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GREEN GUARDIAN

USER MANUAL

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Glossary

- **Absolute Frequency:** The number of times a certain result or phenomenon was observed or calculated during a study.
- **AC:** Acronym for Acceptance Criteria.
- **Acceptance Criteria:** One or more conditions that must be met by a process, project, or functionality, in order to be considered correct and completed.
- **Agenda:** A list, typically separated by days or hours, in which is stored information about scheduled tasks and activities to be performed in the future.
- **Algorithm:** A set of rules or steps to follow in order to accomplish a goal, usually in problem-solving, and particularly steps executed by a computer.
- **Assembly Point:** A point in the park designed to function as a place for people to congregate and organize themselves in the event of an emergency.
- **Asymptotic Behavior:** The behavior of a function as its input size grows and approaches infinity.
- **Authentication:** A method by which a person or system validates the identity of another entity or the validity of a piece of information.
- **Average:** A single number or value that best represents a whole set of data: This typically refers to the arithmetic mean (the sum of a set of numbers divided by the amount of numbers in the set).
- **Barplot:** A data visualization method involving the placement of several thick bars of varying height, and occasionally color, across a horizontal base.
- **Boxplot:** A data visualization method involving the creation of a rectangle representing the second and third quartiles, usually with a line inside representing the median, flanked by two lines representing the first and fourth quartiles.
- **Checkup:** A procedure carried out on a vehicle with the purpose of verifying its correct and safe functionality and ensuring its adherence to security and safety standards.
- **Checkup Frequency:** The number of kilometers a vehicle is allowed to travel from the point of its last checkup before it is required to perform another checkup.
- **Coefficient of Skewness:** The measure of asymmetry of data distribution: In simpler terms, this can be described as a measure of how much and in what direction data mostly deviates from the mean.
- **Collaborator:** Person who is an employee of the organization and carries out design, construction and/or maintenance tasks for green areas, depending on their skills.
- **CSV File:** A computer file storing a table of data, with semi-colons used to delimit columns and line breaks used to delimit lines. "CSV" means "Comma-Separated Values", however in the scope of this project, the separation of values is handled by a semicolon, not a comma.
- **Dashboard:** A method of displaying various types of data in a visual format: Usually, though not always, different yet related pieces of information.
- **Data Structure:** A format and organization chosen to store a large amount of data in the most convenient and efficient way possible.
- **E-Mail:** A communication method that uses computer networks and electronic devices to send messages from a writer to one or more recipients, using address with technical information about how and where to deliver the message embedded into it.

- **Emergency Signs:** Visual indicators placed around the park pointing users to an Assembly Point, from which a safe evacuation in the event of an emergency is possible.
- **Equipment:** A group of tools used by an individual, usually in order to ease or make possible the execution of a certain task.
- **Evacuation Route:** A path from various points in the park to an exit designed to allow for the quick and safe evacuation of as many people as possible in the event of an emergency.
- **Execution Time:** The time required to run a computer process, like a program or an algorithm, from start to finish.
- **FM:** Acronym for Fleet Manager.
- **Fleet Manager:** Person who manages the fleet park, the machines, equipment and vehicles, ensuring their good condition and assigning them to the tasks to be carried out.
- **Garden:** A small garden space with or without trees, little to no equipment, and in some cases a basic irrigation system and seating.
- **GSM:** Acronym for Green Space Manager.
- **GSU:** Acronym for Green Space User.
- **Green Space:** An area of varying size reserved for the presence and growth of vegetation and plant life, typically referring to one such area in an urban environment.
- **Green Space Manager:** Person responsible for managing the green spaces in charge of the organization.
- **Green Space User:** Person who uses the green spaces managed by the organization and who can through the Portal, make comments or report faults in parks and gardens on the Portal.
- **Gross Weight:** The weight of an standard vehicle when fully loaded with fuel, passengers, cargo, etc., but without any trailers.
- **Histogram:** A data visualization method involving the separation of data into ranges, and the drawing of different-sized rectangles, with height proportional to the frequency of the values in each range, and width proportional to the range the rectangle represents.
- **HRM:** Acronym for Human Resource Manager.
- **Human Resources Manager:** Person who manages human resources and defines teams based on the needs of ongoing projects and the skills of the employees.
- **I/O:** Acronym for Input/Output.
- **Input/Output:** The method of communication between a computer system and the outside world: Particularly, a user.
- **Installation Cost:** The cost, in money, time, or some other resource, of the installation and creation of a system, such as an irrigation
- **Irrigation system:** A system created to automate the process of watering various kinds of vegetation and plant life over a specific area through the usage of water supply points connected by a network of pipes.
- **Job:** A piece of work, especially a specific task done as part of the routine of one's occupation, or for a agreed price.
- **Large-sized park:** A big, multifunction green space with many diverse gardens and areas and varied equipment and services.
- **Login:** A procedure that enables an entity to access a secure system, or private and restricted functions of a system.

- **Maintenance:** A continuous, long-lasting process made in order to preserve the well-being of something and ensure its functionality and continuing longevity.
- **Maintenance report:** A list of vehicles that are currently in need of a checkup (within a 5% range of or having surpassed the number of kilometers permitted before its next checkup).
- **Mean:** The center of a collection of numbers: More formally, this can be described as the mathematical average of two or more numbers.
- **Median:** The middle of a collection of sorted (ascending or descending) numbers.
- **Medium-sized park:** A green space with some hundreds or thousands or square meters, with one or more wooded spaces, complete with infrastructure such as toilets, drinking fountains, irrigation and lighting systems, etc.
- **MS:** Acronym for MusgoSublime.
- **MusgoSublime:** An organization dedicated to the organization, maintenance, and development of urban green spaces.
- **Pie chart:** A data visualization method involving the creation of a circle and the separation and coloring of said circle in several different slices.
- **Portal:** Platform in which Green Space Users may post comments, complaints, suggestions, or faults/malfunctions of equipment.
- **Primitive operation:** Within the scope of this project, this can be defined as an operation/instruction that takes a constant, unchangeable amount of time, independent of any external factors.
- **QAM:** Acronym for Software Quality Assessment Team Manager.
- **Quartile:** One of four different groups into which the values of a certain variable can be split, representing the proportion of the population that falls into said category according to the chosen variable.
- **Relative frequency:** The ratio, between 0 and 1, of the absolute frequency of a value to the total number of trials/observations made in a study, even those that did not return the result in question.
- **Route:** A linear path between two points that may not always be direct and is designed to pass through a number of other points.
- **Set:** An extremely vague concept relating to any and all collections of data.
- **Software Quality Assessment Team Manager:** Person who manages the Software Quality Assessment Team and its process.
- **Skill:** An ability to perform a certain task.
- **Standard deviation:** The measure of the amount of deviation from the mean expected in a set.
- **Tare**: The weight of an empty standard vehicle with all fluids, such as oils, and exactly 10 liters of fuel in its tank.
- **Task:** A procedure, scheduled ahead of time, carried out by a team of collaborators that requires time, skill, and effort to achieve.
- **Team:** A group of Collaborators that works and cooperates together, pooling their manpower and skills in order to carry out specific tasks.
- **To-do list:** A list comprised of a series of incomplete tasks that must at some point in the future be carried out.
- **Trailer:** An unpowered vehicle towed by a powered vehicle.
- **Unique data structure:** A Data Structure in which every piece of stored data must be unique: In other words, a data structure that does not allow for the insertion of duplicate data.

- **Vehicle:** A piece of machinery used for effortless movement across any distance, typically designed to carry a number of people or a load of cargo.
- **Water consumption:** The amount of water, typically measured in liters, used by a certain organization or facility to perform its functions over a given time period.
- **Water supply point:** A point in an irrigation system from which water is removed from the network and distributed to the surrounding area, the water in question being supplied by a series of pipes connected to this point.
- **Worst-case Time Complexity:** The asymptotic behavior of an algorithm, measured with inputs that cause said algorithm to run for the longest possible time.

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1. Introduction

Welcome to the GreenGuardian manual! This guide is designed to help you manage green spaces efficiently using our app. Whether you are responsible for a park, garden or any green space, this manual will provide you with the information you need to make the most of our resources effectively.

As a manager or administrator, it is crucial to understand how to maintain your green spaces in an integrated way. In this manual, you will learn how to use GreenGuardian to manage your workforce, maintain vehicles, plan and build irrigation systems, handle emergency planning, and analyze key performance indicators (KPIs) to improve your operations.

Using GreenGuardian, you can streamline your operations and improve the quality of management of your green spaces. For example, you can easily monitor your team's activities, update records as needed, and plan efficient irrigation and emergency response systems.

This manual is aimed at any green space manager who wants to simplify their work with our application. Although it requires some knowledge of green space management, we have made every effort to ensure it is accessible to all interested in the area.

2. System Overview

The Green Space Management application is a holistic solution crafted to enhance the efficiency of overseeing and upkeeping green spaces, encompassing parks, gardens, and recreational areas.

This application serves the needs of diverse individuals engaged in green space management, including human resources managers, fleet managers, green space managers, green space users and collaborators.

Each user role is equipped with distinct tools and functionalities tailored to enable them to carry out their responsibilities with utmost effectiveness.

The Human Resources Manager (HRM) Oversees workforce management, defining project teams based on project requirements and Employee skills.

The Fleet Manager (FM) is responsible for maintaining and assigning vehicles, machines, and equipment for tasks.

Collaborators, employees of the organization, engage in design, construction, and maintenance activities for green areas.

Green Space Manager (GSM) is responsible for managing the green spaces in charge of the organization.

Green Space User (GSU) is the person who uses the green spaces managed by the organization and who can, through the Portal, make comments or report faults in parks and gardens.

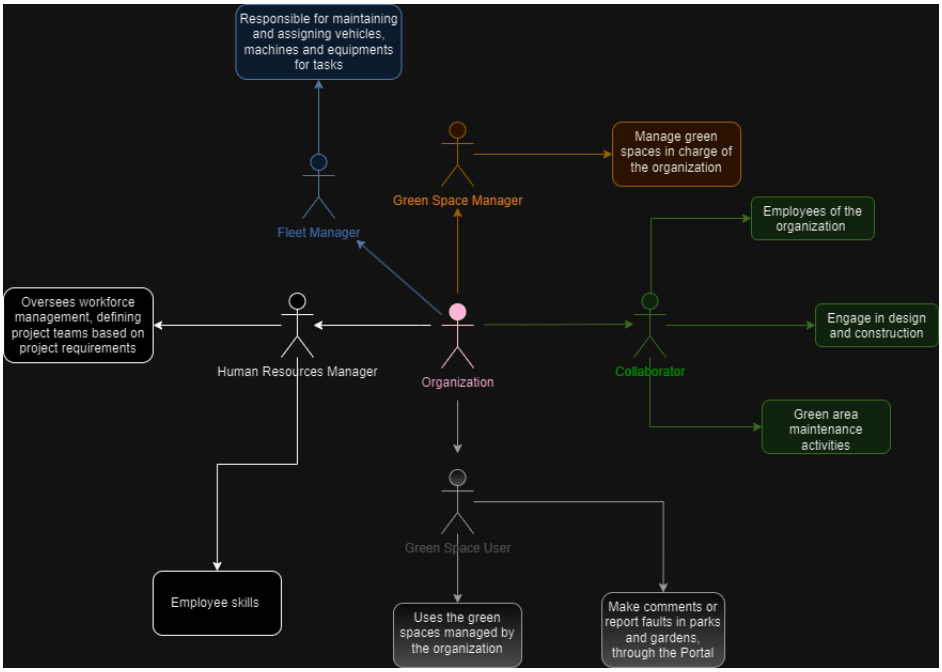

Figure 1- System Overview and features

3. System Requirements

- **RAM:** At least 4 GB;
- **Processor:** Minimum 2 GHz dual-core processor;
- **Disk Space:** At least 10 GB of free space;
- **Operating System:** Compatible with Windows 10 or higher, macOS 10.15 or higher, Linux (Ubuntu 20.04 LTS or similar);
- **Java:** Java 19 or higher, with Java FX 21 installed;
- **Graphics:** OpenGL 3.3 compatible graphics card;
- **Network:** Stable internet connection for updates and online features;
- **Jupyter Notebook Reader:** Anaconda, Visual Studio Code, etc.

3.1 Java 19 Installation

- Look up "*Java Download*" using your web browser;
- Click on the first result;
- Press the button labeled "*Download*";
- The latest Java executable file will begin downloading;
- Save the executable file to your computer and run it;
- Proceed with the installation steps as prompted to finish the process.

