IN PARTNERSHIP WITH PLYMOUTH UNIVERSITY

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| Student Reference Number: 10819506 |

| Module Code: **PUSL2020** | Module Name: **Software Development Tools and Practices** |
|---|---|
| Coursework Title: **Coursework Report 2022-2023** | |
| Deadline Date:**11th of May 2023** | Member of staff responsible for coursework: **: Dr. Rasika Ranaweera \| Ms. Pavithra Subhashini** |
| Programme: **BSC(HONS) SOFTWARE ENGINEERING** | |

Please note that University Academic Regulations are available under Rules and Regulations on the University website www.plymouth.ac.uk/studenthandbook.

Group work: please list all names of all participants formally associated with this work and state whether the work was undertaken alone or as part of a team. Please note you may be required to identify individual responsibility for component parts.

| | | |
|---|---|---|
| **Maddumage perera** | **10819506** | **Manul** |
| **Udugampalage fernando** | **10818629** | **Navodh** |
| **Mudiyanselage ratnayake** | **10819504** | **Dulmini** |
| **Mudiyanselage yapa** | **10819530** | **Mahesha** |
| **Ranhawadi gamhewa** | **10819527** | **Sansika** |
| **Nanayakkarawasam sandakalum** | **10820824** | **Inura** |

***We confirm that we have read and understood the Plymouth University regulations relating to Assessment Offences and that we are aware of the possible penalties for any breach of these regulations. We confirm that this is the independent work of the group.***

Signed on behalf of the group: Manul

Individual assignment: ***I confirm that I have read and understood the Plymouth University regulations relating to Assessment Offences and that I am aware of the possible penalties for any breach of these regulations. I confirm that this is my own independent work.***

Signed :

Use of translation software: failure to declare that translation software or a similar writing aid has been used will be treated as an assessment offence.

I *have used/not used translation software.

If used, please state name of software……

**Overall mark _____%  Assessors Initials _____  Date_16th of January 2023_____**

# Content

## Contents

# INTRODUCTION

Garbage collection and keeping a healthy environment are crucial elements of maintaining a clean and sustainable community. Garbage collection is the process of gathering, transporting, and disposing of waste materials in a safe and environmentally friendly way. The proper disposal of garbage is essential to prevent environmental pollution and the spread of diseases. Optimizing garbage collection involves minimizing the time and resources needed to collect and dispose of waste This ca be achieved through a variety of methods, such as reducing the amount of waste produced, improving collection and disposal methods, and promoting recycling and compositing.

Also, garbage collection involves finding ways to reduce the negative impact of waste on the environment and public health. This can include implementing policies and regulations to limit the use of harmful materials, promoting the use of sustainable materials, and increasing public awareness about the importance of proper waste management.

so, we are planning to launch a web site for Colombo Municipal Council (CMC) to optimize garbage collection, where volunteers within a district can report thrown away garbage and garbage trucks can collect them.

# DESCRIPTION OF THE TEST CASE

## Test case designed.

Home

- On the navigation bar of the home page, there are about us, contact us, login/register.
- With that, members and staff can log in and members can register.
- In the footer section, you can give feedback, we will update new news.

Login

- Staff and members can log in to the login page by specifying the correct username and password.
- If you don't have an account, you can register by clicking the register button below.

GTF member page

- GTF members can report incidents by inputting data including location impact details and images they should be able to insert delete update his own report incident.

Green captain page

- Green captain is who can view all the reported incidents.
- Can be able to set a flag based on importance such as red flag for immediate clean-up. approve and reject as a list and reported incidents on map.

Web master

- Should be able to create account for the captains and collecting staffs.
- Post articles to improve public awareness about garbage collection and garbage sports collection.

GTF collection Staff

- Staff collectors can see the approve report with the summary on a map along with the importance.

General public

- General Public can see the garbage collection spots on a map and news articles post by the CMS

# STRUCTURE AND MOCK OBJECT

Structure

The purpose of the "Optimize Garbage Collection" website is to provide information, resources, and strategies to help individuals and organizations improve their garbage collection processes and practices. Garbage collection refers to the systematic collection and disposal of waste materials, and optimizing this process can have several benefits, including reducing environmental impact, increasing efficiency, and promoting sustainable waste management practices.

The website aims to serve as a comprehensive guide for individuals and businesses looking to optimize their garbage collection methods. It offers a range of content, such as articles, tutorials, case studies, and best practices, all focused on maximizing the effectiveness of garbage collection operations.

Visitors to the website will find information on various topics related to garbage collection optimization, including waste segregation techniques, recycling methods, composting practices, waste reduction strategies, and the proper use of disposal facilities. The content is designed to be accessible and practical, providing actionable insights and step-by-step guidelines for implementing effective garbage collection optimization measures.

Ultimately, the goal of the "Optimize Garbage Collection" website is to empower individuals and organizations with the knowledge and tools they need to minimize waste generation, improve recycling rates, and contribute to a cleaner and more sustainable environment. The types of garbage collection services offered is handling by the CMC and it's going within district to district. Service Area: All the districts that include to the CMC are the covered service areas

Call-to-Action: Encourage the volunteers (The GTF members) to take action, such as requesting a quote or scheduling a pickup.

About Us:

Company Background: Shared the information about our company's services, values, and mission.

Expertise: we had scheduled a pickup and carried out as soon as possible how soon the garbage should be cleared. The garbage collecting staff can be immediately take the actions along with the importance. There's a red flag based on for the immediate clean up. And launched a task to avoid terrible smell and protect attacked wildlife.

- Team Members:
- Green task force member (GTF) (Volunteers)
- Green captain
- Web master (Admin)
- Garbage collection staff
- General public

Services:

GTF: Can input data (including images) delete and update their own incidents.

Green captain: Can see the reported incidents as a list and on a map.

They can select an individual incident to view all the accident details.

They are able to approve or reject a selected incident.

Able to set flags based on importance. The red flags showing for the immediate clean-ups.

Web master (Admin):

Can create accounts for the captains and collecting staff.

Can post articles to improve public awareness about garbage collection and add garbage spots.

Garbage collection staff:

can see the approved report, summary on the map along with the importance of the garbage collections.

General public:

can see the garbage collection spots on the map and the news articles posted by the CMS.

Schedule and Pickup:

Green captain approve or reject stating how soon the garbage should be cleared.

Garbage collection staff can see the approved report, summary on the map along with the importance of the garbage collections.

General public can see the garbage collection spots on the map.

General public Support: Provided contact information for customer support, such as phone numbers, email addresses.

Testimonials:

General public Reviews: Showcase positive feedback from satisfied customers to build trust and credibility.

Case Studies:

Highlighted that our success stories of our garbage collection services and benefiting local communities or businesses.

Contact Us:

Contact Information: Displayed our company's address, phone numbers, email addresses, and social media profiles on there at the website.

Contact Form: In here it's including a user-friendly contact form for volunteers to submit inquiries or requests for additional information.

Remembered to create and prioritize user experience by designing an intuitive and responsive website. Used the high-quality images, concise and engaging content, and clear navigation menus to enhance usability at there.

Regularly update and maintain the website to vouch accurate information and a seamless user experience.

Mock object

Mock objects are used in ASP.NET unit testing to mimic the behaviour of any dependencies a unit under test may have. A mock object imitates the behaviour of a genuine object but lacks the functionality or implementation of the real item.Code is tested separately from its dependencies using mock objects, guaranteeing that there are no unintended consequences from external dependencies and that the code behaves as expected. Mock objects in ASP.NET are frequently made using a mocking framework like Moq, Rhino Mocks, or NSubstitute.

Testing ASP.NET apps in multiple contexts is possible with mock objects. They can be used to mimic calls to external services, HTTP requests, or database calls, for instance. Mock objects can be used to test controller actions, service methods, or repository classes.
To use mock objects in ASP.NET, we follow these basic steps: Utilize a mocking framework to create a mock object.

Make the mock object so it returns the anticipated information or action.

Introduce the fictitious object into the testing unit.

Run the unit test to ensure that the desired behaviour or outcome is obtained.

A mock repository can be built using a mocking framework, configured to return the desired data, and then injected into a controller action that retrieves data from a repository, for instance. The controller action can then undergo a unit test to ensure that it works as expected while obtaining data from the repository.

Mock objects are an effective tool for ASP.NET application unit testing and can aid in the creation of more dependable and maintainable code. However, it's crucial to utilize them sparingly and avoid becoming overly dependent on them as they can occasionally result in overly complicated tests and elusive bugs.

# THE UNIT TESTS AND THE INTEGRATION TEST

Unit testing and integration testing are two important types of testing that are used in quality assurance to ensure that software products meet the required quality standards. Here are the steps that we use for running unit tests and integration tests in quality assurance:

-Define the scope and objectives of the testing: Determine what parts of the software will be tested and what the testing aims to accomplish. This should include defining the test cases, expected results, and criteria for passing or failing the tests.
-Choose a testing framework: Select a testing framework that is compatible with the programming language and technology used to develop the software.
-Write unit tests: Write test cases for individual functions or modules of the software using the chosen testing framework. Unit tests should be designed to verify that each function or module works as expected.
-Run unit tests: Execute the unit tests to verify that each function or module meets its requirements and specifications.
-Fix any issues found in unit testing: If any issues are discovered during unit testing, address them by debugging and correcting the code.
-Write integration tests: Write test cases for testing how multiple components of the software interact with each other. Integration tests should be designed to verify that the components work together as expected.
-Run integration tests: Execute the integration tests to verify that the components interact with each other correctly and produce the expected results.
-Fix any issues found in integration testing: If any issues are discovered during integration testing, address them by debugging and correcting the code.

-Repeat testing as needed: If any changes are made to the software, repeat the testing process to ensure that the changes did not introduce new issues or regressions.

Overall, the key to successful unit and integration testing in quality assurance is to have a well-defined testing plan and framework, thorough test cases, and a commitment to fixing any issues that are discovered during testing.

