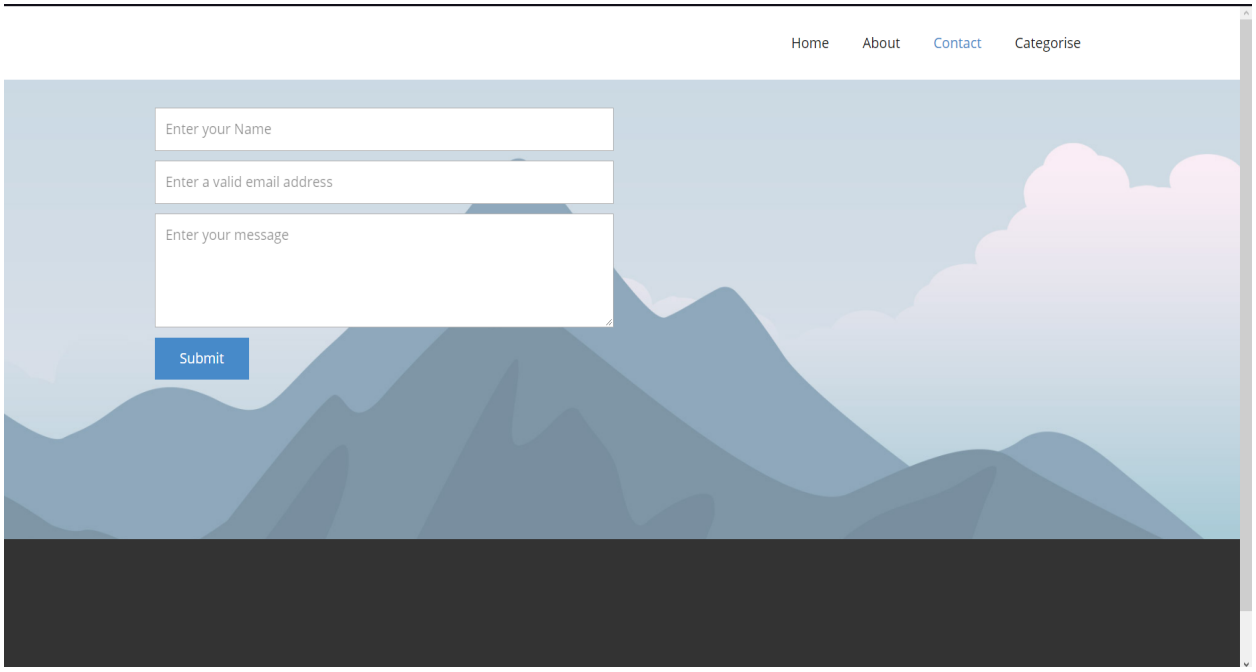
- **Home** page gives a little introduction about our project.



- The **About** page contains all the group members information and description of the website and its working.