3.2 JavaFX setup in IntelliJ

- **Step 1:** Open GreenGuardian in IntelliJ;
- **Step 2:** Click in the "*m*" button in the right side of your screen;

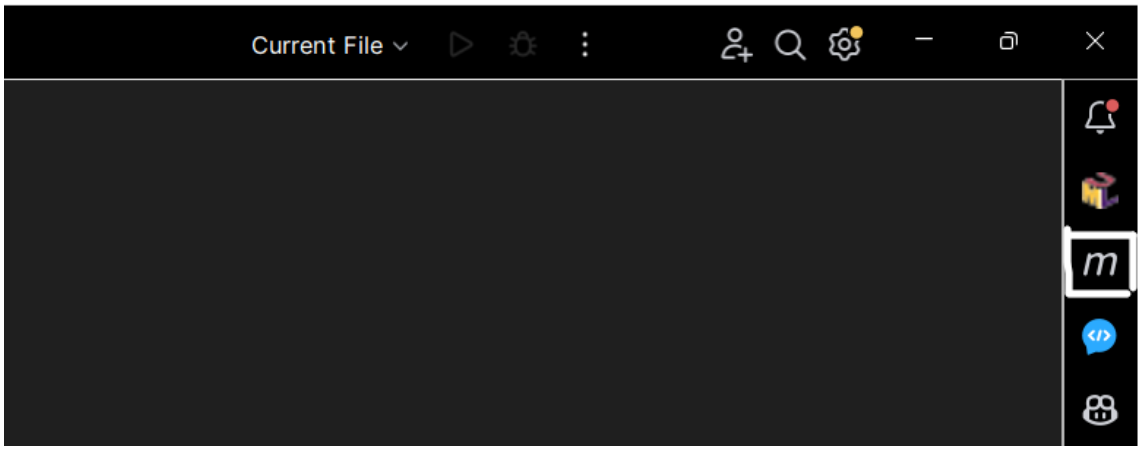

Figure 2 - "m" button

- **Step 3:** Press the "*reload all maven projects*" button;

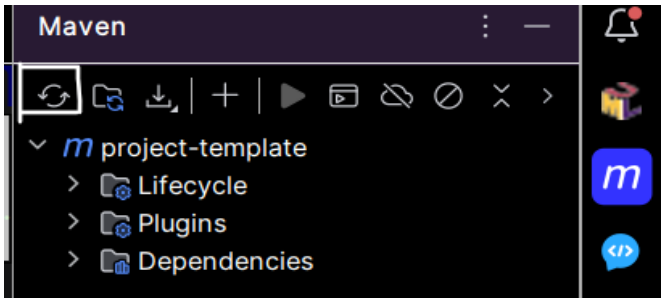

Figure 3 - reload maven

- **Step 4:** Enjoy the *GreenGuardian* experience.

4. Features

4.1 User Features - Admin Main Menu

4.1.1 Do Login - Login UI

- **Step 1:** Open the class “Main” in IntelliJ and press the run button;

Figure 4 - Initialization

- **Step 2:** Then press “*s*” to open GreenGuardian app;

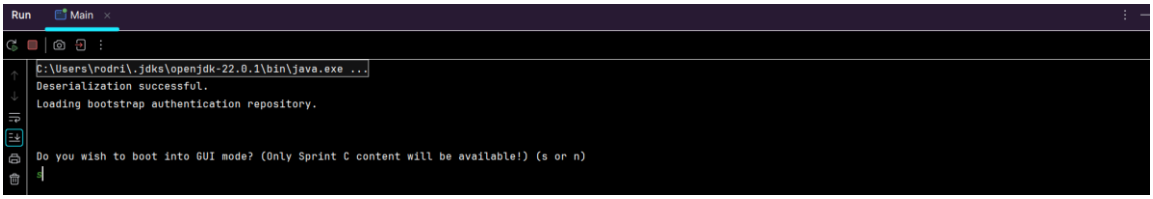

Figure 5 - Open GreenGuardian

- **Step 3:** Enter the credentials. The UserId/Email must be in the following format “*user@this.app*”. Then press “*submit*”;

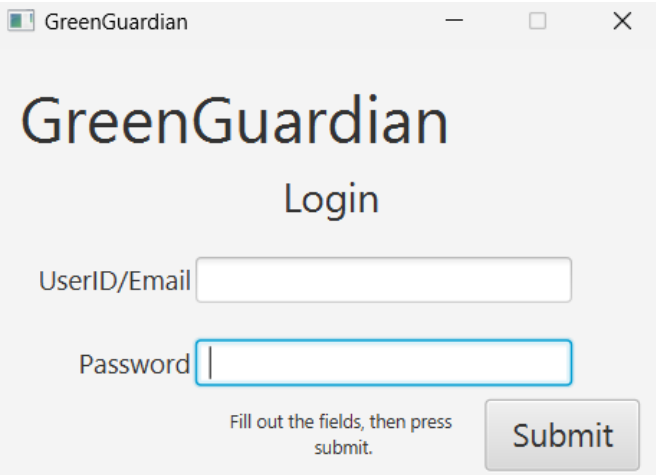

Figure 6 - Admin login

- **Step 4:** After the admin logs in, the following page will open with the options menu in the top bar.

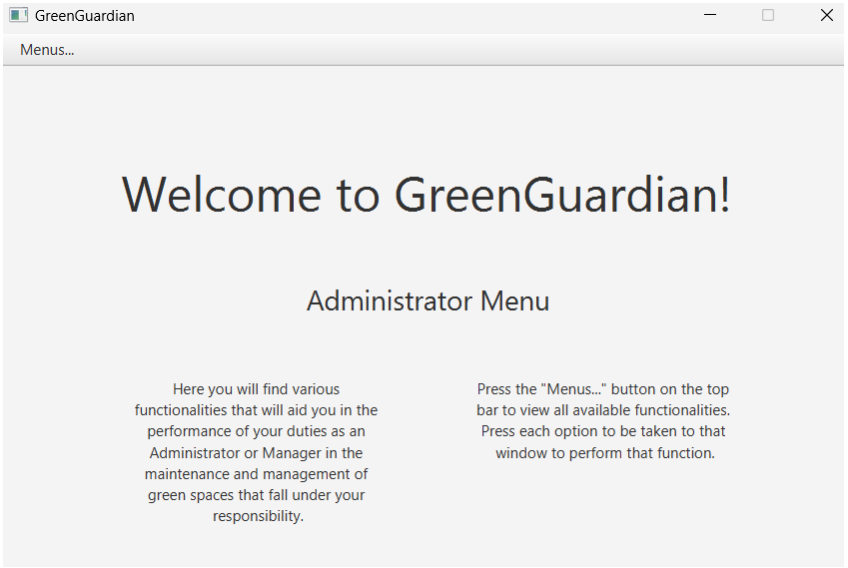

Figure 7 - Admin Menu

4.1.2 Register Skills

- **Step 1:** Select "*Register Skill* to register the skills that a collaborator may have;

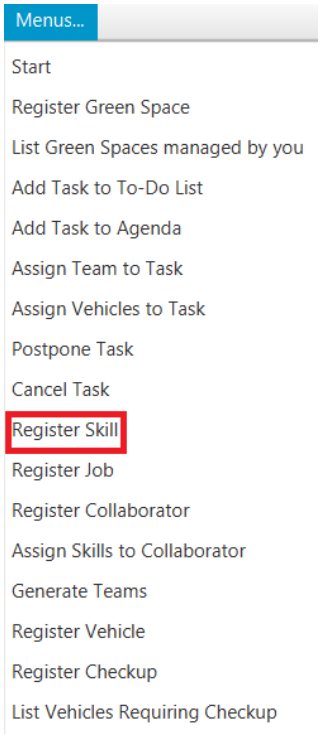

Figure 8 - Menu (register skill)

- **Step 2:** Enter the name of the skill and press “Add Skill”. The information will then be recorded;

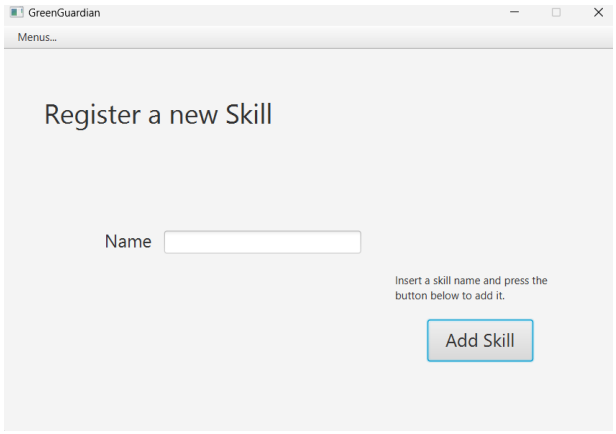

Figure 9 - New skill

- **Step 3:** A message will appear confirming that the skill was successfully registered.

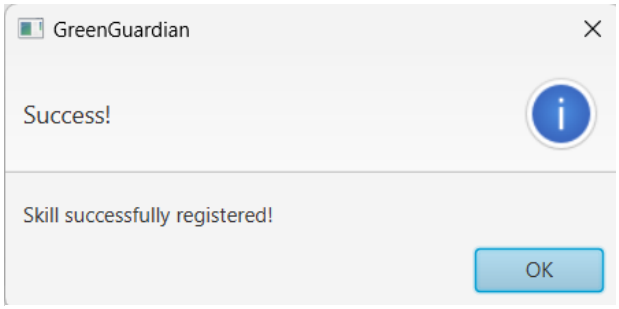

Figure 10 – Skill Success

4.1.3 Register a job

- **Step 1:** Access the menu and select "Register a Job";

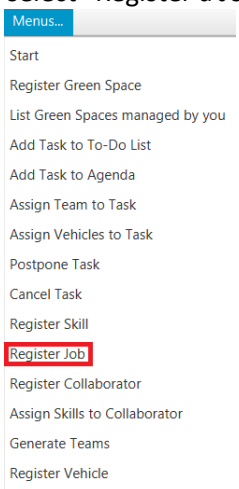

Figure 11– Menu (Register Job)

- **Step 2:** Enter the name of the profession and confirm by pressing the “Add Job2” button;

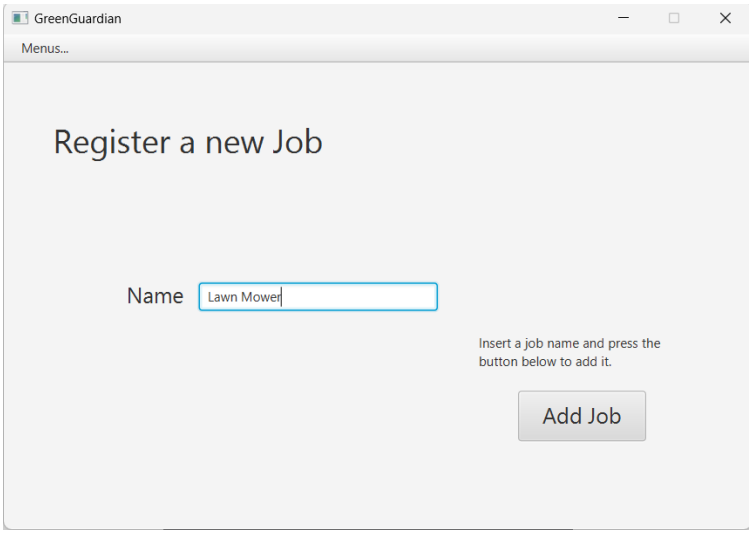

Figure 12 – New job

- **Step3:** A message will appear confirming that the job was successfully registered.

