

EGERTON



UNIVERSITY

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER SCIENCE

COMP 493

COMPUTER SYSTEM PROJECT

ON

USER MANUAL

BY

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5.1 SYSTEM OVERVIEW

This system focuses on a single smart bin equipped with the hardware components which include; NodeMCU, ultrasonic sensor, a buzzer and LED. The ultrasonic sensor continuously measures the distance to the top of the waste within the bin. This data is processed by the NodeMCU and used to estimate the fill level. The data is then sent to the Blynk IoT App. An LED is be programmed to indicate fill level visually. It lights when the bin is full Additionally, a buzzer is configured to alert when the bin reaches a pre-defined fill level, prompting waste disposal.

5.2 SYSTEM REQUIREMENTS

For this system, the following requirements are needed:

5.2.1 Hardware Requirements

1. Bin with a lid or equipped with mounting brackets for sensor installation.
2. Ultrasonic Sensor - for measuring bin distance.
3. NodeMCU esp8266 - for data processing and communication.
4. Buzzer - generating alerts.
5. LED - for visual feedback on bin fill levels.
6. Power Supply - (e.g.,AC adapter) for the NodeMCU and peripherals.

5.2.2 Software Requirements

1. Arduino IDE for programming the NodeMCU.
2. Blynk mobile application for real-time monitoring and management.

3. Firmware code for interfacing with the ultrasonic sensor, buzzer, and LED, integrated with the Blynk platform.
4. Integration with Blynk IoT platform for remote monitoring and control.

5.2.3 Connectivity Requirements

1. Wi-Fi or other wireless connectivity for data transmission between the NodeMCU and Blynk platform.
2. Internet access on mobile devices for monitoring dustbin levels via the Blynk mobile app.

5.3 SYSTEM FEATURES

5.3.1 Blynk IoT Platform and App

This system has several features which include:

- Adding user after registration the figure below shows a description with a pointed arrow.

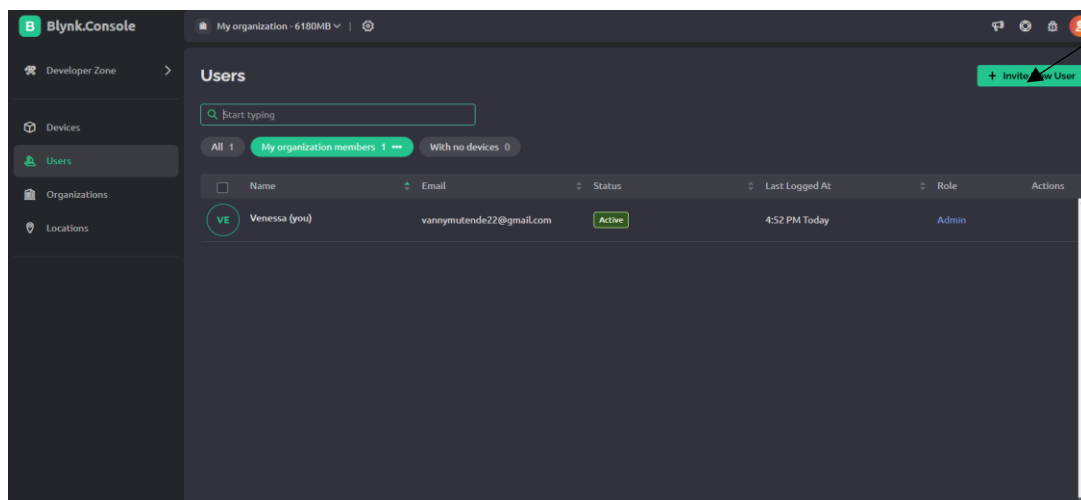


Fig 5.0: Adding User

- Real-time Monitoring: this monitoring Bin level using the Blynk IoT App. A user can access it from anywhere and anytime but with internet access using his/her mobile phone.

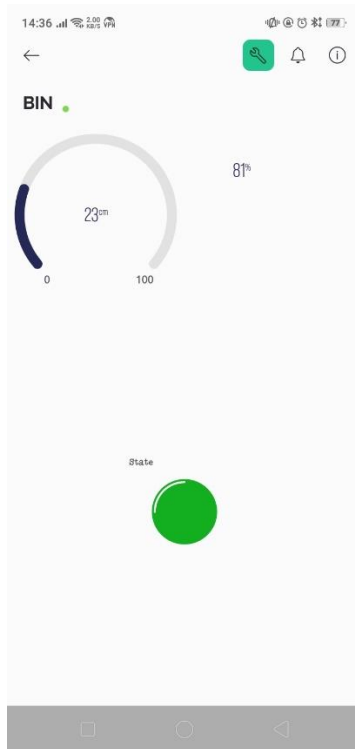


Figure 5.1: Blynk App Monitoring

Figure 5.1 above shows the Blynk IoT app that a user uses to monitor the bin level.