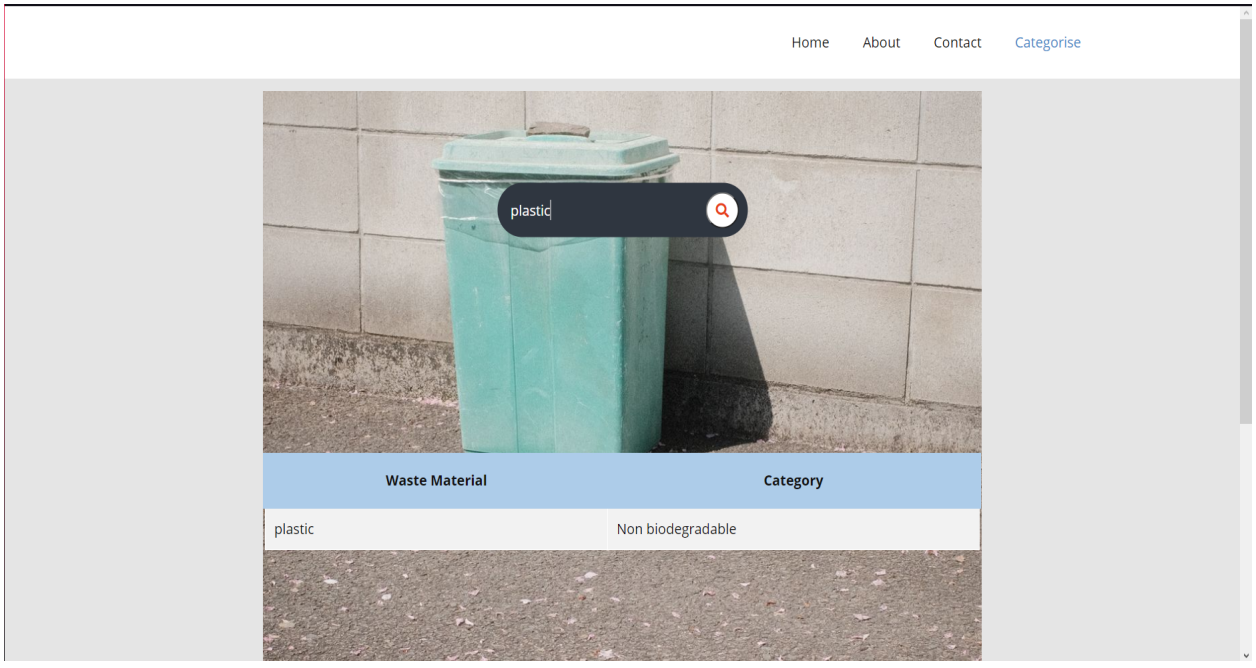


- The **Contact** page can be used to report a bug.



- The **Category page** is the main working page of our project. This is where the user will enter the name of waste material and the website will return the category.

Working of the Category Page: The webpage takes the input from the user and sends the string to the JavaScript script named app.js which checks if the waste name is already in the dataset sample.csv and if it finds the entry it returns the category corresponding to it.



Below is the code base of our website. The full code of our website is very long, it is easily accessible in the github repository below.
https://github.com/Anas-Ahmad-Siddiqui/Segregation_Made_Easy.git

Below is the app.js JavaScript code of our website, which contains the main search mechanism.

```
d3.csv("http://anas-ah-siddiqui.infinityfreeapp.com/segregation-made-easy/sample.csv").then(function (data) {

    var sample = data;

    var button = d3.select("#button");

    var form = d3.select("#form");

    button.on("click", runEnter);

    form.on("submit", runEnter);

    // Defining the function

function runEnter() {

    // This line of code selects the <tbody> from the html and clears it. If this is not used, then the results would appear on top of the previous result.

    d3.select("tbody").html("")

    // This code is needed to prevent the page from reloading.

    d3.event.preventDefault();

    // This code will get the user's input from what the user will type in the html <input> since we assigned it the "user-input" id. It will get the value and store it in our inputValue variable

    var inputValue = d3.select("#user-input").property("value");

    // This loop will loop through the first column of the csv file (i.e. waste), if it matches the element it will assign the values accordingly

    for (index=0; index < sample.length; index++){

        if (sample[index][" waste "] == inputValue){
```