# Unit tests

To ensure that specific sections of code (also known as Units)—typically methods—perform as intended by the author, unit tests are employed in the software development process. Any programmer can create a unit test to check the functionality of smaller components of larger programs.
Testing is always intended to be simple. The term "UNIT" here refers to the smallest testable portion of a large code block, which is typically one method among many methods of a class. The majority of test cases are created as functions that analyze if the value produced by a unit test matches the value you anticipated when you developed the function. Isolating one component is the main goal of unit testing. The word "unit testing" refers to a technique or approach for assessing software, which involves testing a piece of code to ensure that it is accurate and dependable.
We first write the test cases and then the straightforward code that passes the test, is one of the core principles of unit testing. Another method is to initially write simple code and then, based on potential scenarios, implement unit tests. As said earlier, we may also create Tests first, then create the code necessary to pass the test. It is up to each person to select their own method of code testing. Any beginner studying C# who wants to learn how to develop unit tests should be able to grasp the simple software I've created.

# Integration Testing

To guarantee that software components function together, testers do integration testing. This method of software testing integrates and evaluates many program components.

Integration testing is made easier by test stubs and test drivers. Both a bottom-up and a top-down strategy are used to conduct integration tests.

- FUNCTIONAL TEST

https://drive.google.com/drive/folders/1WrQPPyUuzG-G5CvLrbmvrSa-3GqXkVM2?usp=share_link

(EXCEL SHEET)

# Technologies we used.

**ASP.NET with C#**

Microsoft created and commercialized ASP.NET, a web application framework that allows programmers to create dynamic web sites, apps and services.
The ASP.NET framework is a server-side framework. The
Active Server Pages Network Enabled Technologies (ASP.NET) is the name of the technology that allows.
users to launch Active Server Pages.

**SQL Server**

The basic role of a database server is to store and retrieve data from other software programs running on the same machine

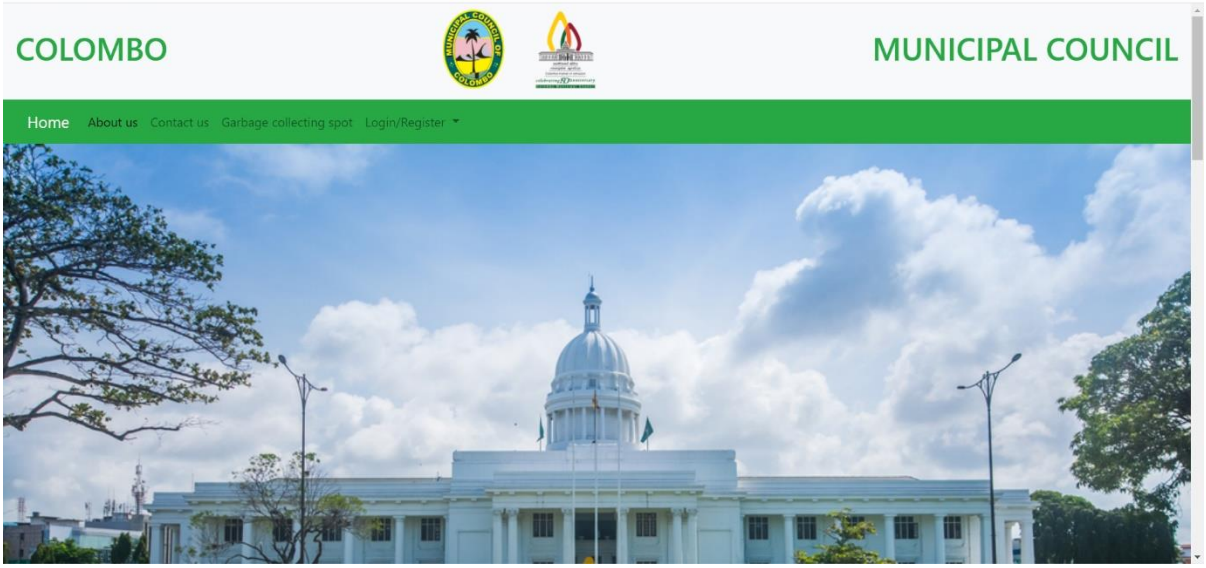
- CRITICAL ANALYSIS OF TEST STRATERGY

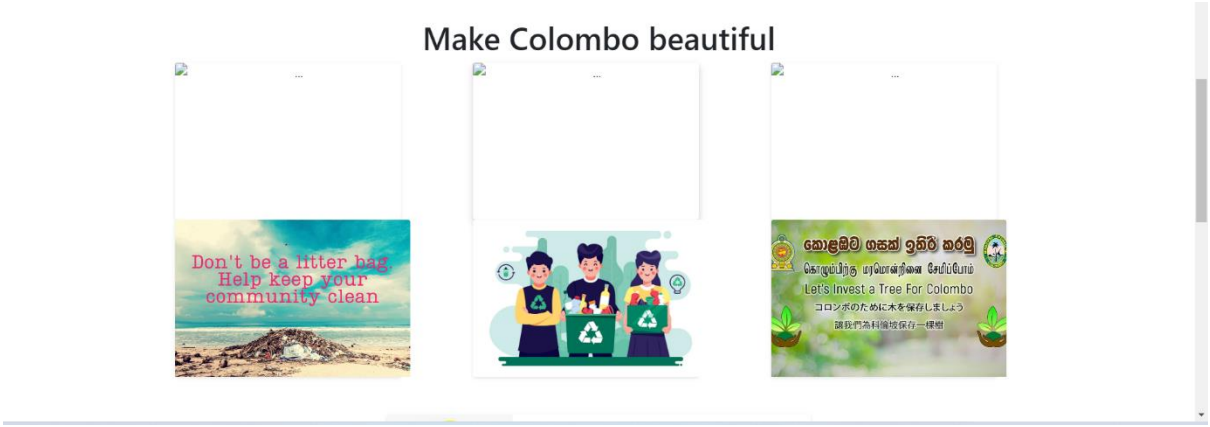
Each individual website component was tested by the team working on the unit testing project. Each component is tested separately using the white box method. The white box testing approach places a greater emphasis on testing the application's source code than its usability. This application's code is tested individually to ensure that there are no bugs or issues. Our project discovered several code issues during unit testing.

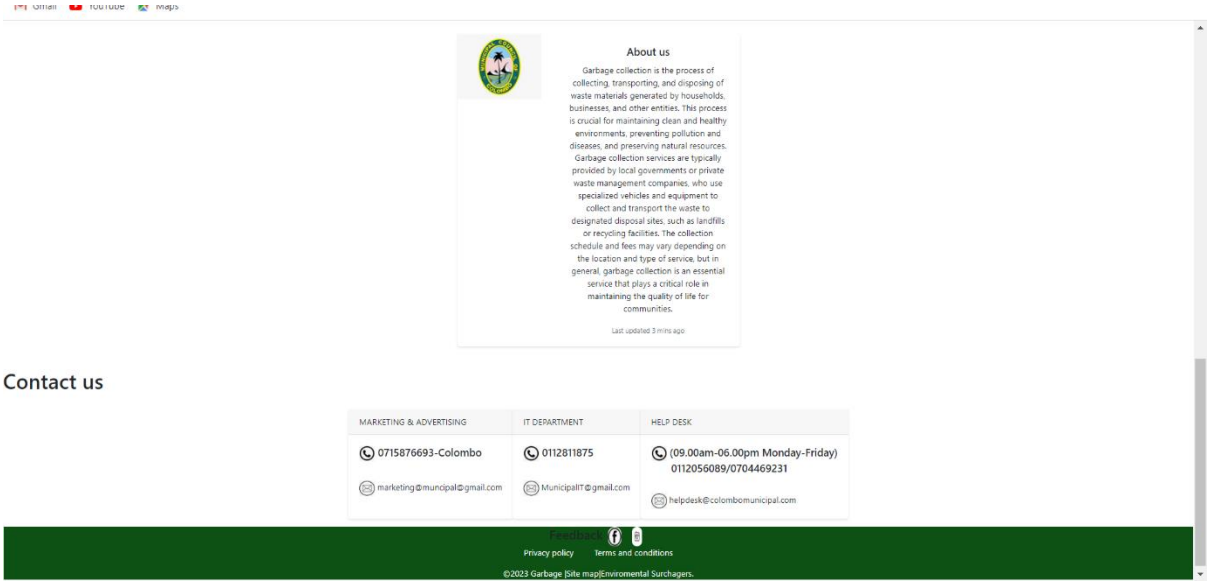
Following the completion of unit testing, our project team began integration testing. Integration testing is quite important when it comes to testing. The basic goal of integration testing is to find any flaws that may develop when several components are put together to create a fully functional system. The project team employed the black box testing method for testing. We mostly focused on the application's functionality rather than the source code when black box texting. To simulate various interactions between the system's components and ensure that they function properly together, test cases are developed during integration testing. Test cases are particularly useful for evaluating how the system performs in different scenarios.

# TEST AND VALIDATION METRICS

Home Page



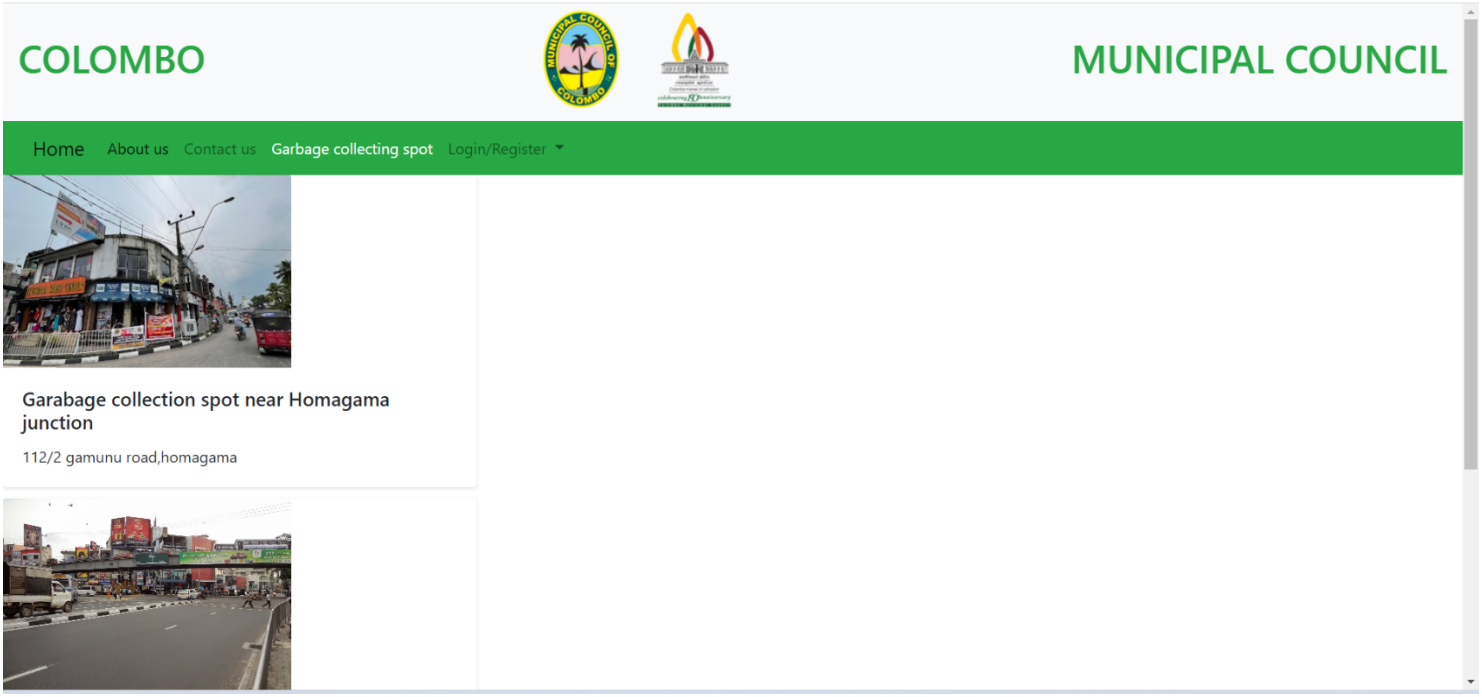






In here people can see the home page of the site and they can see the abouts us section and contact us section.