- **Percentage Filled Calculation:** the system calculates the percentage fill level of dustbins based on measured distances, providing accurate assessments of waste accumulation.

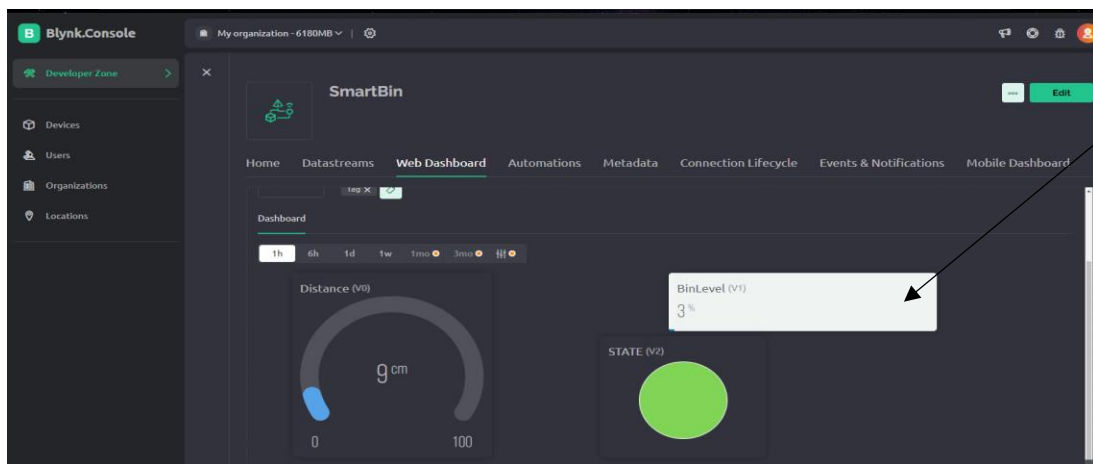


Figure 5.2 Web Dashboard Monitoring

The pointer shows where the Bin Level is indicated in the web dashboard for the user to view. For the Blynk Mobile App, the Figure 5.3 below shows where the Bin Level Percentage is shown.

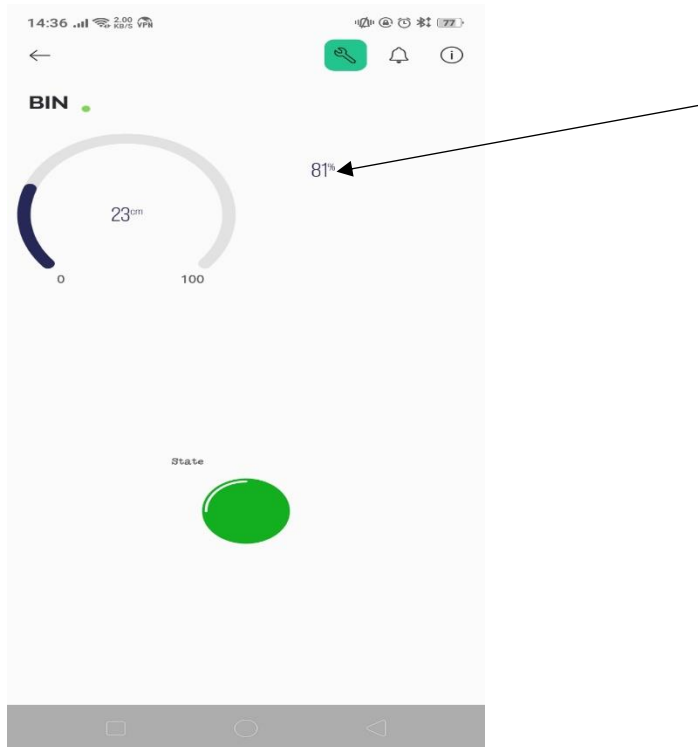


Figure 5.3: Blynk App Monitoring2

- Alerts and Notifications: Receive push notifications and visual alerts on the Blynk mobile app when dustbin fill levels exceed predefined thresholds.