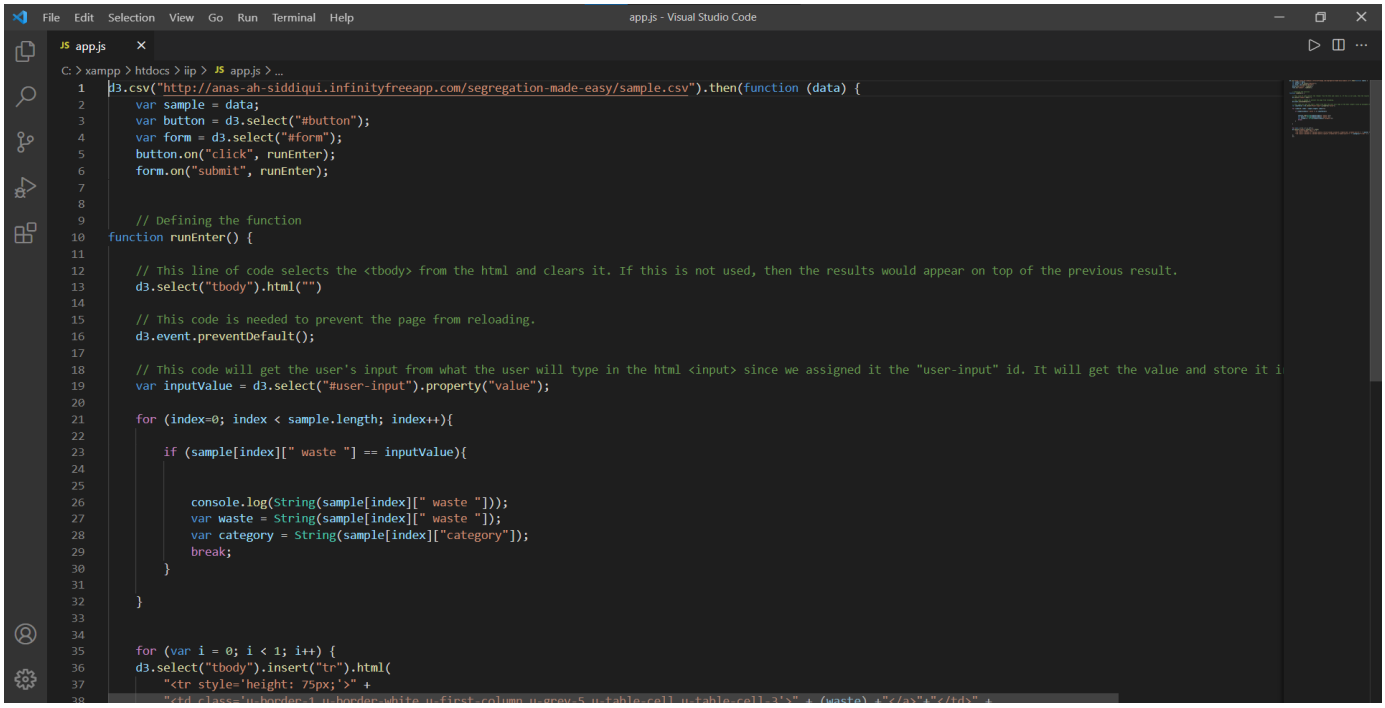
```
        console.log(String(sample[index][" waste "]));
        var waste = String(sample[index][" waste "]);
        var category = String(sample[index]["category"]);
        break;
      }

  }

  //Inserts the html code in the tbody
  d3.select("tbody").insert("tr").html(
    "<tr style='height: 75px;'>" +
    "<td class='u-border-1 u-border-white u-first-column u-grey-5 u-table-cell u-table-cell-3'>" + (waste) +"</a>"+"</td>" +
    "<td class='u-border-1 u-border-white u-grey-5 u-table-cell u-table-cell-4'>" + (category)+"</td>" )

  };
  });
```

JavaScript sample:

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    var inputValue = d3.select("#user-input").property("value");

    for (index=0; index < sample.length; index++){

        if (sample[index][" waste "] == inputValue){


            console.log(String(sample[index][" waste "]));
            var waste = String(sample[index][" waste "]);
            var category = String(sample[index]["category"]);
            break;
        }