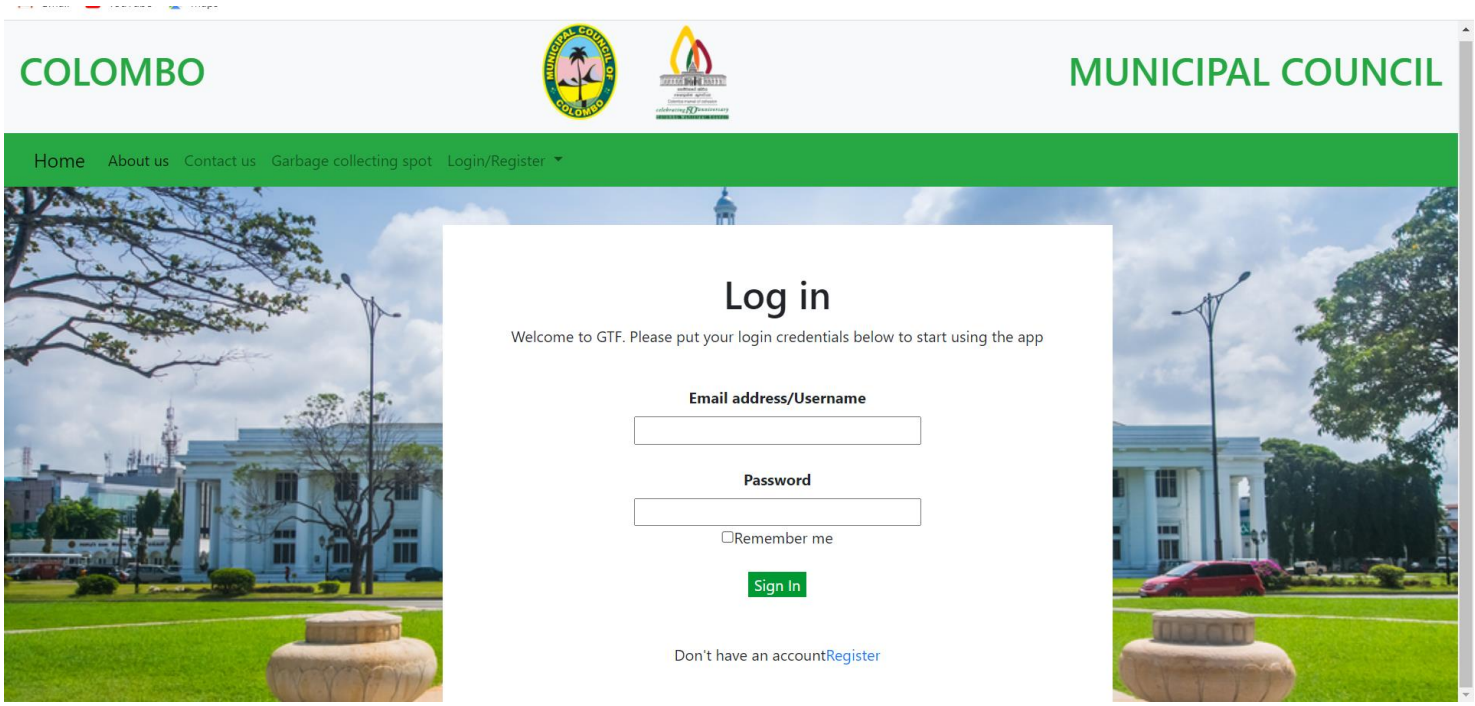
Admin upload posters will be displayed here

## Garbage collecting spot.




In this section user can identify the places where garbage collecting places.

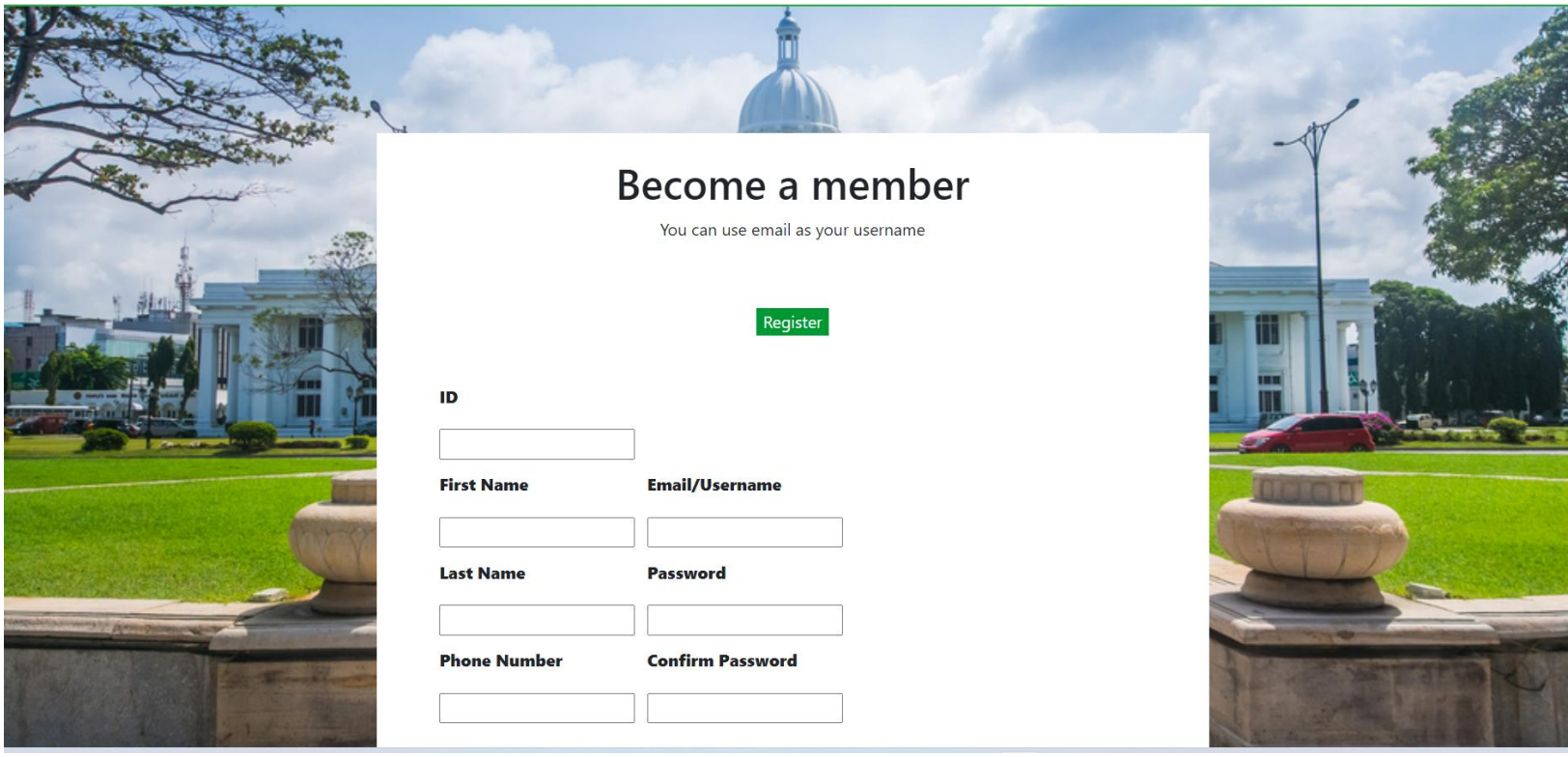
# GTF member login page




- If the user is member of GTF he can login to his GTF account using his username and password.