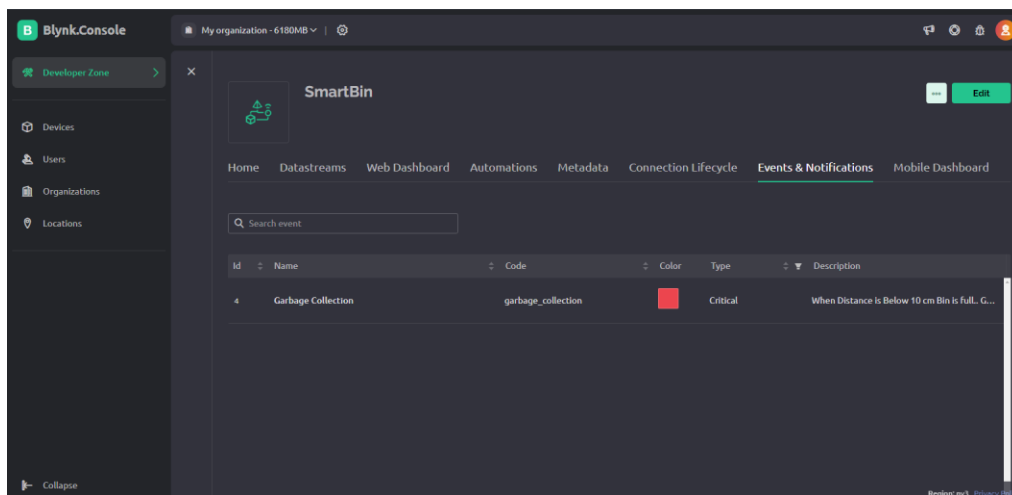


Fig 5.3.1: Alert Notification

- Shows users location according to where the bin has been installed. The figure below shows a description.

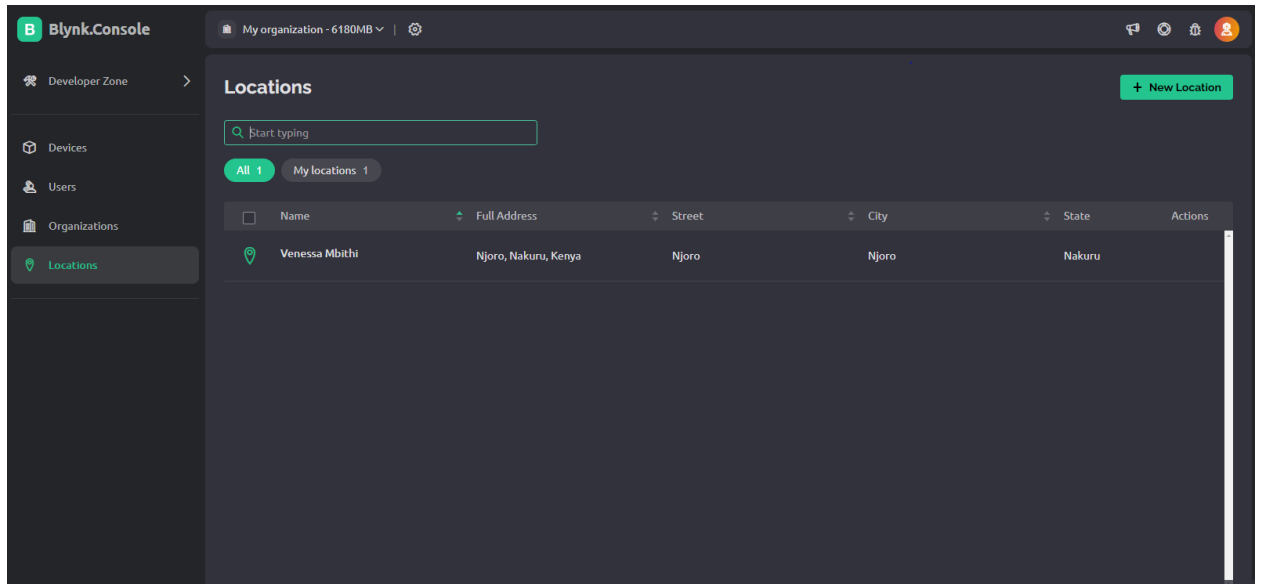


Fig 5.3.2: Location of user

5.3.2 Hardware Features

Apart from the software part, the hardware features include:

This Figure 5.4 shows how the hardware components are all connected together for measuring the bin level. The figure consists of the NodeMCU, buzzer, LED, Ultrasonic sensor, LCD and jump wires for connecting the components.