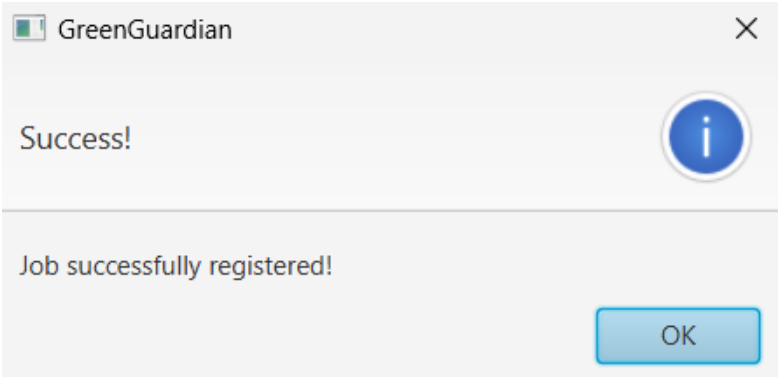

Figure 13 – Job success

4.1.4 Register a Collaborator

- **Step 1:** Access the menu and select "Register Collaborator";

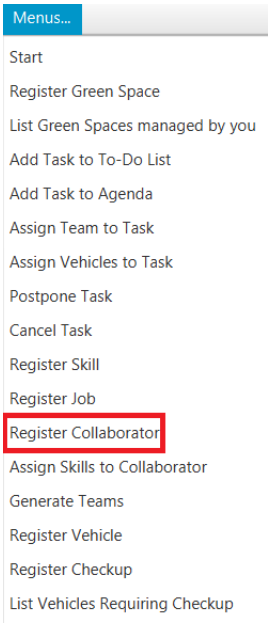

Figure 14 – Menu (Register Collaborator)

- **Step 2:** Fill all the requested data and confirm by pressing “Register Collaborator” button;

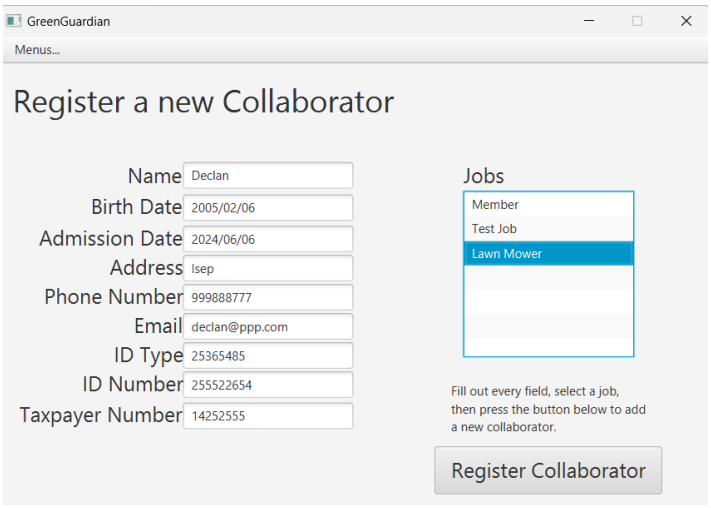

Figure 15 – New collaborator

- **Step 3:** Records and displays operation success.

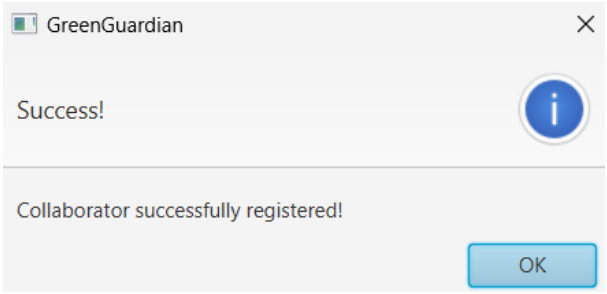

Figure 16 – Collaborator success

4.1.5 Assign Skills to Collaborator

- **Step 1:** Select the option "*Assign Skills to Collaborator*" to associate a skill to a Collaborator;

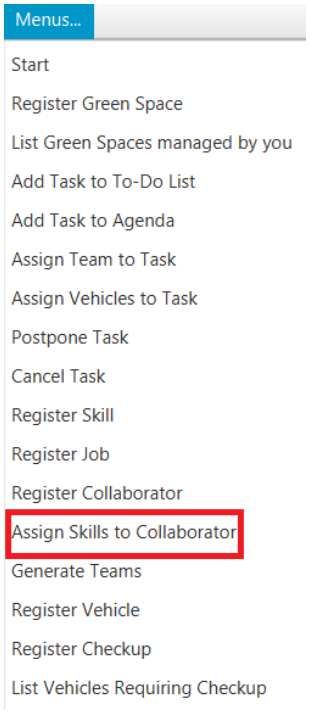

Figure 17 – Menu (Assign Skill)

- **Step 2:** Select the corresponding employee and skill(s) to associate. To select more than one skill, hold down the "Ctrl" key while clicking on the skills;

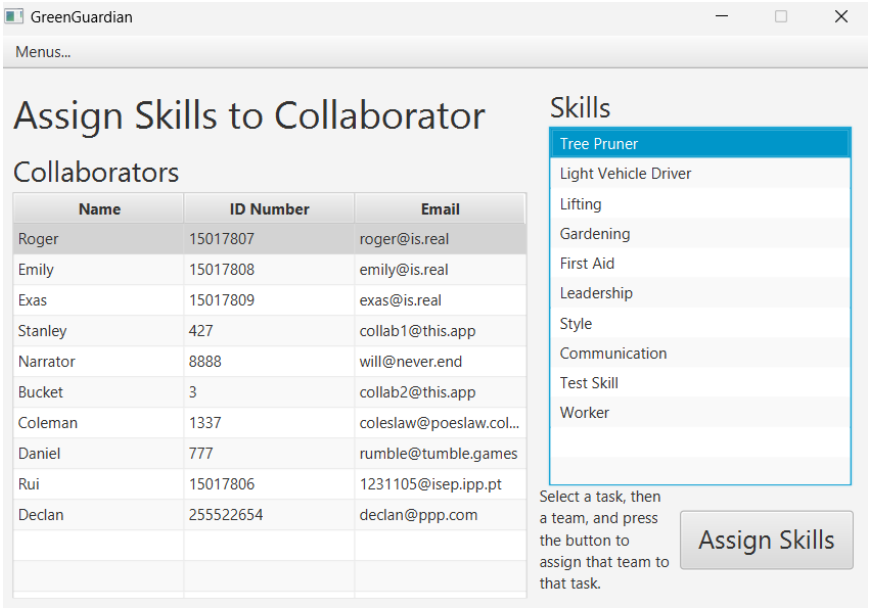

Figure 18 – Assign Skill

- **Step 3:** Records and displays operation success with assigned skills list.

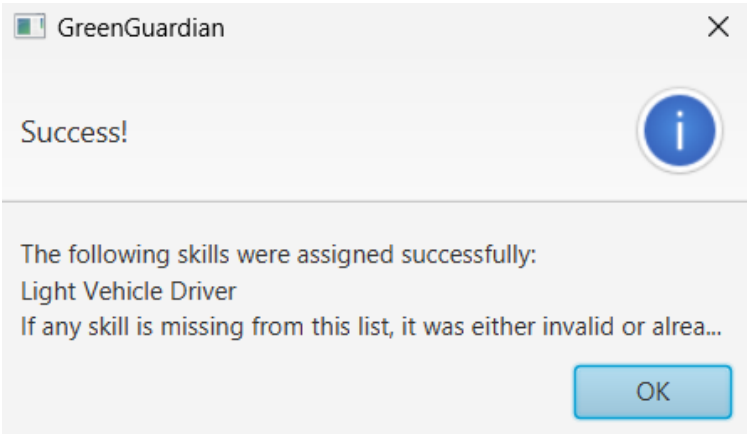

Figure 19 – Assign Skill success

4.1.6 Generate Teams

- **Step 1**: Access the menu and select "Generate Teams";

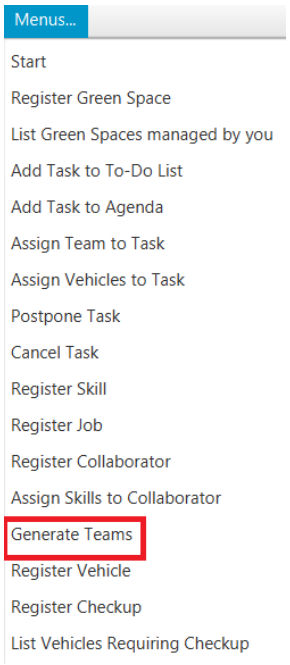

Figure 20 – Menu (Generate teams)

- **Step 2:** Select the skills and the number of team members, then click the button "Generate Team" and then "Accept Team";

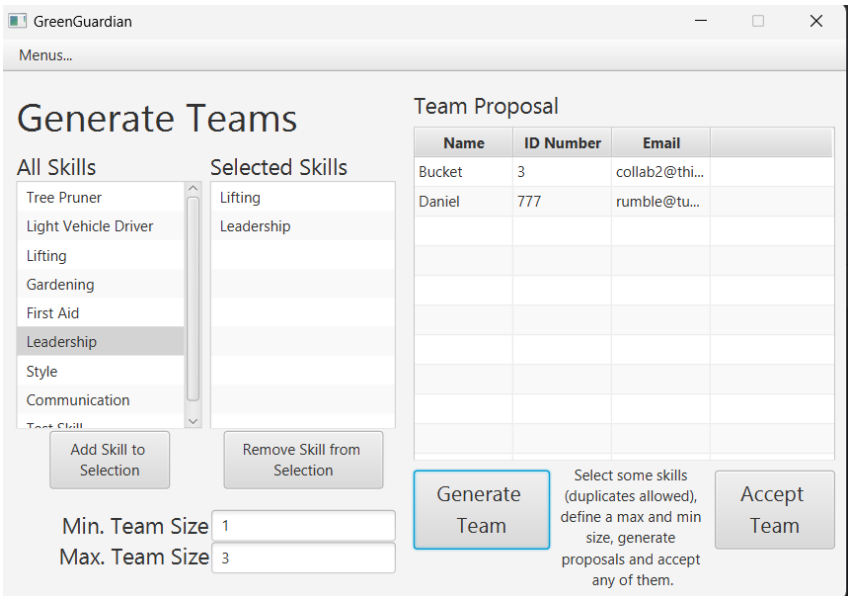

Figure 21– Generate Teams

- **Step 3:** Records and displays operation success with assigned skills list.

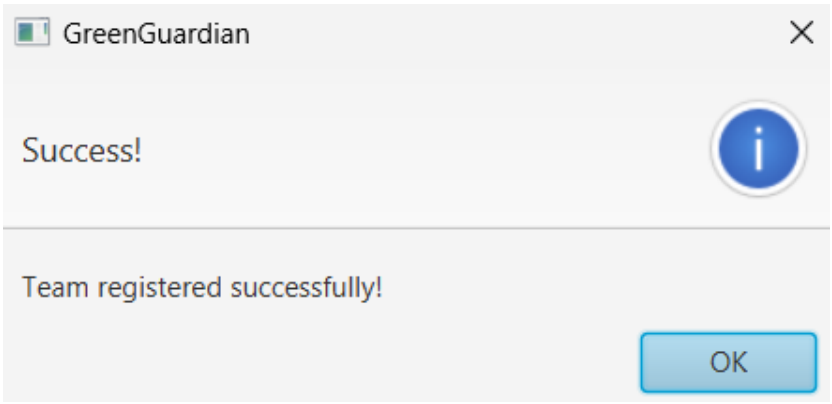

Figure 22 – Generate team success

4.1.7 Register Vehicle

- **Step 1:** Access the menu and select "Register Vehicle";

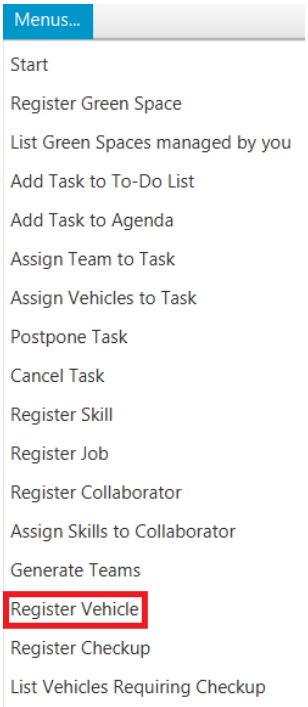

Figure 23 – Menu (Register Vehicle)

- **Step 2:** Fill all the requested data and confirm by pressing “Register Vehicle” button;

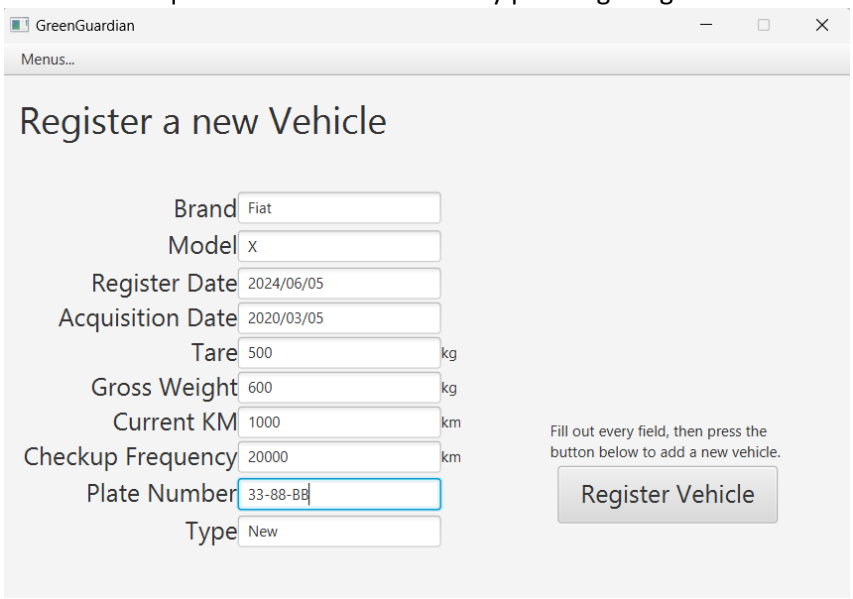

Figure 24 - Register Vehicle

- **Step 3:** A message will appear confirming that the vehicle was successfully registered.