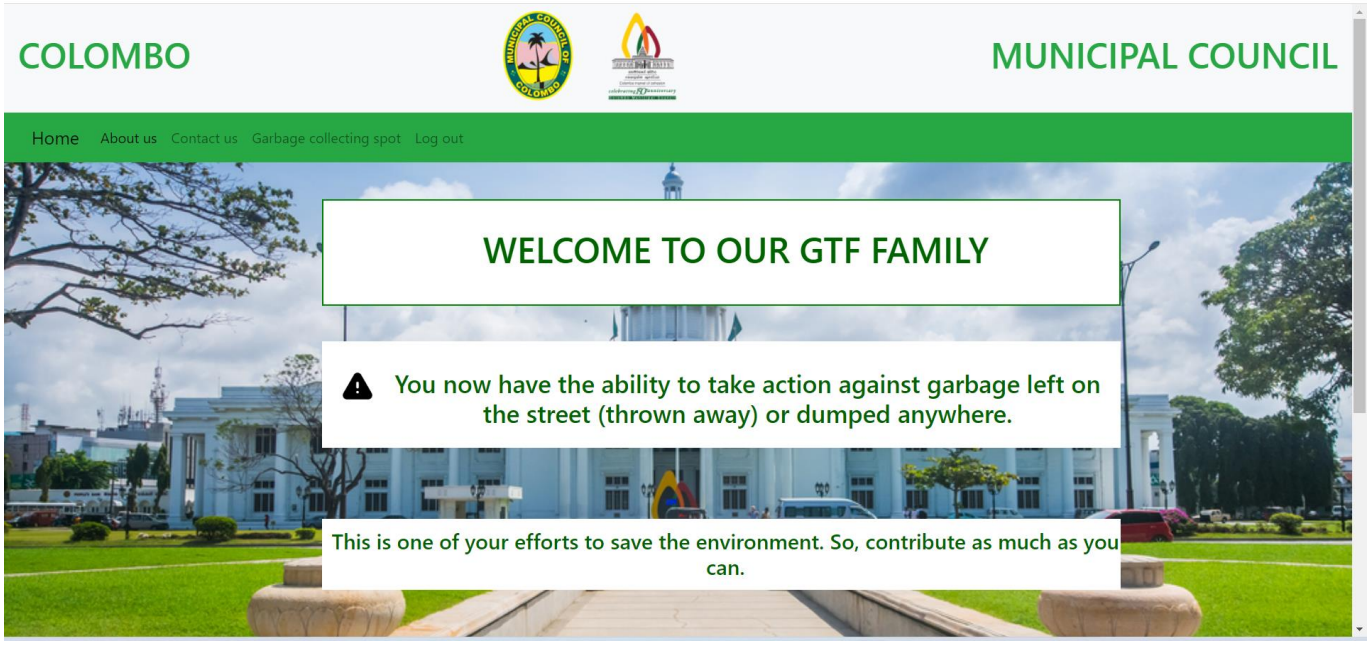
  Username = manulperera
  Password=m1234

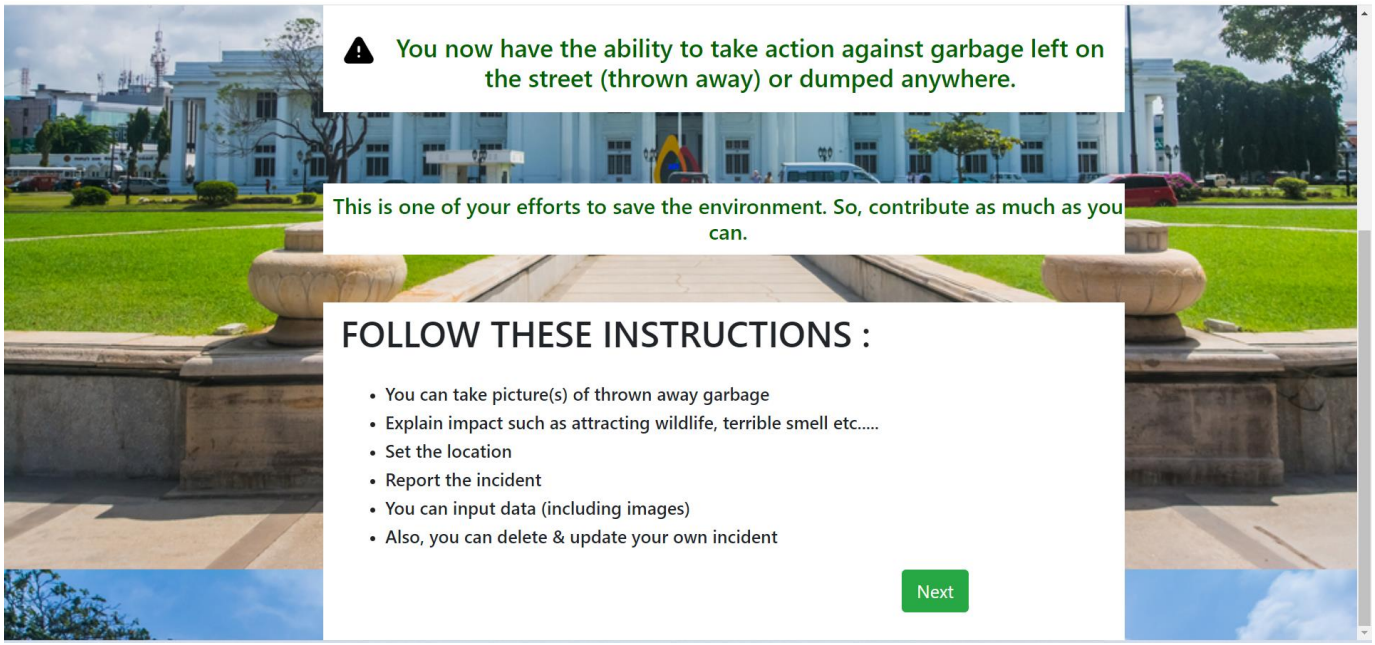
# GTF registration Form




If user don’t have any account in GTF, he/she can create an account using this site