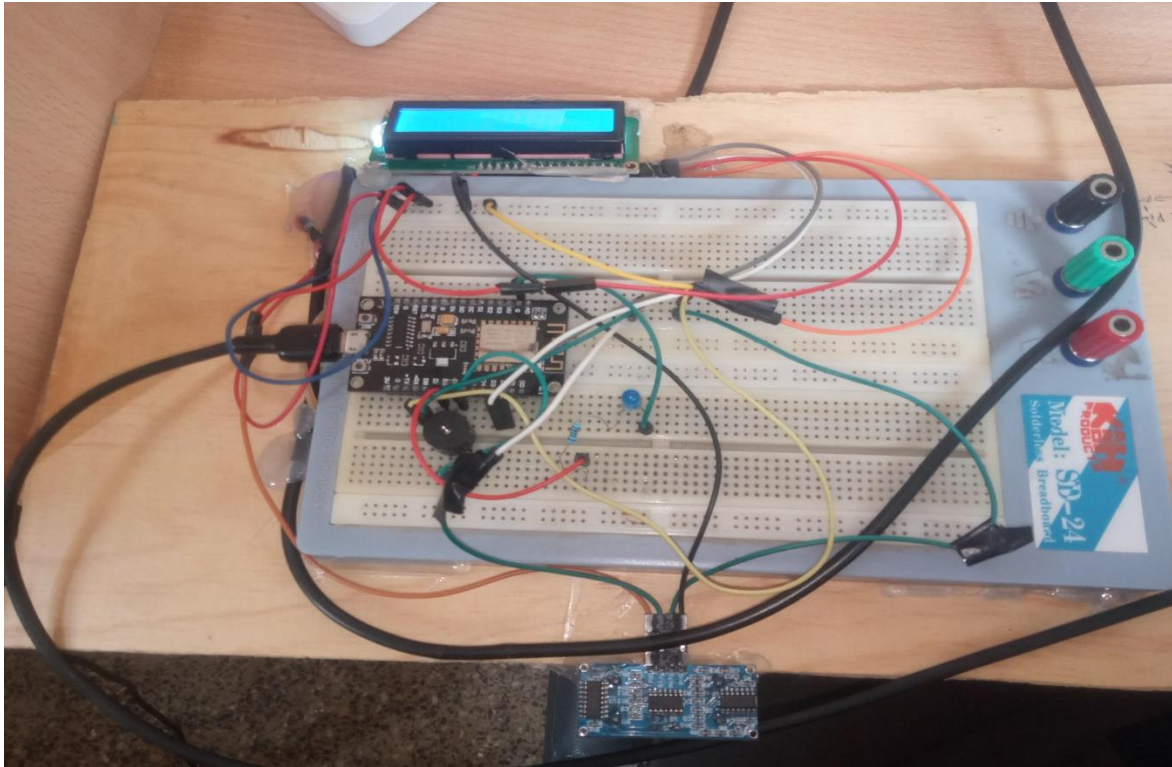


Figure 5.4: Whole Connected system

- When the bin is full, this means when the distance between the ultrasonic sensor and the waste is below 10cm, the LCD displays “Dustbin is full” as shown below and the LED lights up to indicate the bin is full. As shown in figure 5.5 and figure 5.6 below respectively.