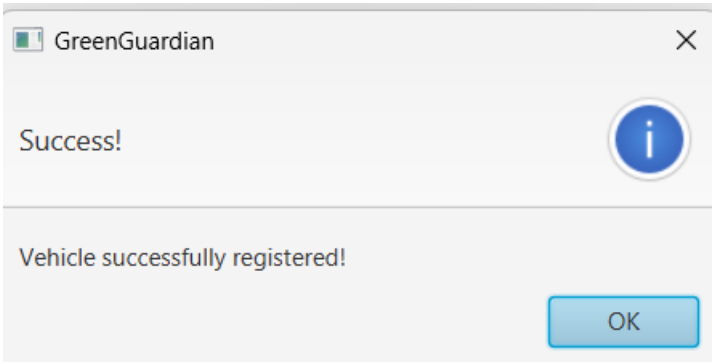

Figure 25 – New vehicle success

4.1.8 Register Vehicle Checkup

- **Step 1:** Access the menu and select "Register Vehicle Checkup";

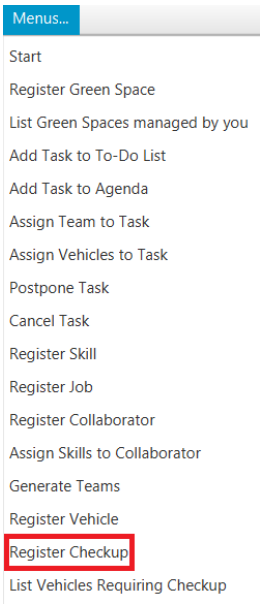

Figure 26 – Menu (Register Checkup)

- **Step 2:** Fill all the requested data and confirm by pressing “Register Checkup” button;

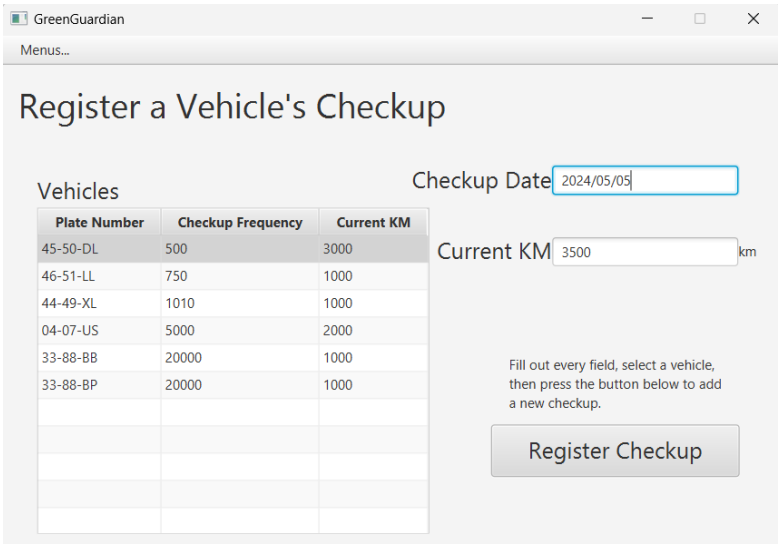

Figure 27 - Register Checkup

- **Step 3:** A message will appear confirming that the Vehicle Checkup was successfully registered.

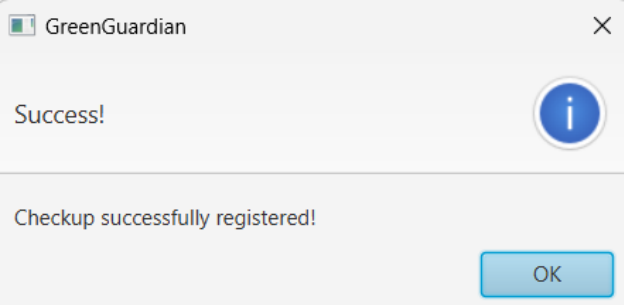

Figure 28 - Register Checkup success

4.1.9 List Vehicles Requiring Checkup

- **Step1:** Access the menu and select "List Vehicles Requiring Checkup" to display the list of vehicles that need a checkup.

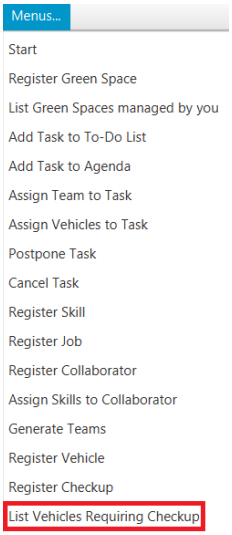

Figure 30 – Menu (List Vehicles)

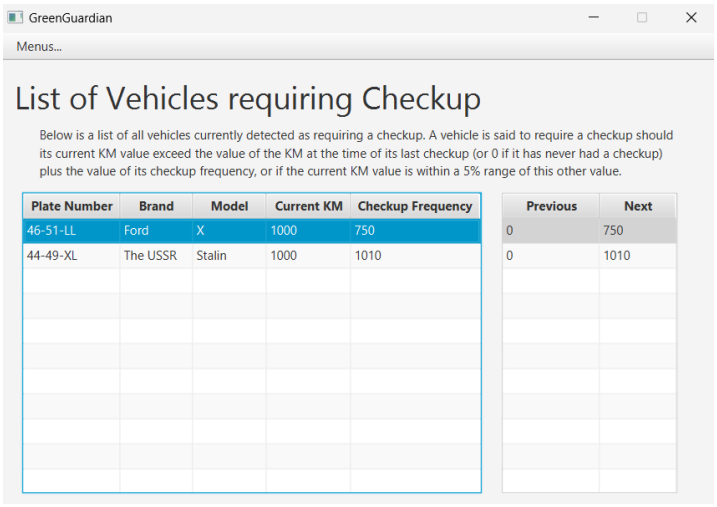

Figure 29 – List Vehicles

4.1.10 Register Green Space

- **Step 1:** Access the menu and select "Register Green Space";

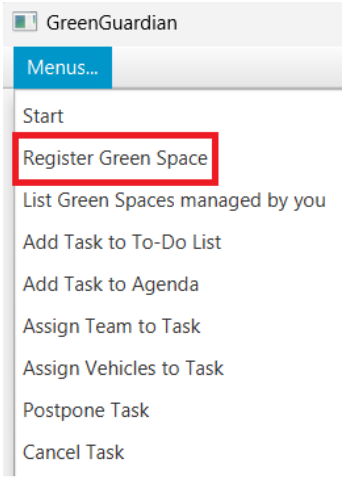

Figure 31 – Menu (Register Green Space)

- **Step 2:** Fill all the requested data and confirm by pressing “Register Green Space” button;

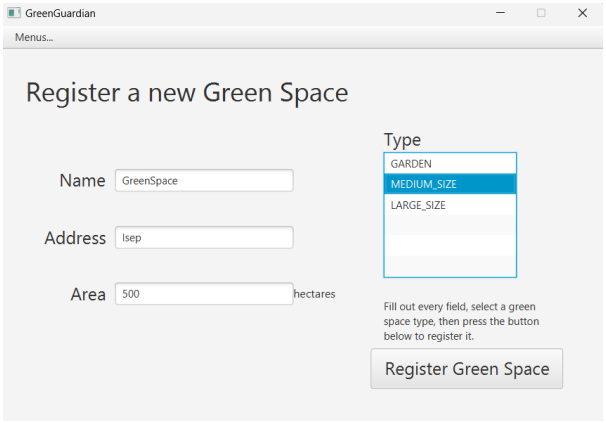

Figure 32 – New Green Space

- **Step 3:** A message will appear confirming that the green space was successfully registered.

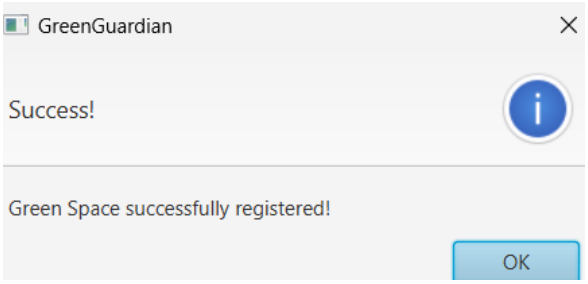

Figure 33 – New Green Space success

4.1.11 List of Green Spaces managed by you

- **Step 1:** Access the menu and select "List Green Spaces managed by you" then it will show the existing green spaces.

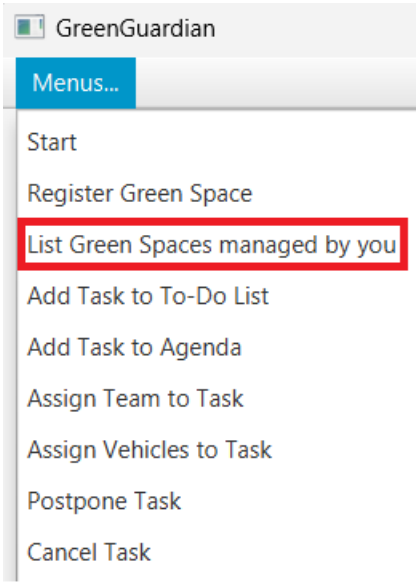

Figure 35 – Menu (List Green Spaces)

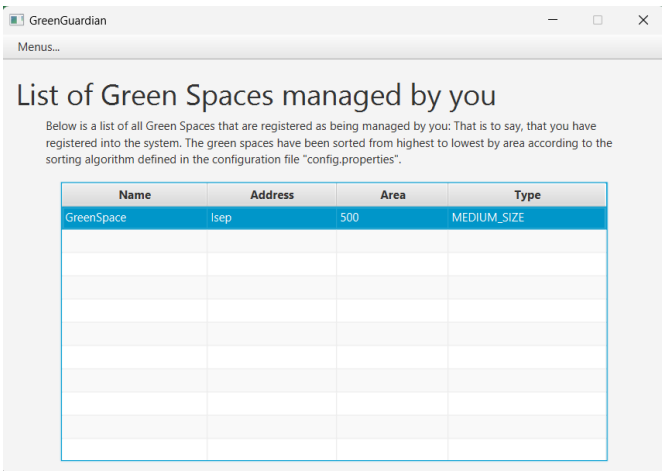

Figure 34 – Green Spaces list

4.1.12 Add Task to To-Do List

- **Step 1:** Access the menu and select “Add Task to To-Do List” ;

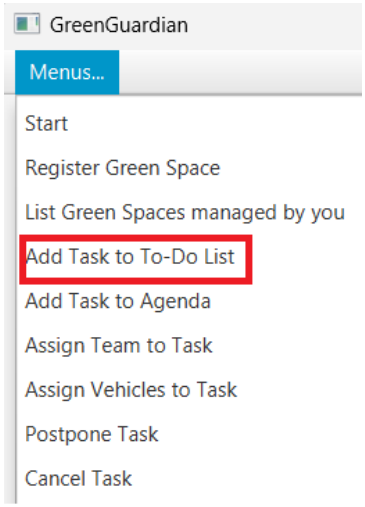

Figure 36 – Menu (Add task to to-do list)

- **Step 2:** Fill all the requested data and confirm by pressing “Add Task” button;

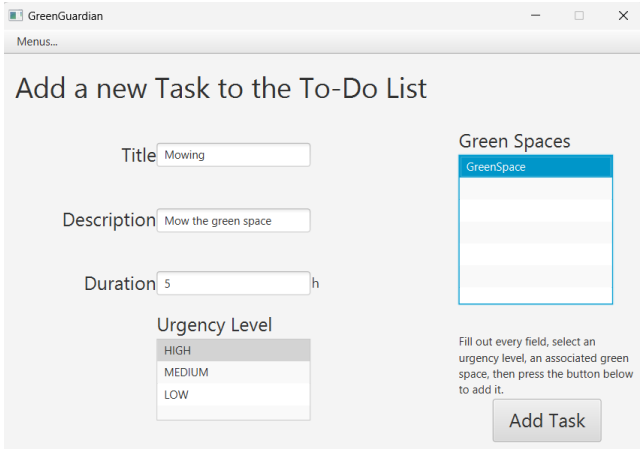

Figure 37 - Add task to to-do list

- **Step 3:** A message appears that the Task was successfully added to the to-do list.