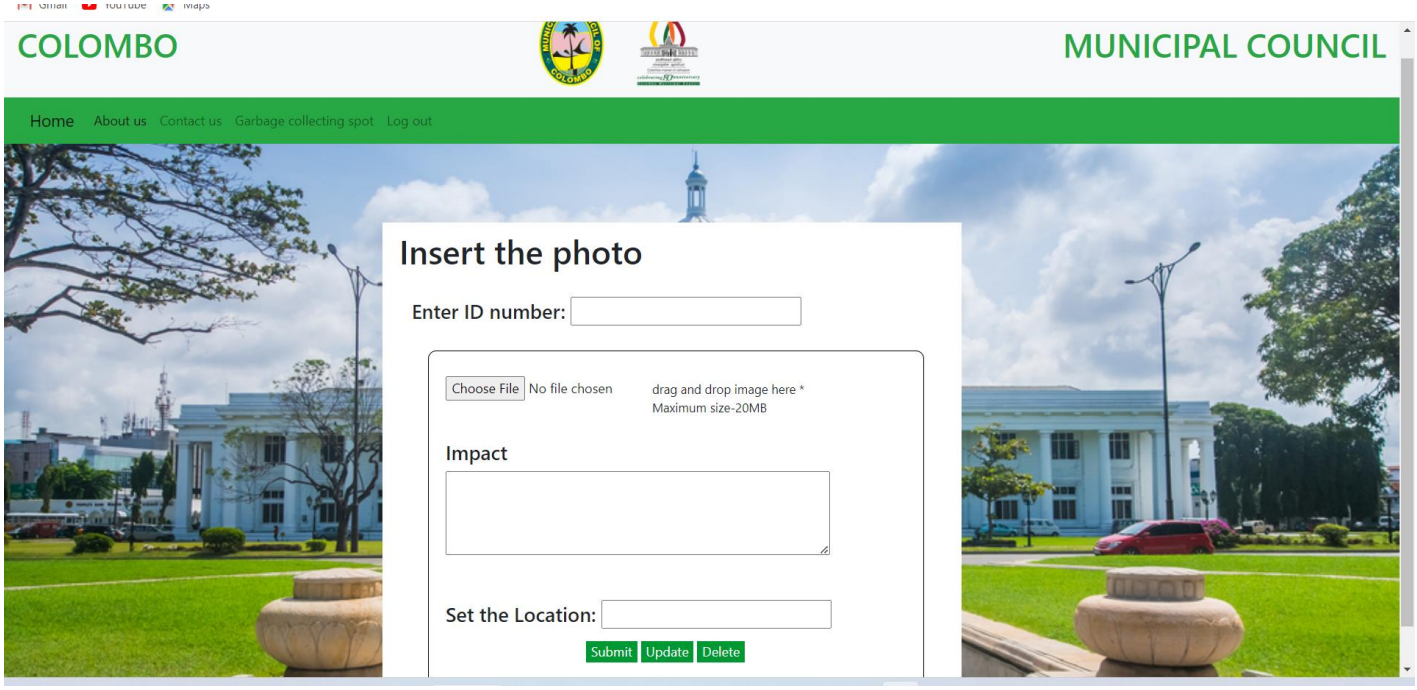
# GTF welcome page



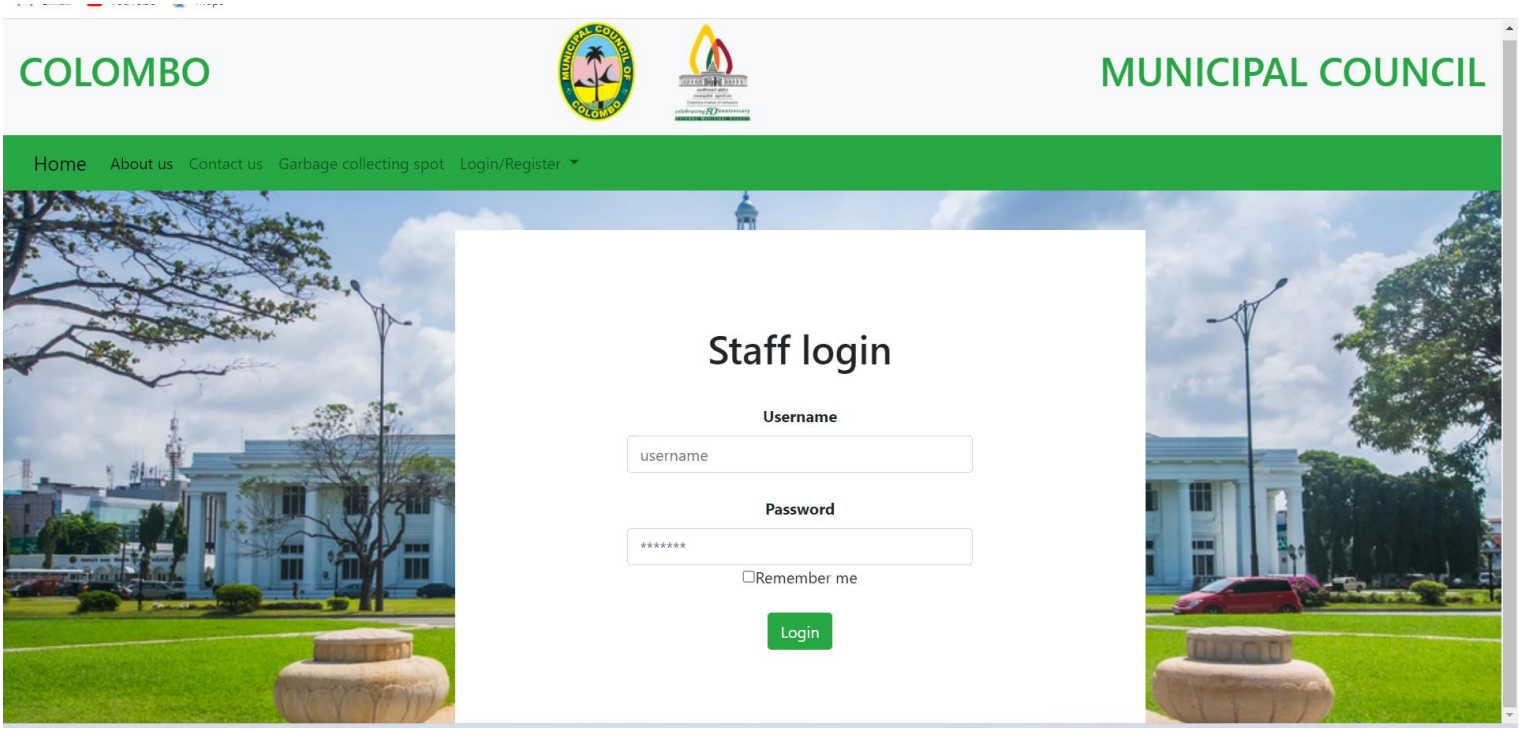

This is the welcome page of GTF page

# Report the incident



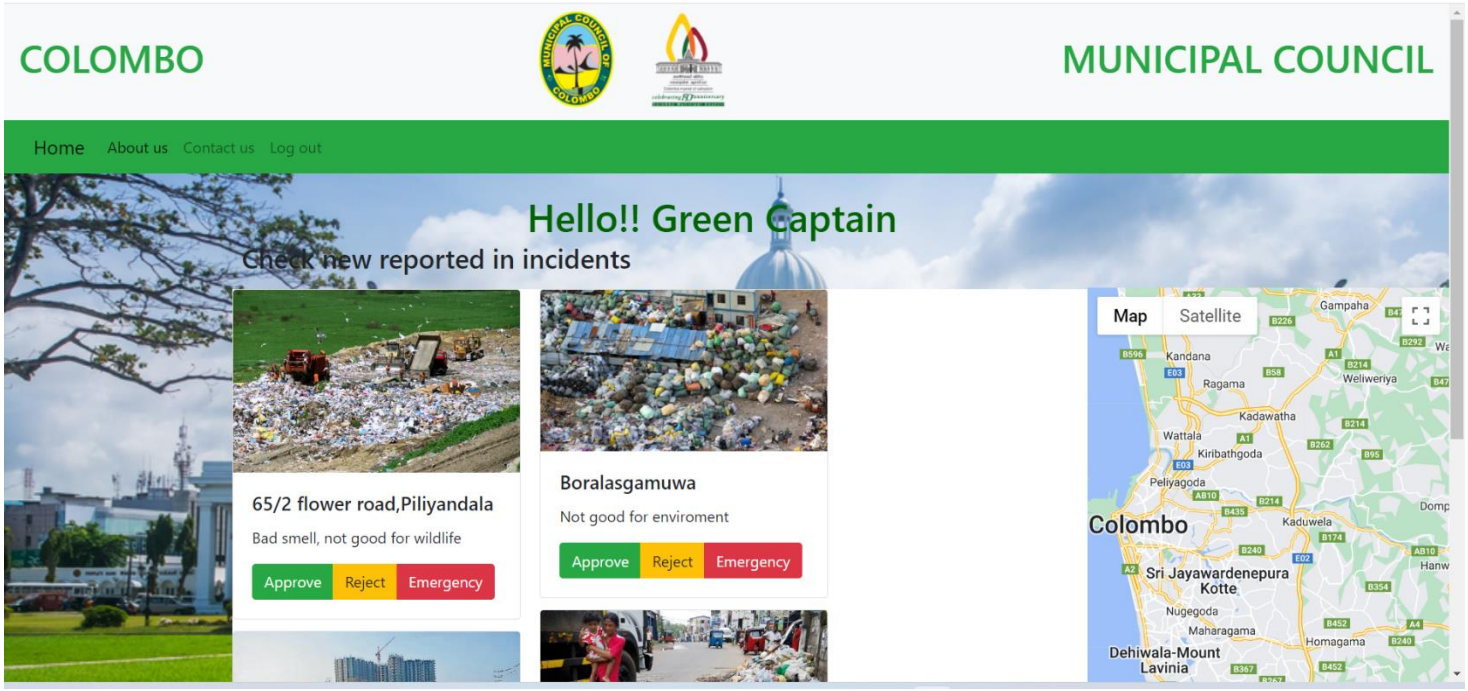

In this section user can upload the image of garbage and need to give explanation about it and the location.
After filling this form user can submit it. Also user can update and delete the submitted form.

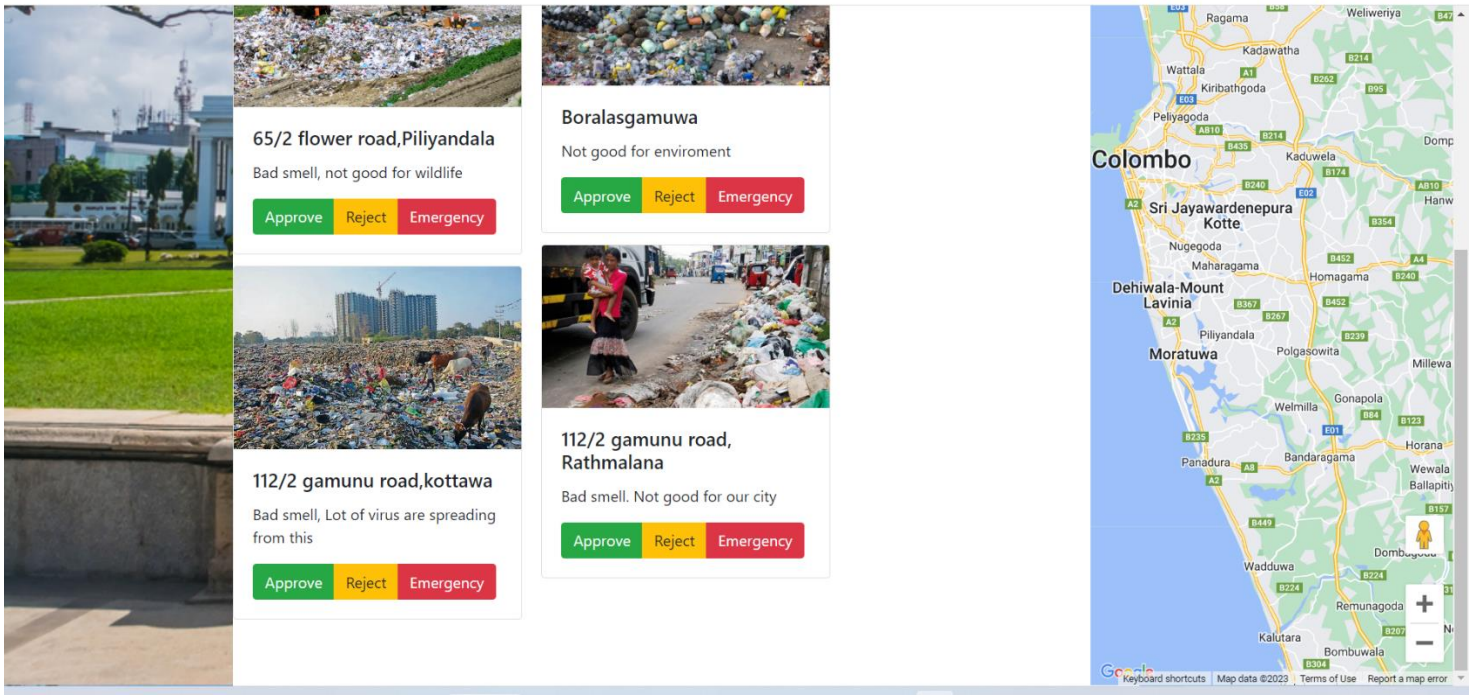
# Staff Login




If user is staff member in CMC he/she can login into his/her account using this site.