Figure 5.5: LCD display when bin is full

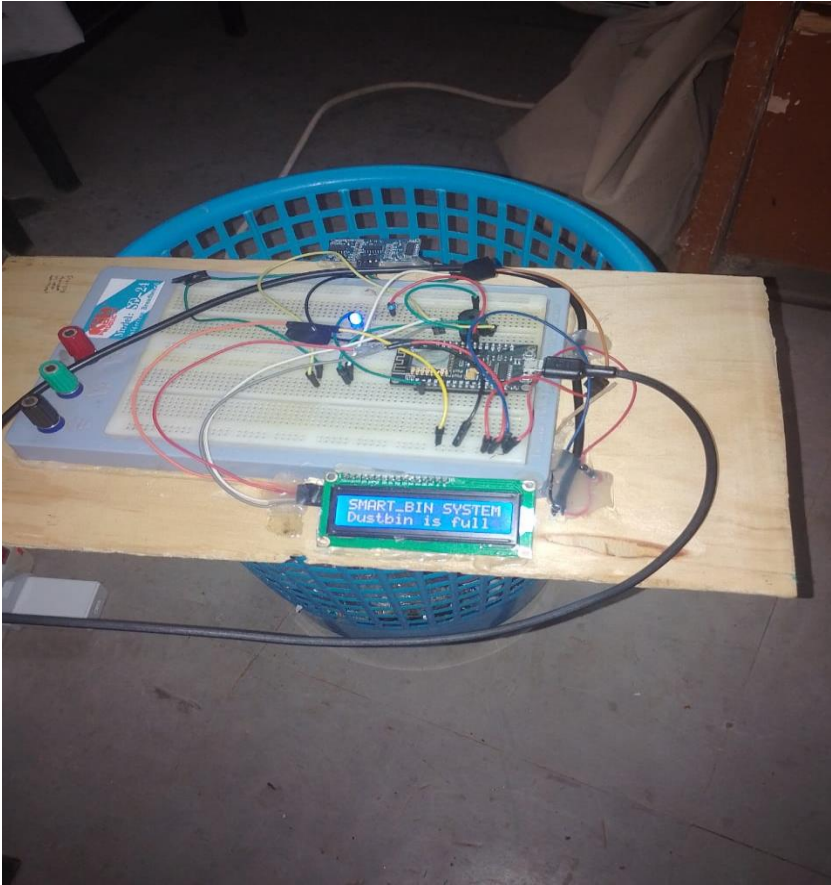


Figure 5.6: LED lights up when bin is full

- When Bin is not full, the LCD displays “Not full” together with the bin distance level from the sensor as shown in the figure below. The LED does not light up.



Figure 5.7: LCD display when bin is not full

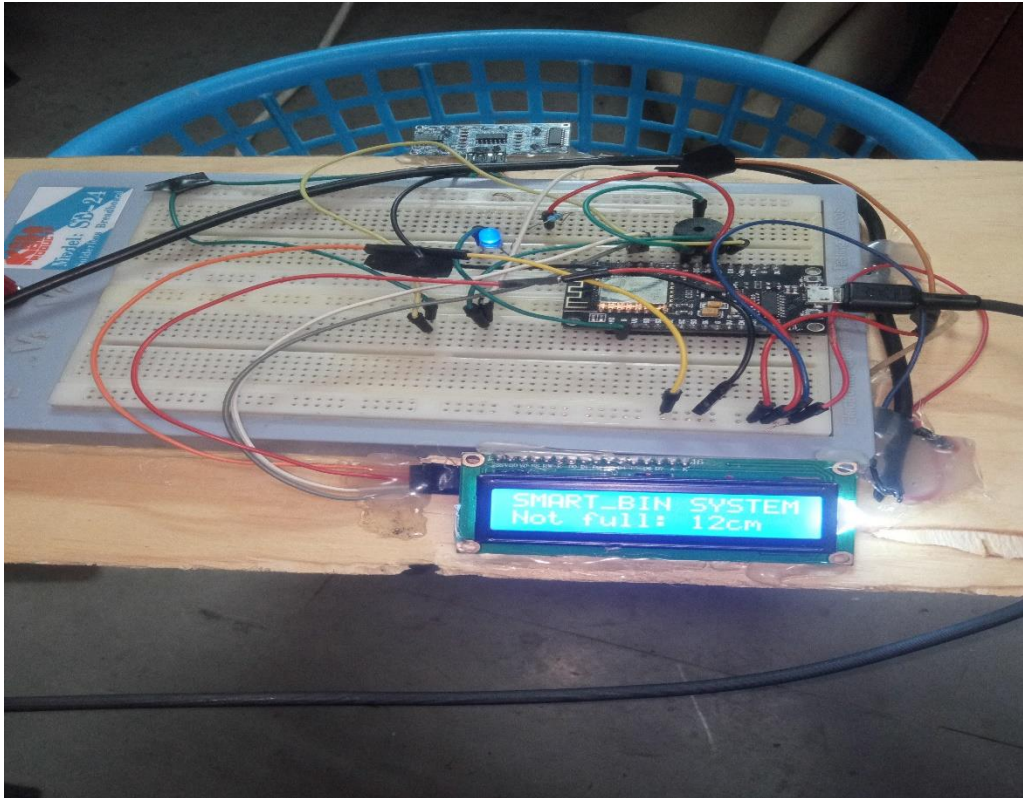


Fig 5.8: Bin measurement when bin is not full.

5.3.3 Website Features

A website was made to advertise the system and users can register. Below are the features that are in the website.

- Landing-page/ home-page

The figure below shows the landing page of the website used to advertise the project and registering users.