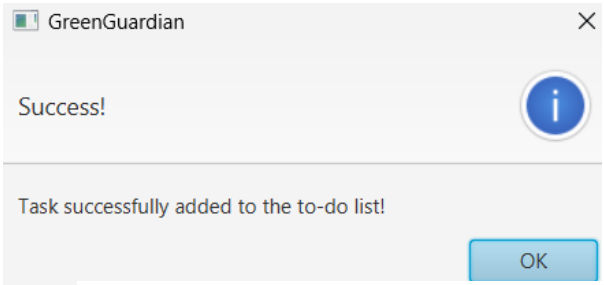

Figure 38 - Add task to to-do list success

4.1.13 Add Task to Agenda

- **Step 1:** Access the menu and select “Add Task to Agenda”;

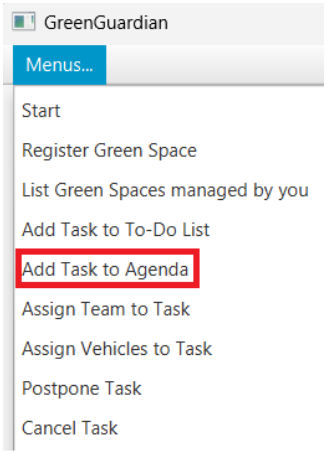

Figure 39 - Menu (Add task to Agenda)

- **Step 2**: There, you can choose the task you want, select the start date, and specify the start time. Finally, click the “Assign Task” button;

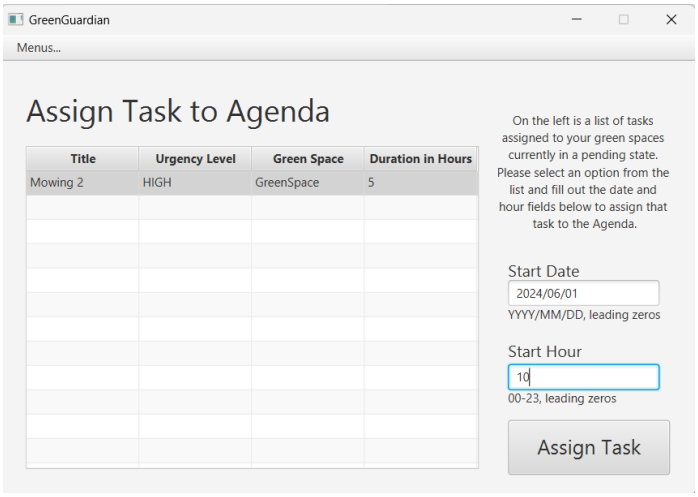

Figure 40 - Add task to agenda

- **Step 3:** A message will appear informing that the task was successfully assigned.

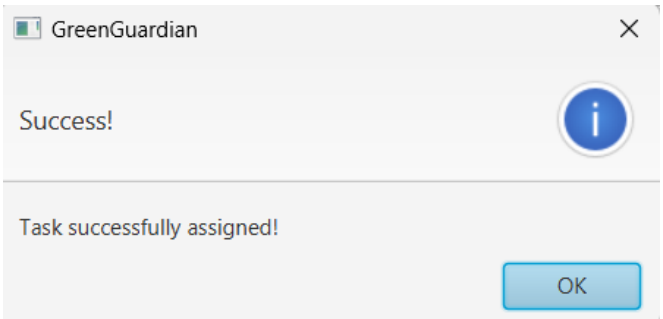

Figure 41 - Add task to agenda success

4.1.14 Assign Vehicles to Task

- **Step 1:** Access the menu and select “Assign Vehicles to Task”;

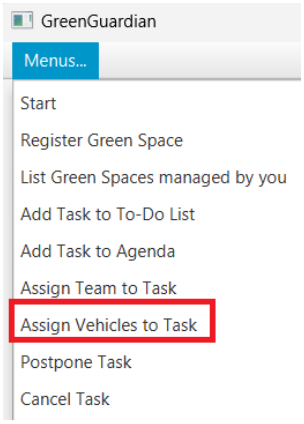

Figure 42 – Menu (Assign Vehicle to Task)

- **Step 2:** First, you choose the task and then the vehicle you want to assign to the task. Finally, click on the "Assign Vehicles" button;

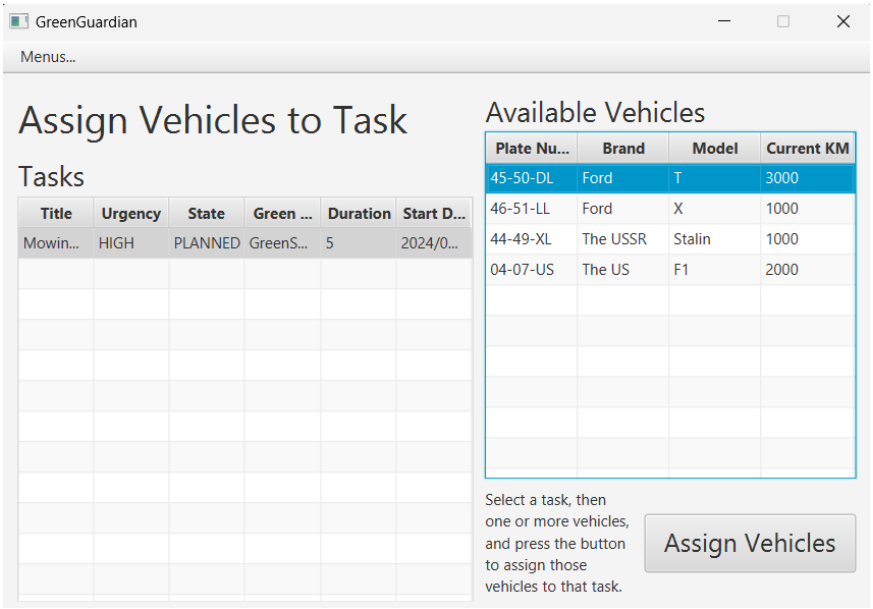

Figure 43 - Assign Vehicle to Task

- **Step 3:** A message will appear informing you that the following vehicles were successfully assigned.

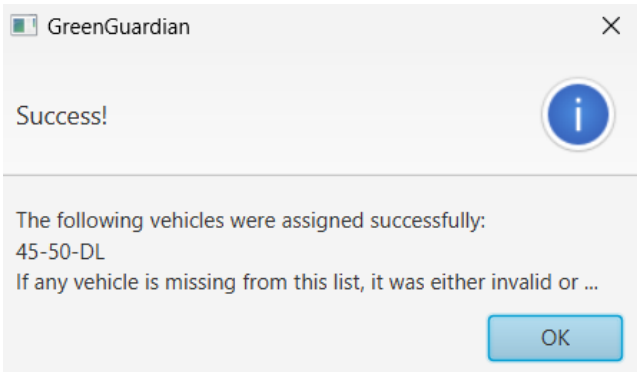

Figure 44 - Vehicle to Task success

4.1.15 Assign Team to Task

- **Step 1:** Access the menu and select “Assign Team to Task”;

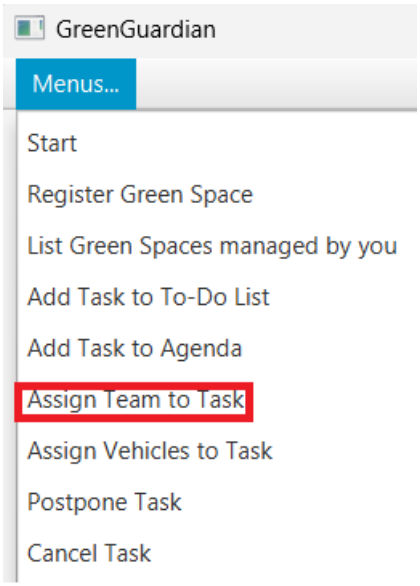

Figure 45 – Menu (Assign team to task)

- **Step 2:** Assign the task to the team that will perform it and press the “Assign Team” button;

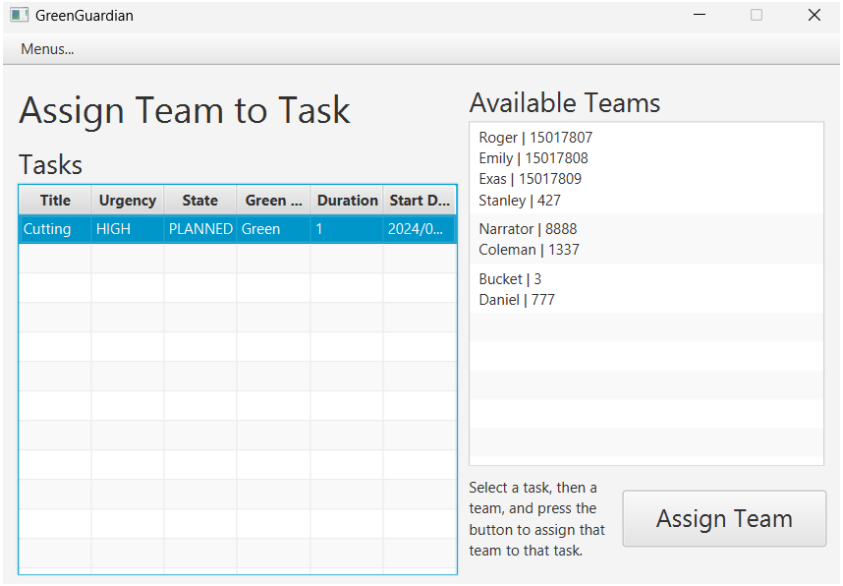

Figure 46 - Assign team to task

- **Step 3:** A message will appear informing you that the team was successfully assigned.

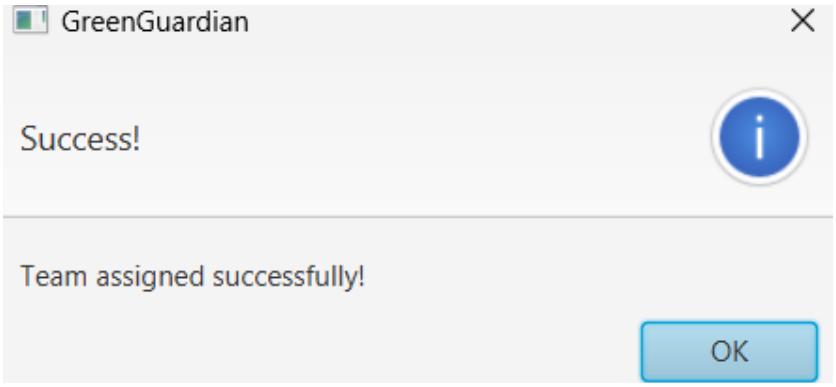

Figure 47 - Assign team to task success

4.1.16 Postpone Task

- **Step 1:** Access the menu and select “Postpone Task”;

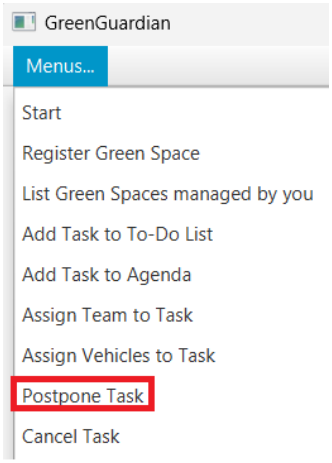

Figure 48 – Menu (Postpone Task)

- **Step 2:** First, you choose the task you want to postpone, select a new start date and hour, and finally click on the "Postpone Task" button;

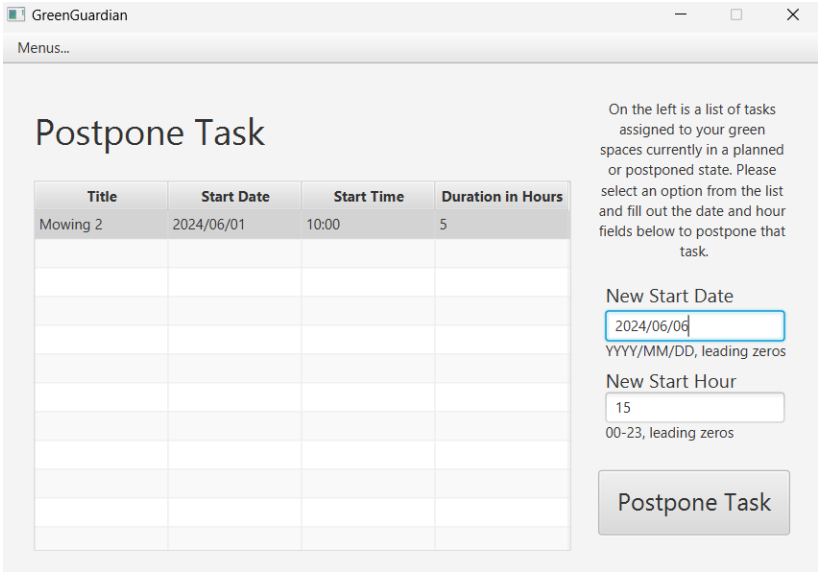

Figure 49 - Postpone Task

- **Step 3:** A message will appear informing that the Task was successfully postponed.