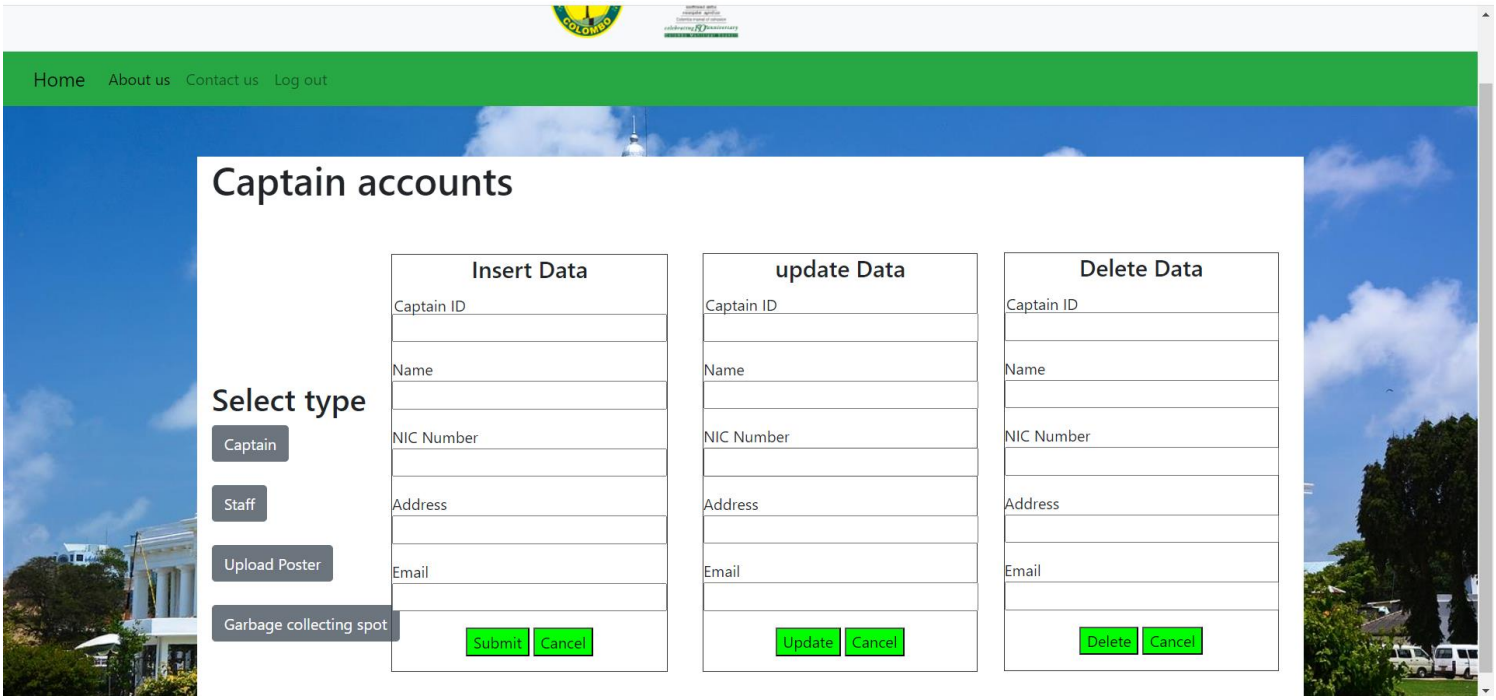
# Captain site

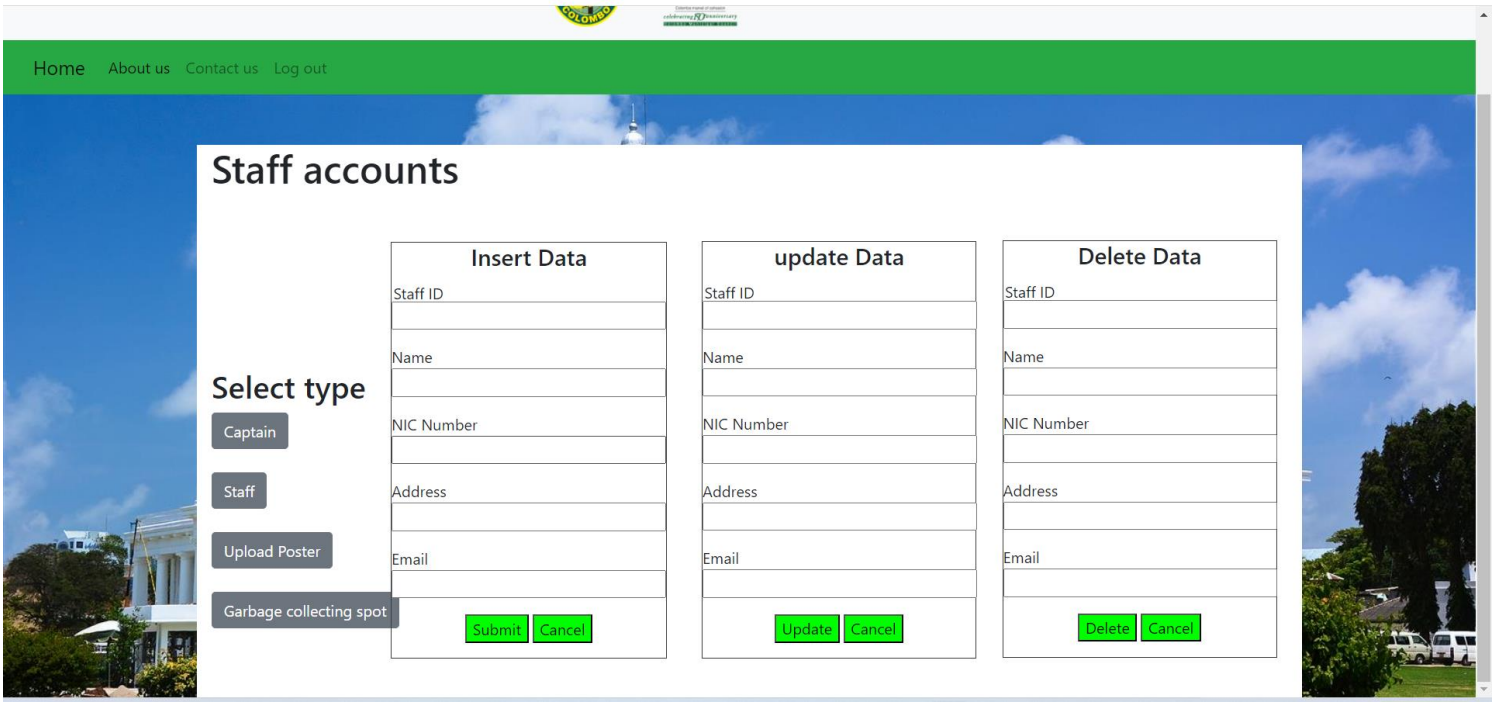


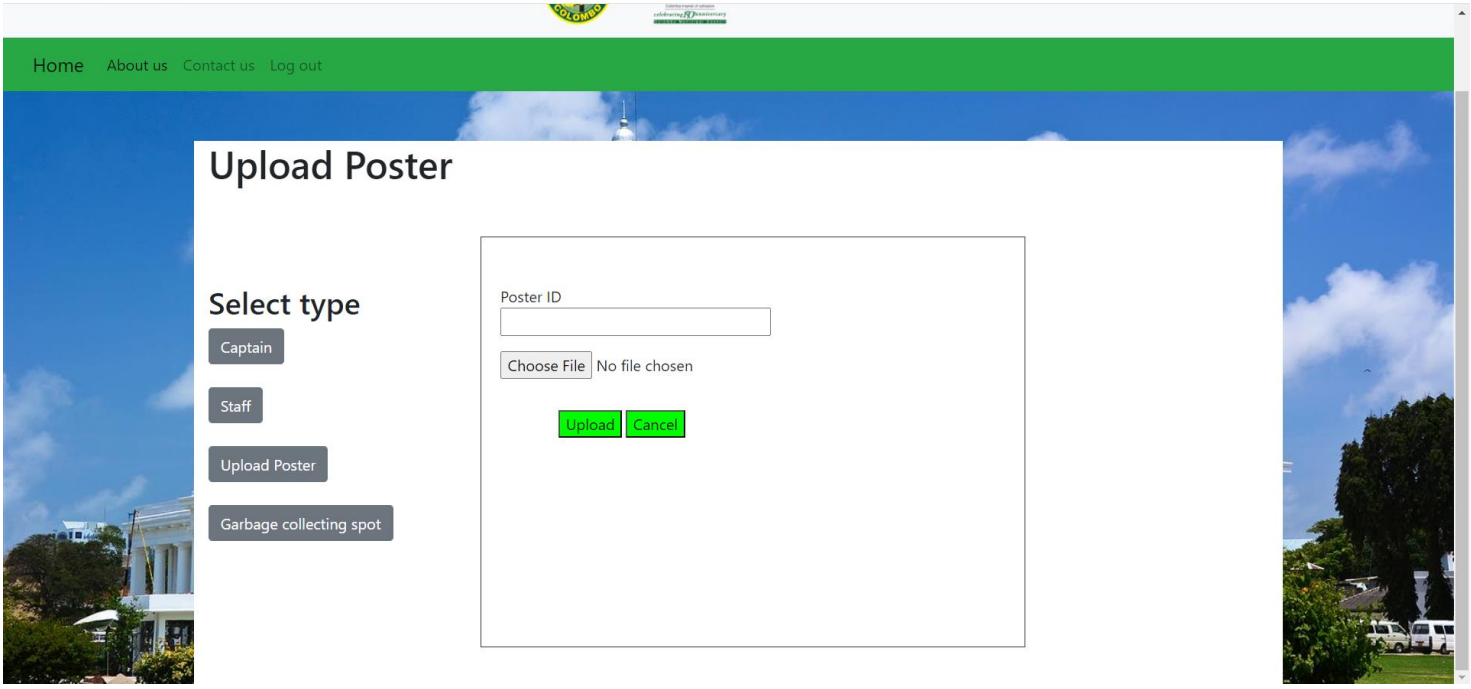


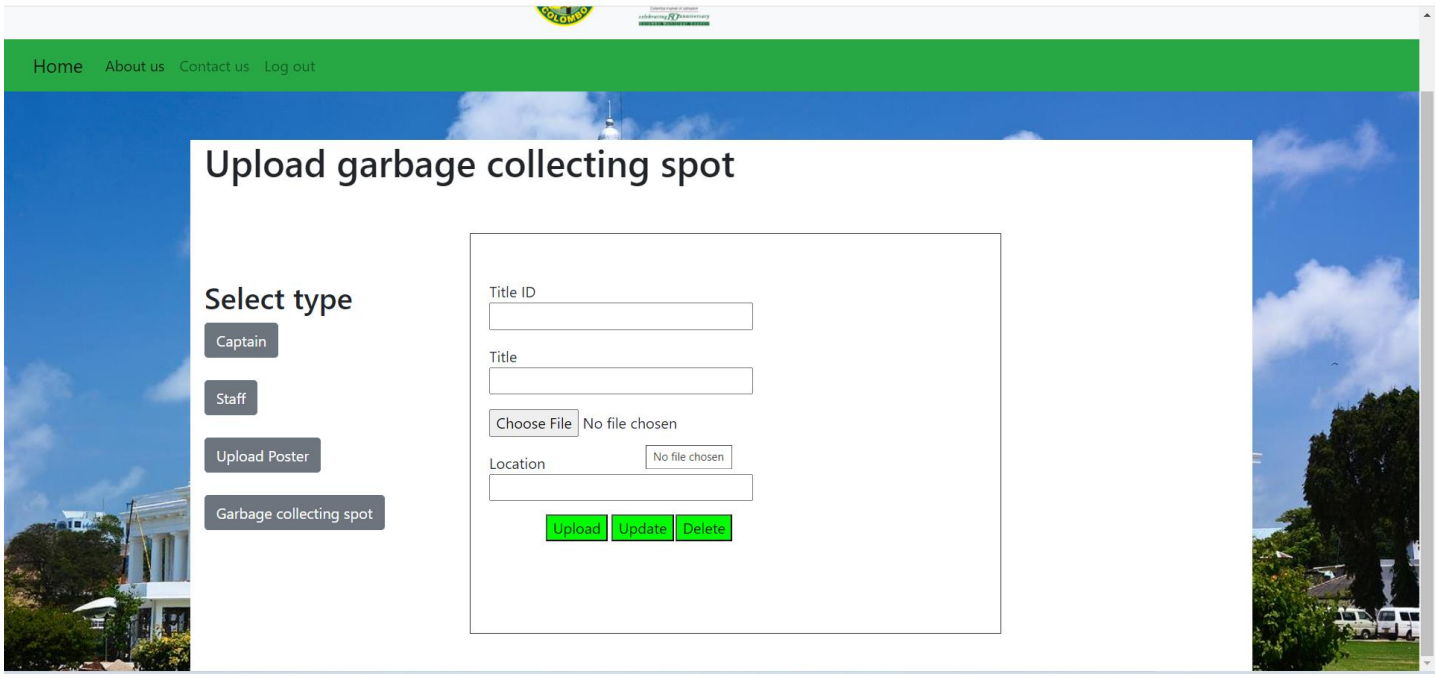

- If user login as the captain, this is the captain site.
- In here user can see all the submitted report incidents.
- User can select one item can approve it or reject it. If one of it is emergency user can click the emergency button.
- User can see the map of Colombo city. Form that user can identify locations very easily.