    }


    for (var i = 0; i < 1; i++) {
    d3.select("tbody").insert("tr").html(
        "<tr style='height: 75px;'>" +
```

Dataset Sample:

	A	B
1	waste	category
2	paper	Dry Waste
3	plastic	Dry Waste
4	food container	Dry Waste
5	plastic carrybag	Dry Waste
6	paper towel	Dry Waste
7	glass bottle	Dry Waste
8	cardboard	Organic/ Bio-degradable Waste
9	dust	Dry Waste
10	bucket	Dry Waste
11	shampoo bottles	Dry Waste
12	ear buds	Dry Waste
13	pen	Dry Waste
14	toothbrush	Dry Waste
15	pencil	Dry Waste
16	shoes	Dry Waste
17	paper coffee cups	Dry Waste
18	sanitary pads	Dry Waste
19	steel bottle	Dry Waste
20	screwdriver	Dry Waste
21	metal tools	Dry Waste
22	rubber band	Dry Waste
23	electric fan	Dry Waste
24	face mask	Dry Waste
25	duster	Dry Waste

3. Results and Discussion

Improved waste management at all levels is needed to maintain environmental balance amid rapid socioeconomic development. Waste segregation is the biggest obstacle for effective solid waste management. It is common in developed countries like the U.S., Europe and Japan; but countries like India where mixed waste is often dumped in open areas.It is mainly because of lack of public awareness and advancements in source separation techniques. Segregation step should be unavoidable in waste management. Segregation process can help reduce the burden of transportation of waste as well as lower leach rate and greenhouse gas (GHG) emissions.

If the waste is segregated at source, various components can be utilized in different types of production processes, generating marketable use value.

Adopting proper waste segregation practices at household level could be the key for developing workable waste management systems in urban settings. Segregation at the source ensures that waste goes through different recycling and resource recovery streams, reducing waste and offering economic opportunities for households and communities. Waste segregation and its proper management can be one of the important determinants of creating healthy and sustainable communities.

Our website helps in providing the waste segregation details, thus contributing to solve the issue of waste management.

4. Pros and Cons

Pros:

1. The greatest advantage of waste segregation is keeping the environment fresh and neat.
2. Improving waste segregation can increase and ease the efficiency of disposal techniques.
3. This practice is highly lucrative as the wastes segregated can undergo further waste management processes like recycling,reusing etc. By doing so it can reap benefits.
4. Hazardous wastes if left unchecked can cause a huge sum of trouble to both humans and the environment. Thus by segregating it, we may come up with a proper solution for it’s disposal.

5. There are many dry wastes like plastic,glass,old papers etc which can be recycled and reused. Doing so we can conserve energy and consumption of earthly resources.

6. Reduces environmental pollution by minimizing the intensity of greenhouse gases emission from the wastes accumulated(food and yard wastes mainly).

Cons:

1. Even Though waste segregation is done using our website, knowing the best disposal techniques in a detailed manner would make this process more efficient.
2. Not all the disposal techniques are cost efficient(operating expenses for disposal of certain hazardous wastes may be high)

5. Conclusion/Summary

Team IRIS has made a website that helps for the purpose of distinguishing types of waste materials. The necessity of distinguishing wastes has come to an alarming state, hence one has to be aware of how to distinguish between waste materials. This project serves the purpose of distinguishing between waste materials. Our website helps the customer by letting them know what type of waste is the waste material they've searched for. Our website stands out beside the other websites as its customer friendly and is quite simple to use.

Individual contributions

Name	Contribution
SREE LAKSHMI	**Database management, presentation, Results and Discussion**
ANAS AHMAD SIDDIQUI	**Website Development, Implementation of website**
ANOSH DAMANIA	**Website Designing , Mind Map, Objectives and goals.**
MEHER SHRISHTI NIGAM	**Database Management, Abstract and Literature Review Research**
SHREYA RAMARAO	**Project Idea, Database Creation**

VANISHA	**Result and Discussion**
GAUTHAMA	**Database creation, Pros & Cons**
VAGADEESHWAR G	**References, Database Creation**

6. REFERENCES

[1]Challenges and opportunities associated with waste management in India

[2]https://www.infona.pl/resource/bwmeta1.element.psjd-bbb8c945-dfcb-4449-bb28-09cca98de565/content/partContents/a9732487-5daf-373d-8f33-e527d28208f9

[3] https://rdcu.be/cmQ65

[4]https://search.earth911.com/

[5] What are some examples of wet and dry waste ?

[6] Waste management in India

[7] Unsplash: Beautiful Free Images & Pictures

[8] http://indiawastemanagementportal.org/about-portal/

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