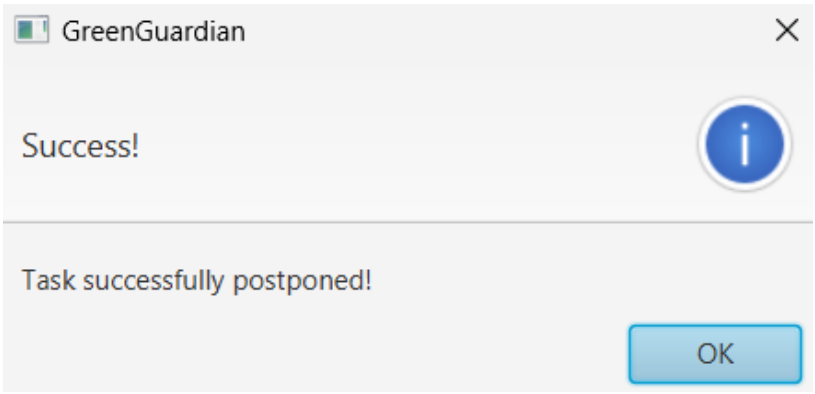

Figure 50 - Postpone Task success

4.1.17 Cancel Task

- **Step 1:** Access the menu and select" Cancel Task";

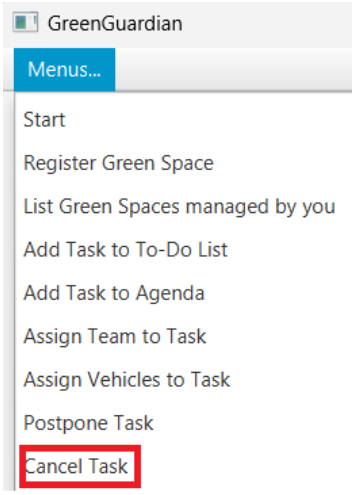

Figure 51 - Menu (Cancel Task)

- **Step 2:** Choose the task you want to cancel and click on the button “Cancel Task” to complete;

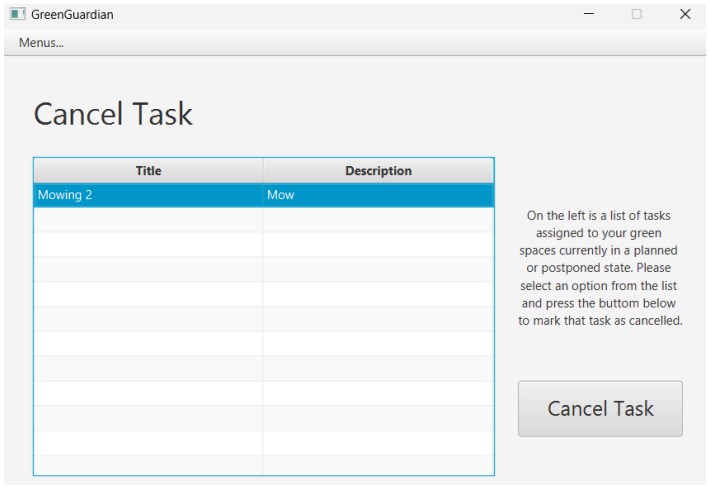

Figure 52 - Cancel Task

- **Step 3:** A message will appear informing that the Task was successfully canceled.

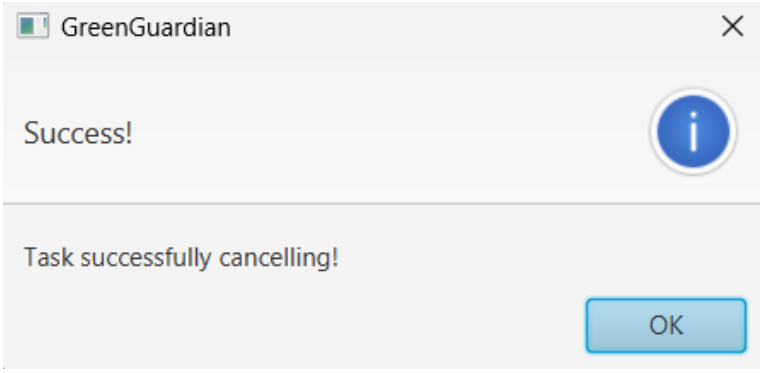

Figure 53 - Cancel Task success

4.2 User Features - Collaborator Main Menu

4.2.1 Do Login - Login UI

- **Step 1:** Enter the credentials. The UserId/Email must be in the following format "user@this.app". Then press "submit";

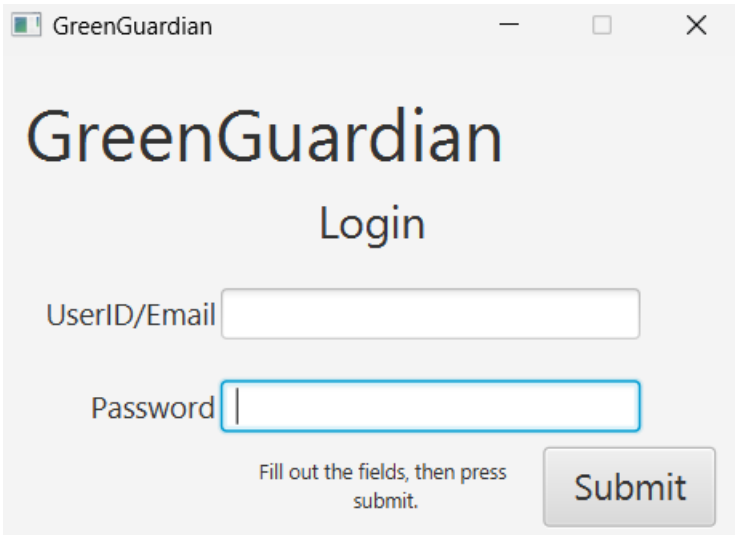

Figure 54 – Collaborator Login

- **Step 2:** After the admin logs in, the following page will open with the options menu in the top bar.

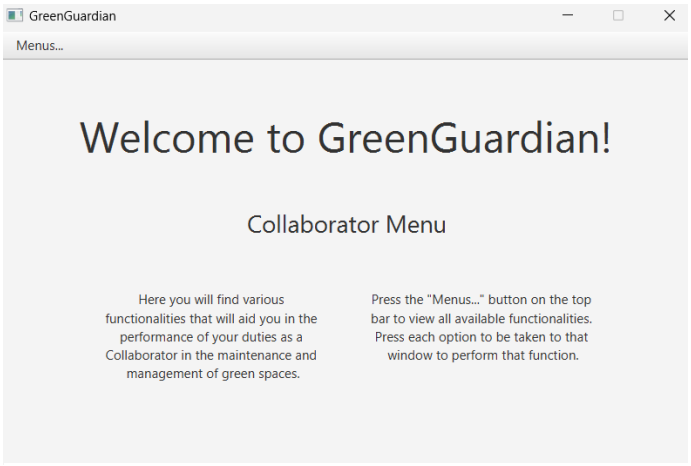

Figure 55 - Collaborator Menu

4.2.2 List tasks between dates

- **Step 1:** Access the menu and select “List Tasks Between Dates”;

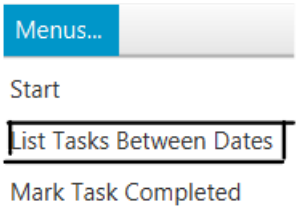

Figure 56 – Menu (List tasks between dates)

- **Step 2:** Choose two dates and press the “Get Task List” button to see the tasks assigned to you between those dates.

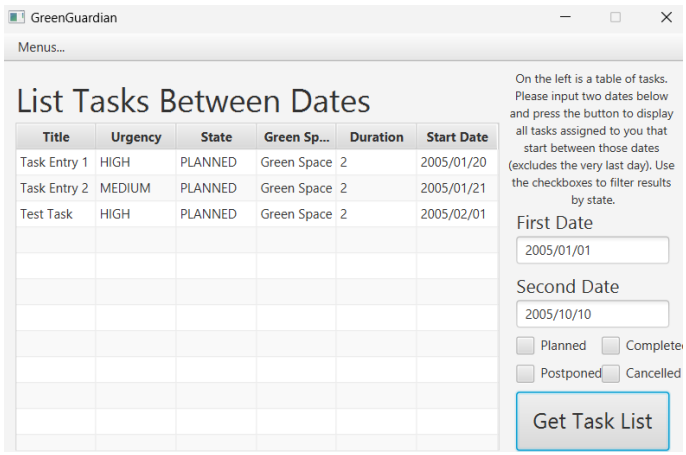

Figure 57 - List tasks between dates

4.2.3 Mark task completed

- **Step 1:** Access the menu and select “Mark task completed”.

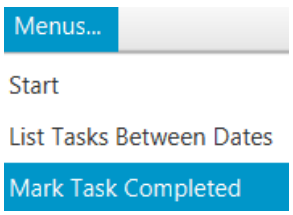

Figure 58 – Menu (Mark Task)

- **Step 2:** Choose a task and press the “Complete Task” button to change the status of the task to completed;

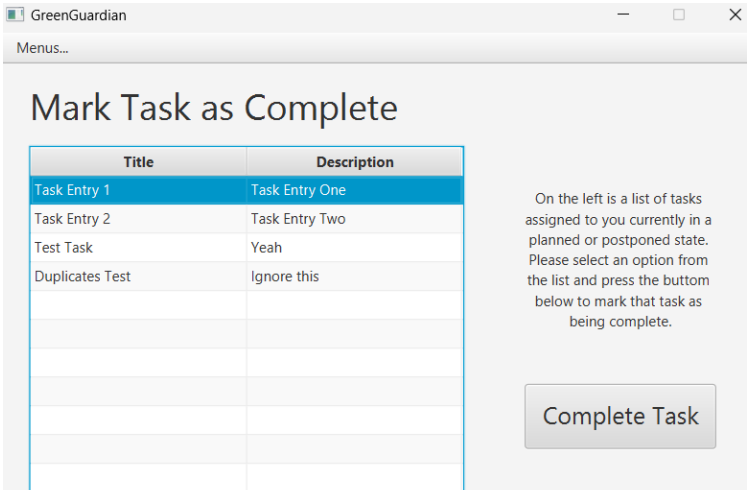

Figure 59 – Mark task as complete

- **Step 3:** A message will appear informing that the Task was successfully completed.

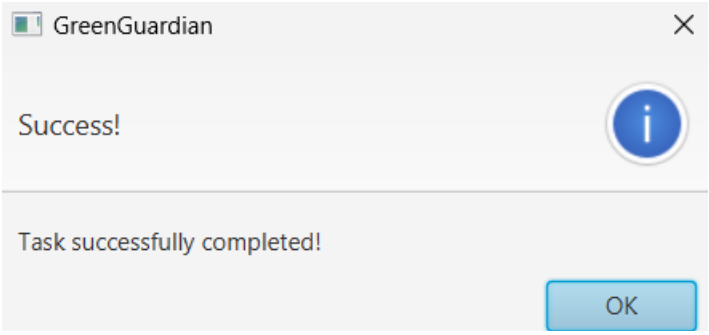

Figure 60 – complete task success

4.3 Park Statistics

To run a cell, select the cell and press "*Ctrl + Enter*", or hit the "run cell" button on the chosen Jupyter file reader application.

4.3.1 Water Consumption Costs

- **Step 1:** Select the first Python cell and run it to import all the necessary libraries.
- **Step 2:** Run the second cell and input the requested data:
    - Year, Start Month, End Month and Singular Park Name: to create a bar plot of the park's monthly water consumption, from the start month to the end month of the specified year.
    - Number of Parks and its respective names: to calculate each park average monthly water consumption.