# Admin site


Home
About us
Contact us
Log out
Captain accounts
Select type
Captain
Staff
Upload Poster
Garbage collecting spot
Insert Data
Captain ID
Name
NIC Number
Address
Email
Submit
Cancel
update Data
Captain ID
Name
NIC Number
Address
Email
Update
Cancel
Delete Data
Captain ID
Name
NIC Number
Address
Email
Delete
Cancel


Home
About us
Contact us
Log out
Staff accounts
Select type
Captain
Staff
Upload Poster
Garbage collecting spot
Insert Data
Staff ID
Name
NIC Number
Address
Email
Submit
Cancel
update Data
Staff ID
Name
NIC Number
Address
Email
Update
Cancel
Delete Data
Staff ID
Name
NIC Number
Address
Email
Delete
Cancel

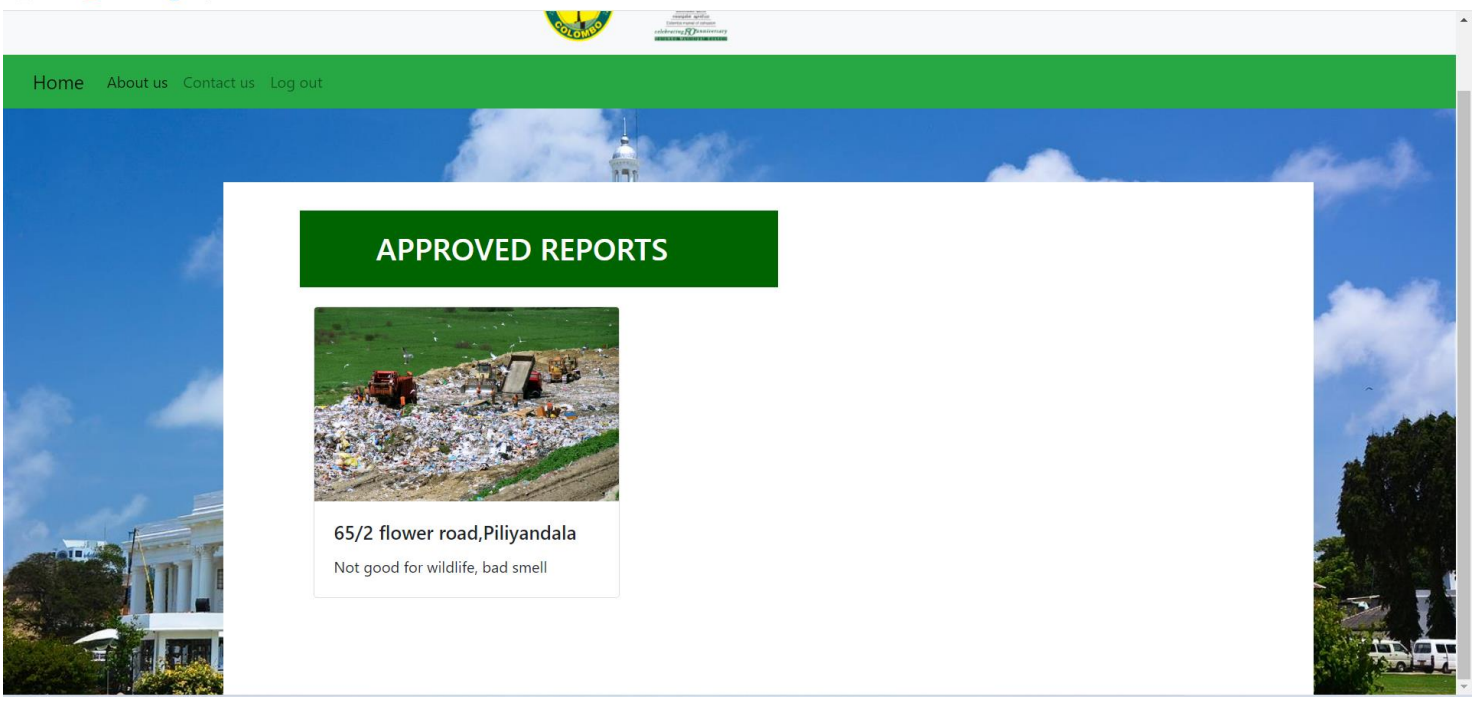



- This is the admin site. User can create accounts for captain and the staff members.

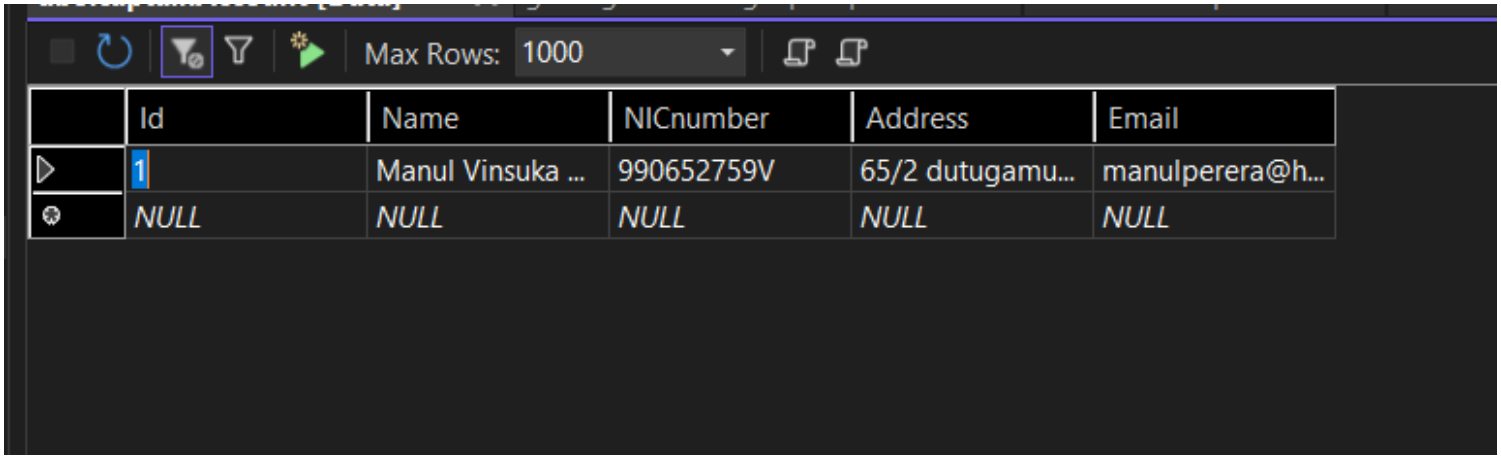
- Also admin can upload posters to motivate people and also admin can upload details about garbage collecting spot.

## Garbage collectors' site




- The item approved by the captain will be displayed here

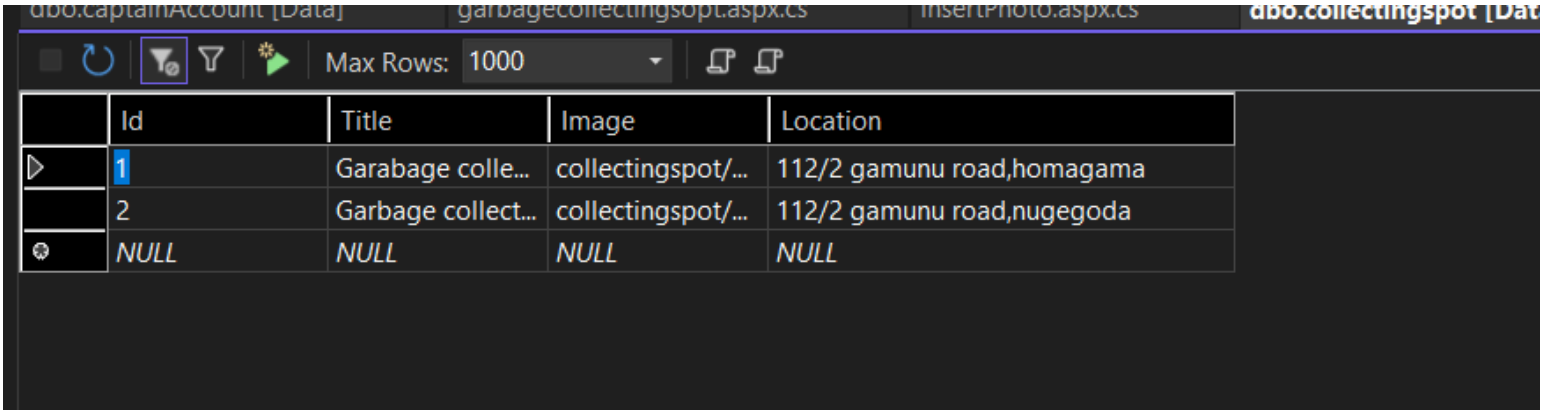
# SQL server screenshots



Max Rows: 1000

| | Id | Name | NICnumber | Address | Email |
|---|---|---|---|---|---|
| ▷ | 1 | Manul Vinsuka ... | 990652759V | 65/2 dutugamu... | manulperera@h... |
| | NULL | NULL | NULL | NULL | NULL |