Fig 5.3.3.1: Homepage

- About us page

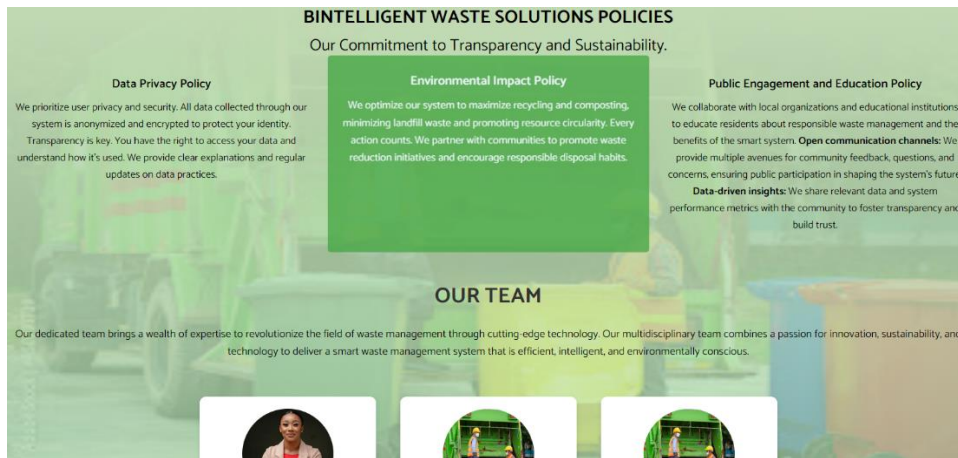


Fig 5.3.3.2: About Us page

- Service page: this highlights the services that the company will offer.

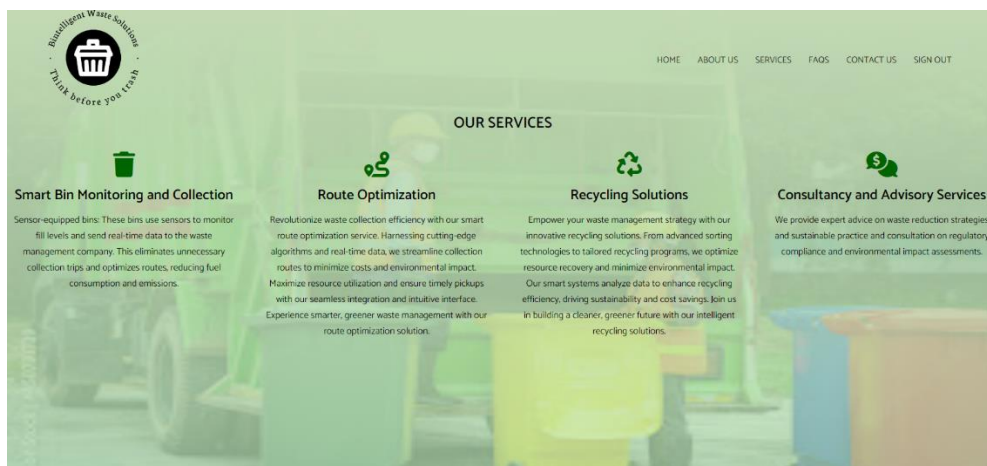


Fig 5.3.3.3: Service page

- Frequently asked Questions (FAQ) : it highlights the questions that are frequently asked by users and their answers.

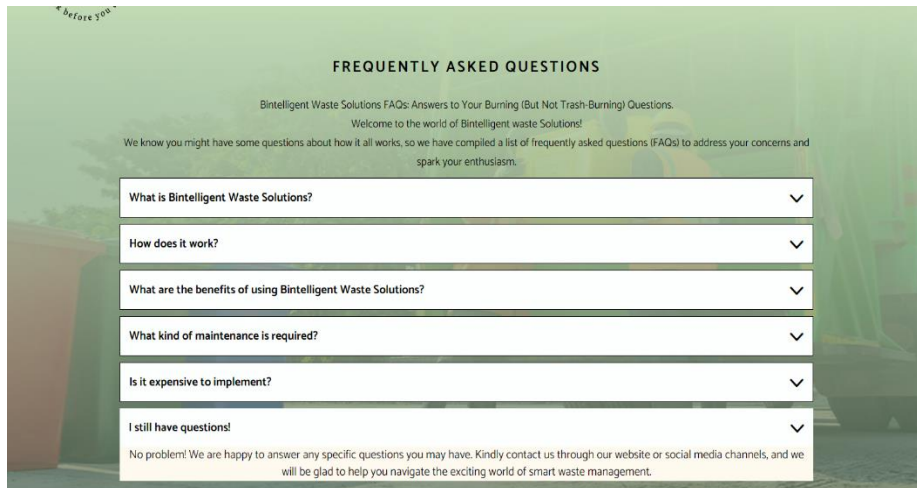


Fig 5.3.3.4: FAQ Page

- **Contact Page:** this page includes the company's contact information and where users can send messages on requesting for services.