The output will also show the analysis of daily water used by the two parks with less and most consumption per one day:

- Mean, median, standard deviation and coefficient of skewness.
- Relative and absolute relative table.
- Outliers' verification.
- Data represented in histograms.

```
------------------ PARKS TO ANALYZE AVERAGE MONHTLY WATER CONSUMPTION ------------------
Cidade average monthly water cost: 998.73€


ArcaAgua Analysis (Has lowest consumption)

Mean: 8.99599282623465
Median: 6.7718554315
Standard Deviation: 4.852369347899769
Coefficient of skewness: 2.1656
  Consumption Range  Absolute Frequency  Relative Frequency
0           0-9.84                 315            0.690789
1        9.84-19.68                 137            0.300439
2       19.68-29.52                   2            0.004386
3       29.52-39.36                   1            0.002193
4       39.36-49.22                   1            0.002193
Interquartile range: 6.323549615000001
Outliers:
[30.6, 49.2, 17.2, 17.0, 18.5, 17.2, 17.0, 17.6, 17.0, 17.7, 18.5, 18.1, 17.2, 18.1, 17.6
```

Figure 61 - Water Consumption Costs text output

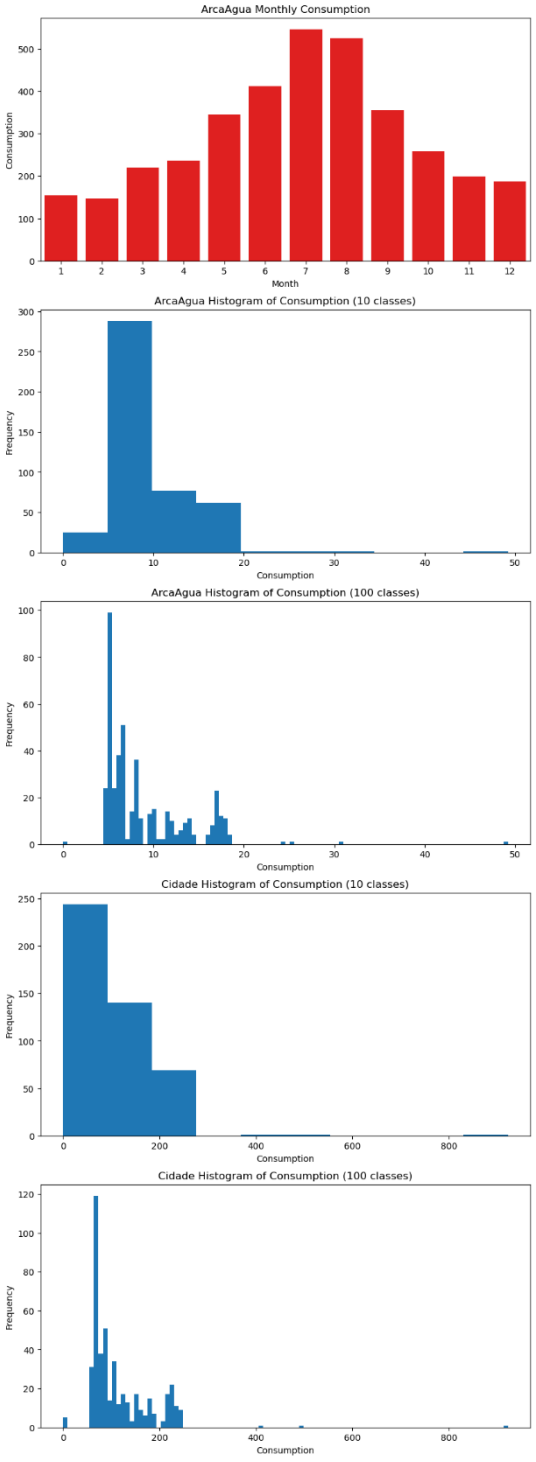

Figure 62 - Water Consumption Costs graphics output

4.3.2 View Equipment Usage Percentage

- **Step 1:** Select the first Python cell and run it to import all the necessary libraries (if this step was already done, it's not necessary to do it again).
- **Step 2:** Run the third Python cell and wait for the pie chart in the output.

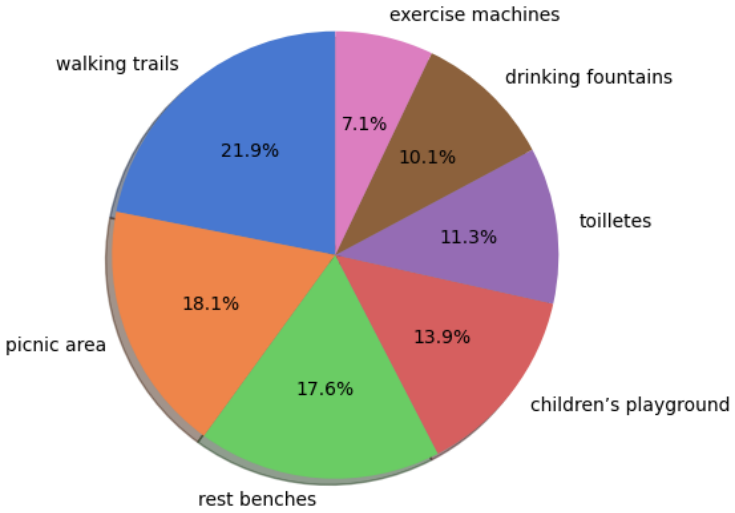

Figure 63 - Equipment Usage Pie Chart

4.3.3 View Park User Information

- **Step 1:** Select the first Python cell and run it to import all the necessary libraries (if this step was already done, it's not necessary to do it again).
- **Step 2:** Run the fourth Python cell and wait for the pie chart and the box plot in the output.

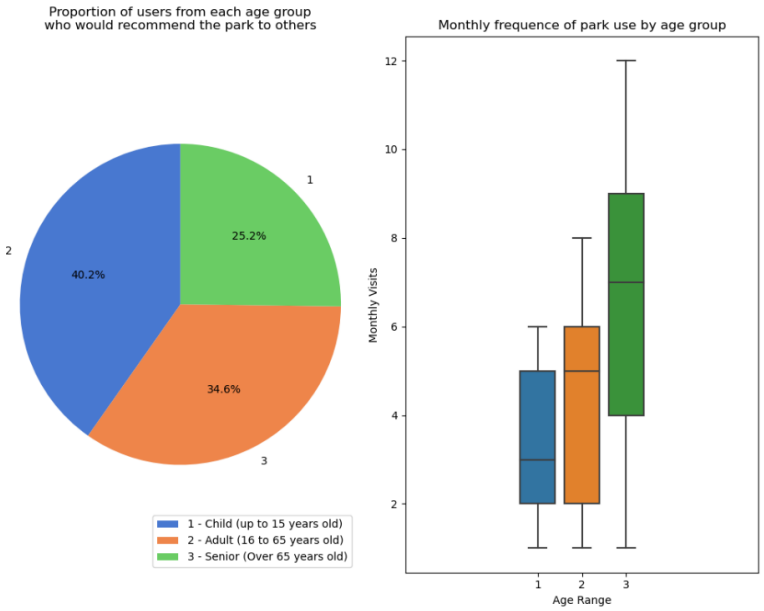

Figure 64 - Park User Information Pie Chart and Box Plot

4.3.4 New Park Average Monthly Cost Prediction

- **Step 1:** Select the first Python cell and run it to import all the necessary libraries (if this step was already done, it's not necessary to do it again).
- **Step 2:** Run the fifth Python cell and wait for the output.

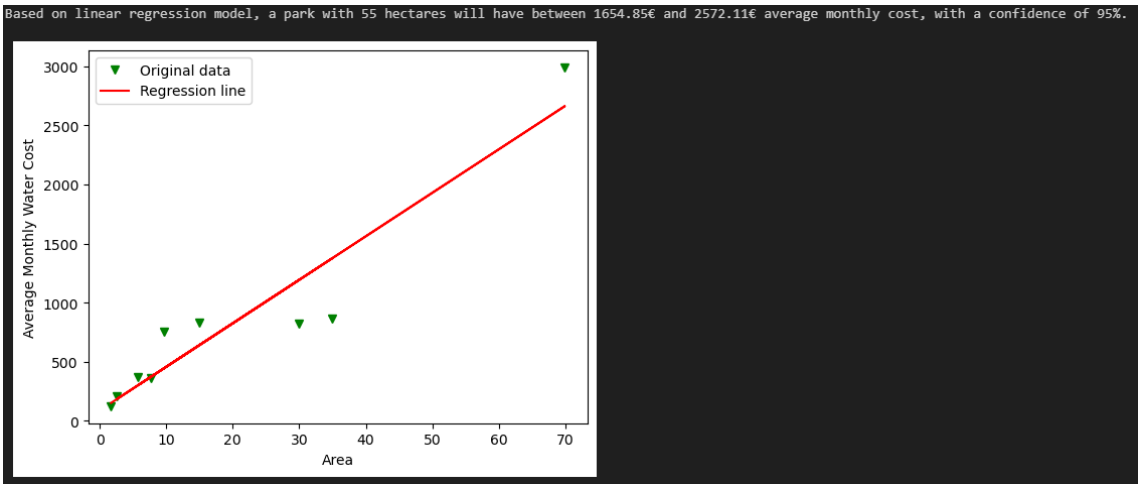

Figure 65 - New Park Average Monthly Cost Output

4.3.5 Apply Polynomial Regression to US014 Data

- **Step 1:** Select the first Python cell and run it to import all the necessary libraries (if this step was already done, it's not necessary to do it again).
- **Step 2:** Run the sixth Python cell and wait for the output.

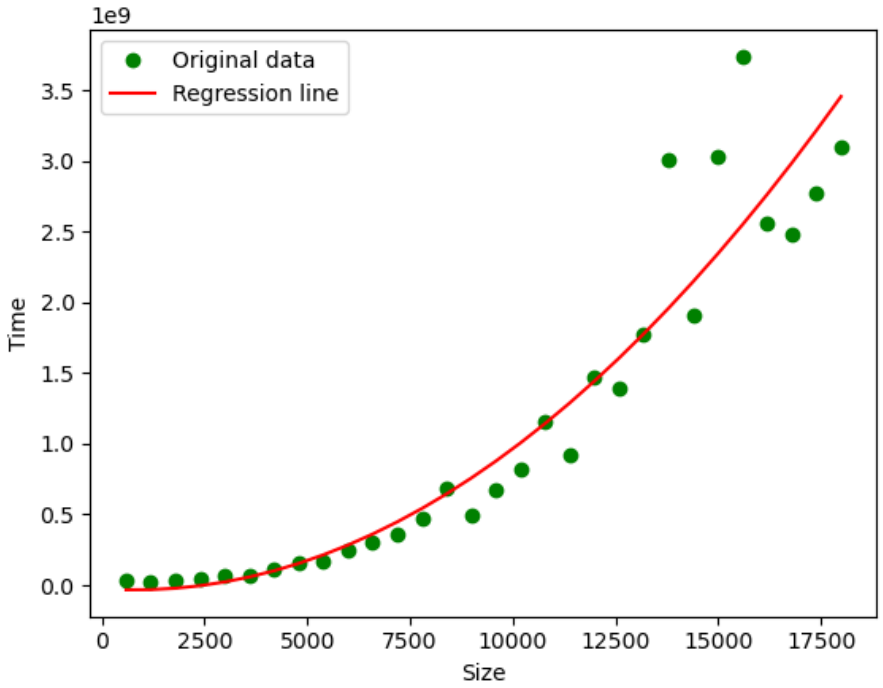

Figure 66 - US014 Data Polynomial Regression Graph

4.4 Irrigation and Emergency Planning

On the separate program dedicated to these functionalities you will find access to the various irrigation system and evacuation route planning tools. Here is a guide on how to use them:

4.4.1 Create an Irrigation System from a Planning File

- **Step 1:** Run the program and select the "Sprint B Mode" option.

```
1- Sprint B mode
2- US17 mode
3- US18 mode

Enter your selection:
1
```

Figure 67 - Planning tools start menu

- **Step 2:** Select option 1 to input a planning file.

```
--- IRRIGATION SYSTEM MENU ---

1 - Import irrigation system planning file
2 - Generate irrigation system map
3 - Run execution time tests for the generation algorithm
(Execution time in nanoseconds, input length in edge amounts)
4 - Toggle milliseconds as the execution time metric on/off.
5 - Toggle file index as the input length metric on/off.
6 - Go back to the main menu

Input an option number to proceed.
1
```

Figure 68 - Irrigation System Planning Main Menu

- **Step 3:** Input a path to the planning file (only .csv format files are allowed)

```
Please input the path to the planning file (absolute or relative)
example.csv
```

Figure 69 - Planning file insertion example

- **Step 4:** Select option 2 to generate the irrigation system map.

```
--- IRRIGATION SYSTEM MENU ---

1 - Import irrigation system planning file
2 - Generate irrigation system map
3 - Run execution time tests for the generation algorithm
(Execution time in nanoseconds, input length in edge amounts)
4 - Toggle milliseconds as the execution time metric on/off.
5 - Toggle file index as the input length metric on/off.
6 - Go back to the main menu

Input an option number to proceed.
2
```

Figure 70 - Irrigation System Planning Main Menu for Map Generation

The desired output will then appear in the form of a .csv file for technical examination and a graph for visualization.