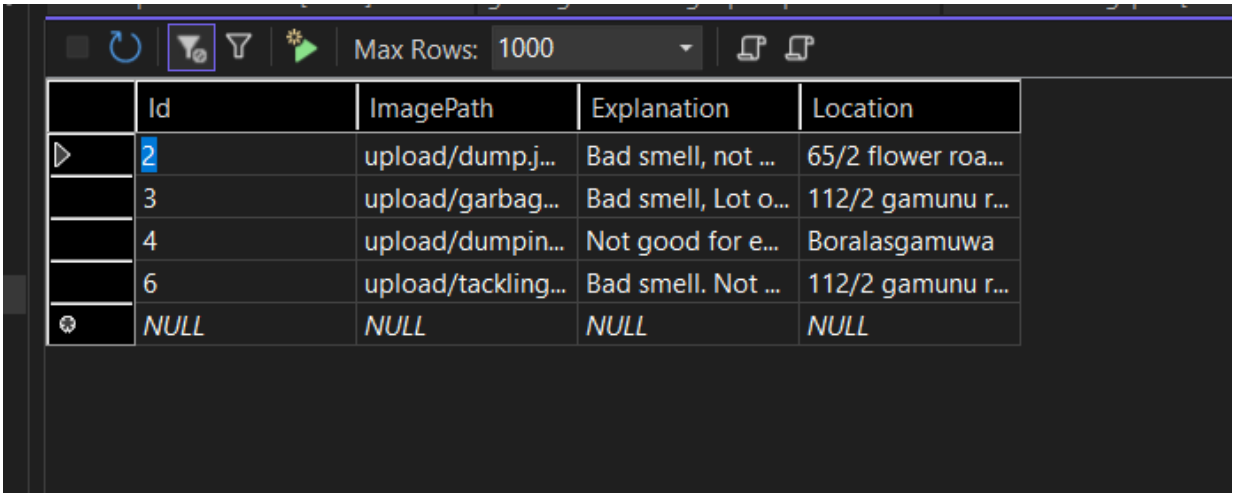
Captain Account table



Max Rows: 1000

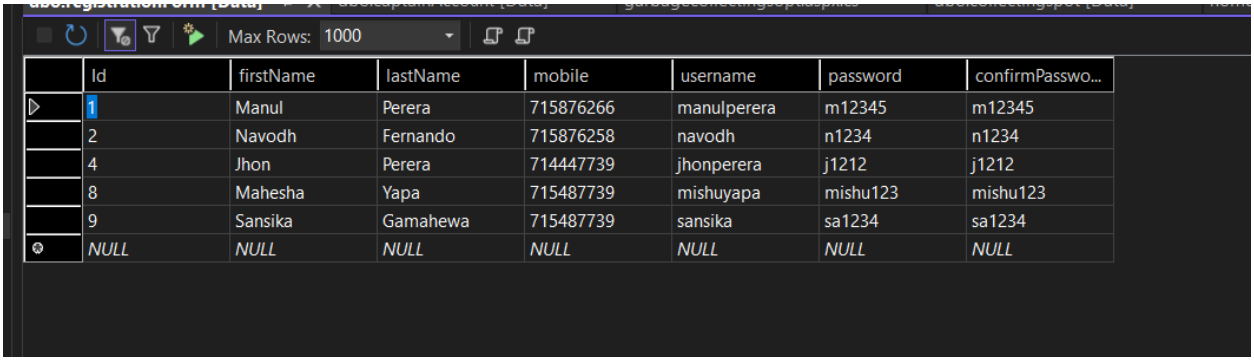
| | Id | Title | Image | Location |
|---|---|---|---|---|
| ▷ | 1 | Garabage colle... | collectingspot/... | 112/2 gamunu road,homagama |
| | 2 | Garbage collect... | collectingspot/... | 112/2 gamunu road,nugegoda |
| | NULL | NULL | NULL | NULL |

Collecting spot table



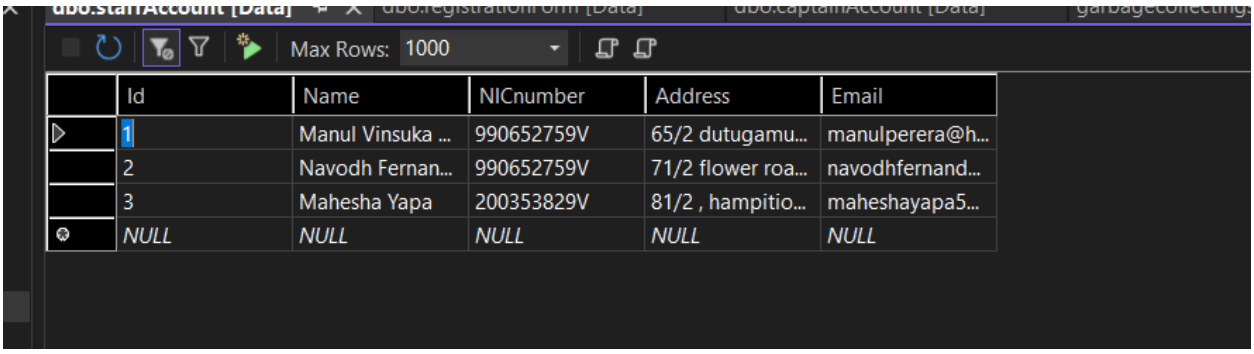

| | Id | ImagePath | Explanation | Location |
|---|---|---|---|---|
| ▷ | 2 | upload/dump.j... | Bad smell, not ... | 65/2 flower roa... |
| | 3 | upload/garbag... | Bad smell, Lot o... | 112/2 gamunu r... |
| | 4 | upload/dumpin... | Not good for e... | Boralasgamuwa |
| | 6 | upload/tackling... | Bad smell. Not ... | 112/2 gamunu r... |
| ⚙ | *NULL* | *NULL* | *NULL* | *NULL* |

Garbage table



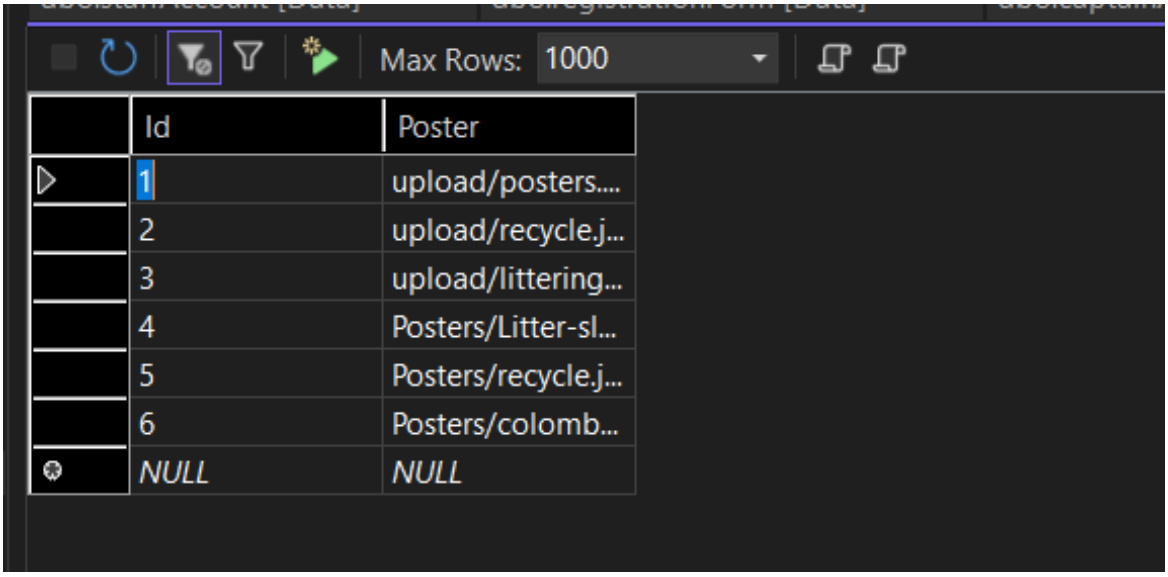

| | Id | firstName | lastName | mobile | username | password | confirmPasswo... |
|---|---|---|---|---|---|---|---|
| ▷ | 1 | Manul | Perera | 715876266 | manulperera | m12345 | m12345 |
| | 2 | Navodh | Fernando | 715876258 | navodh | n1234 | n1234 |
| | 4 | Jhon | Perera | 714447739 | jhonperera | j1212 | j1212 |
| | 8 | Mahesha | Yapa | 715487739 | mishuyapa | mishu123 | mishu123 |
| | 9 | Sansika | Gamahewa | 715487739 | sansika | sa1234 | sa1234 |
| ⚙ | *NULL* | *NULL* | *NULL* | *NULL* | *NULL* | *NULL* | *NULL* |

Registration Form table




| | Id | Name | NICnumber | Address | Email |
|---|---|---|---|---|---|
| ▷ | 1 | Manul Vinsuka ... | 990652759V | 65/2 dutugamu... | manulperera@h... |
| | 2 | Navodh Fernan... | 990652759V | 71/2 flower roa... | navodhfernand... |
| | 3 | Mahesha Yapa | 200353829V | 81/2 , hampitio... | maheshayapa5... |
| | *NULL* | *NULL* | *NULL* | *NULL* | *NULL* |

Staff Account table




| | Id | Poster |
|---|---|---|
| ▷ | 1 | upload/posters.... |
| | 2 | upload/recycle.j... |
| | 3 | upload/littering... |
| | 4 | Posters/Litter-sl... |
| | 5 | Posters/recycle.j... |
| | 6 | Posters/colomb... |
| | *NULL* | *NULL* |

Upload poster table

# INDIVIDUAL CONTRIBUTION

| Name | Plymouth Index | Contribution |
|---|---|---|
| Maddumage Perera | 10819506 | Backend & Frontend Development |
| Udugampalage Fernando | 10818629 | Backend & Frontend Development |
| Mudiyanselage Rathnayake | 10819504 | UI Design |
| Mudiyanselage Yapa | 10819530 | UI Design |
| Ranhawadi Gamhewa | 10819527 | Testing Part |
| Nanayakkarawasam Sandakelum | 10820824 | Testing Prt |

# CONCLUSION

Finally, the optimized garbage collection website provides an efficient and user-friendly platform for waste disposal management. It streamlines the process of scheduling and collecting garbage through advanced algorithms and intelligent features, resulting in increased efficiency, lower costs, and improved environmental sustainability. Individuals and businesses can easily request pickups, track collection schedules, and receive real-time updates thanks to the website's seamless user experience.

The website promotes a cleaner and healthier environment while meeting the needs of both service providers and users by leveraging technology to a optimize garbage collection.