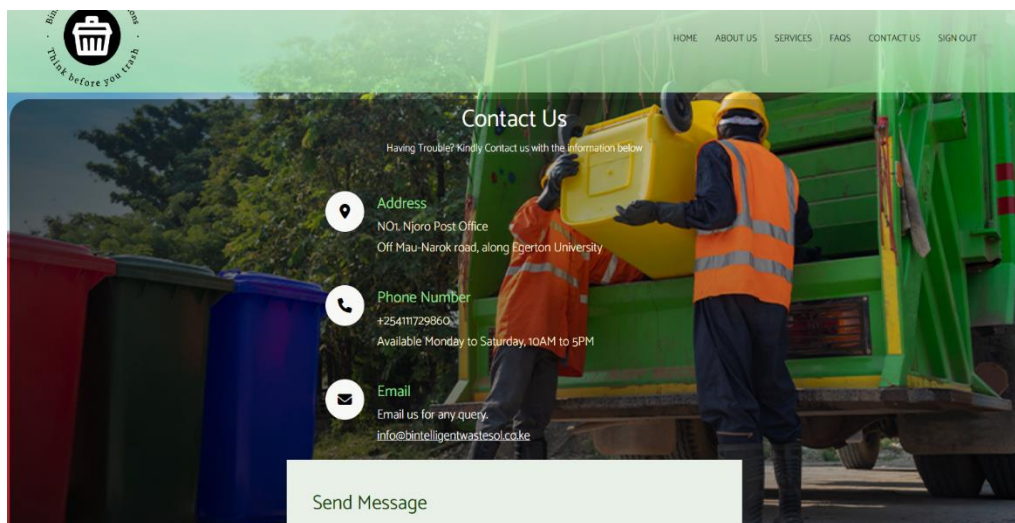


Fig 5.3.3.5: Contact Details

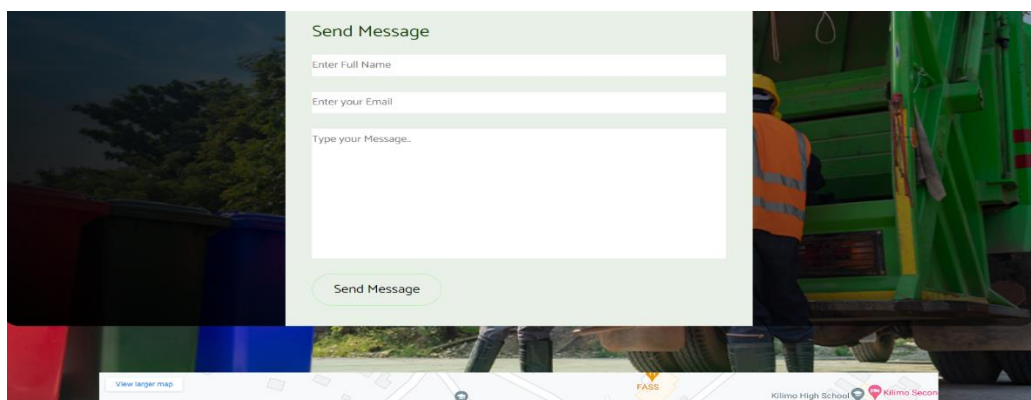


Fig 5.3.3.6: Send Message

- User Register: users can register here for services.

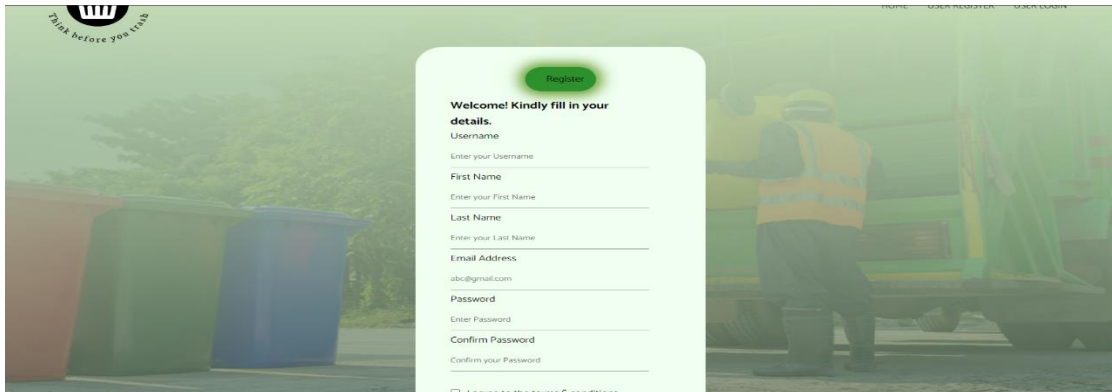
The screenshot shows a web page with a background image of a person in a high-visibility vest standing next to a green waste management truck. On the left, there are three large trash bins in red, green, and blue. A circular logo in the top left corner contains a trash bin icon and the text 'Think before you trash'. In the top right corner, there are navigation links: 'HOME', 'USER REGISTER', and 'USER LOGIN'. The main content is a white registration form with a green 'Register' button at the top. The form text includes: 'Welcome! Kindly fill in your details.', 'Username' (with a sub-label 'Enter your Username'), 'First Name' (with a sub-label 'Enter your First Name'), 'Last Name' (with a sub-label 'Enter your Last Name'), 'Email Address' (with a sub-label 'abc@gmail.com'), 'Password' (with a sub-label 'Enter Password'), 'Confirm Password' (with a sub-label 'Confirm your Password'), and a checkbox for 'I agree to the terms & conditions'.

Fig 5.3.3.7: User Register

- User Login: once user has registered one can log in to the website using the registered credentials in the page below.

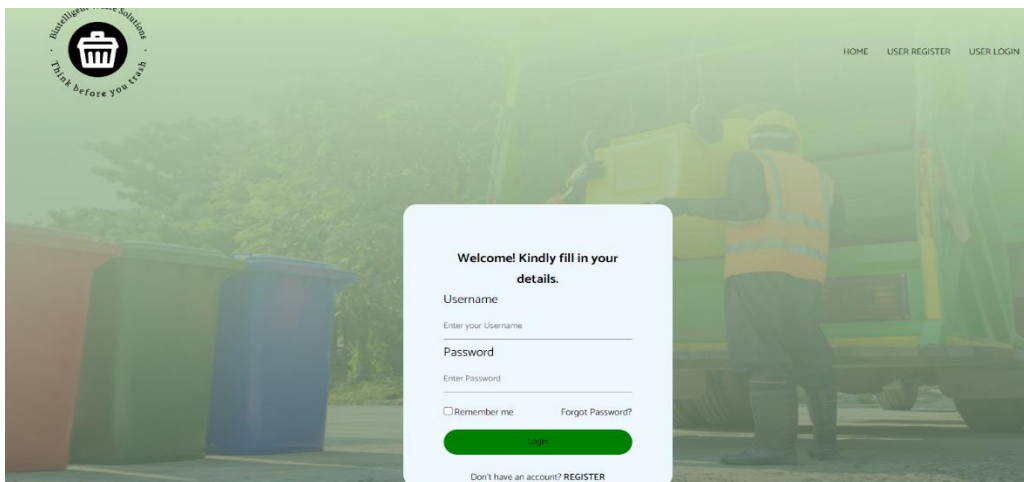
The screenshot shows a web page with the same background image as the previous one. The circular logo and navigation links are also present. The main content is a white login form with a green 'Login' button. The form text includes: 'Welcome! Kindly fill in your details.', 'Username' (with a sub-label 'Enter your Username'), 'Password' (with a sub-label 'Enter Password'), a 'Remember me' checkbox, a 'Forgot Password?' link, and a 'Don't have an account? REGISTER' link at the bottom.

Fig 5.3.3.8: User Login page

5.4 SYSTEM SUPPORT

Our support services are available to assist user with the setup, operation, and maintenance of the Smart Waste Management IoT System with the Blynk integration. We offer:

1. Technical Assistance: the support team for assistance with system configuration, troubleshooting, or any other technical issues users may encounter during setup or operation. We have IoT experts who are the one that install the components in the users bin.

2. Documentation: Access comprehensive documentation, which is the user manual for assistance. In the website, FAQs is available for users to answer some of their questions.