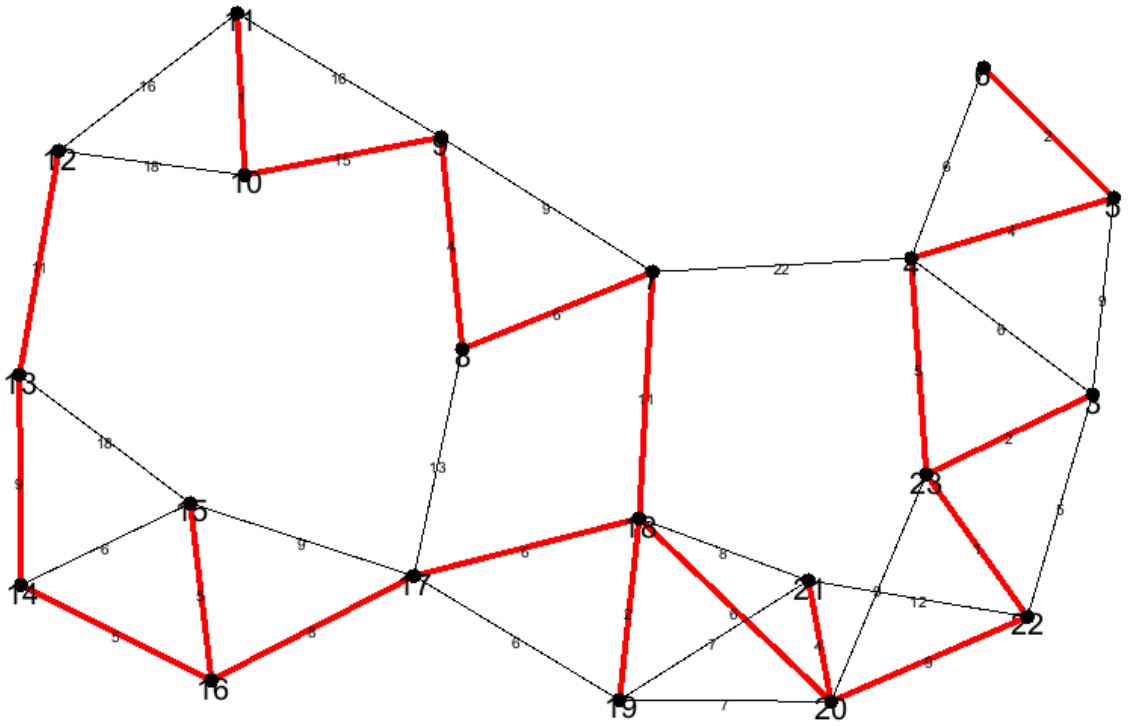

Figure 71 - Irrigation System Planning Graph Example

4.4.2 Test the Asymptotic Behaviour of Irrigation System Planning

- **Step 1:** Run the program and select “Sprint B mode”.

```
1- Sprint B mode
2- US17 mode
3- US18 mode

Enter your selection:
1
```

Figure 72 - Planning System Start Menu

- **Step 2:** Select option 3 to run execution time tests.

```
--- IRRIGATION SYSTEM MENU ---

1 - Import irrigation system planning file
2 - Generate irrigation system map
3 - Run execution time tests for the generation algorithm
(Execution time in nanoseconds, input length in edge amounts)
4 - Toggle milliseconds as the execution time metric on/off.
5 - Toggle file index as the input length metric on/off.
6 - Go back to the main menu

Input an option number to proceed.
3
```

Figure 73 - Irrigation System Main Menu for Exectuion Time Testing

- Step 3: Insert all requested data, according to the program’s instructions.

```
Please input the path (absolute or relative) to the directory with the test files.
(Do not include a final backslash on the file)
tests
Please input the test file prefix.
us14_
Please input the amount of files to be tested.
30
```

Figure 74 - Execution Time Testing Inputs

After a short while, the program will create a .csv file containing the input size of each iteration of the algorithm used for irrigation system planning, as well as a graph for the visualization of this data.

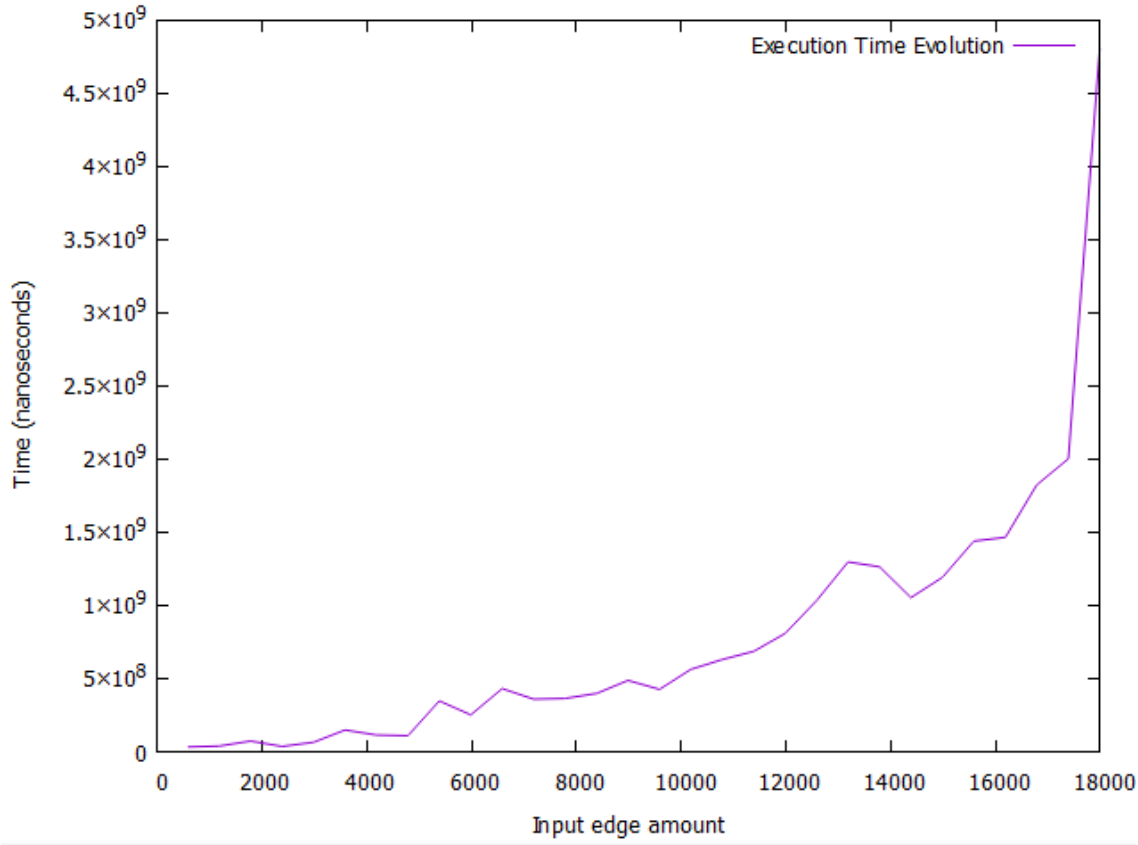

Figure 75 - Execution Time Planning Graph Example

4.4.3 Find Shortest Evacuation Route to Assembly Point

- **Step 1:** Run the program and select "US17 mode".

```
1- Sprint B mode
2- US17 mode
3- US18 mode

Enter your selection:
2
```

Figure 76 - Planning Tools Start Menu

- **Step 2:** Fill out all inputs as requested.

```
Please input the path to the edge planning file (absolute or relative)
us17_matrix.csv

Please input the path to the vertice planning file (absolute or relative)
us17_points_names.csv
```

Figure 77 - Shortest Routes to Assembly Point Inputs

After some time, the program will create a .csv file containing information about these files, as well as a graph for the visualization of such.

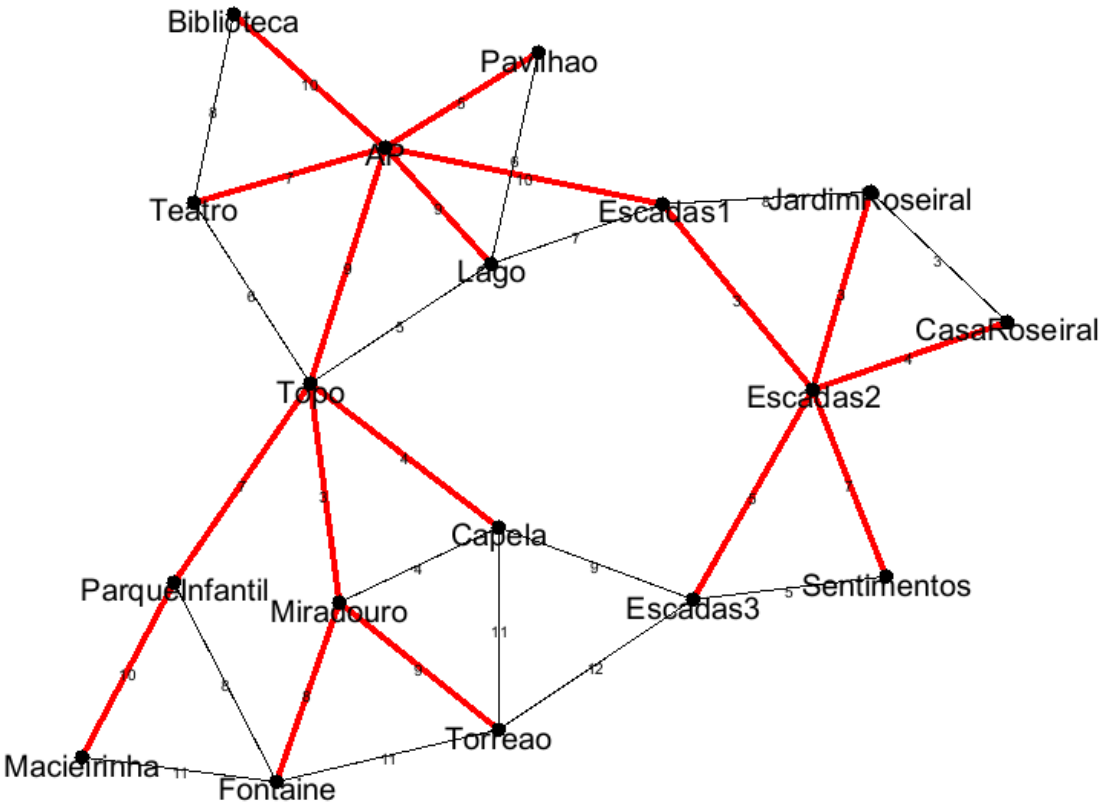

Figure 78 - Shortest Routes to AP Graph Example

4.4.4 Find Shortest Evacutation Route to Any Assembly Point

- **Step 1:** Run the program and select “US18 mode”.

```
1- Sprint B mode
2- US17 mode
3- US18 mode

Enter your selection:
3
```

Figure 79 - Planning Tools Start Menu

- **Step 2:** Fill out all inputs as requested.

```
Please input the path to the edge planning file (absolute or relative)
us18_matrix.csv

Please input the path to the vertice planning file (absolute or relative)
us18_points_names.csv
```

Figure 80 - Find Shortest Routes to Any AP Inputs

After some time the program will create a .csv file containing information about these paths. However, no visualizing graph is created this time: Instead, only the .csv file is made. Below is an incomplete example of one such output.

```
(0,7,AP1);9
(1,3,5,AP5);8
(2,3,5,AP5);10
(3,5,AP5);5
(AP5,AP5);0
(5,AP5);3
(6,5,AP5);5
(7,AP1);6
(8,9,AP4);4
(9,AP4);2
(AP4,AP4);0
(11,AP4);2
(12,11,AP4);3
(13,12,11,AP4);4
(14,9,AP4);5
(15,AP1);5
```

Figure 81 - Find Shortest Routes to Any AP Output Example

5. Troubleshooting

5.1 Error message “Invalid skill” when trying to select a skill

Possible cause: Register a skill with an invalid character.

Solution: Register a skill without special characters (@, #, *,...) and digits (1,2,3,...).

5.2 Error message “Invalid Job” when trying to select a job

Possible cause: Register a job with an invalid character.

Solution: Register a job without special characters (@, #, *, ...) and digits (1,2, 3,...).

5.3 Error message “Invalid birthdate” when trying to register a Collaborator

Possible cause: Setting birthdate in the wrong format.

Solution: Verify the accuracy of the birthdate and try again using the correct format (YYYY/MM/DD).

5.4 Error message “Invalid Assignment” when the Collaborator has already the selected Skill

Possible cause: The Collaborator that you selected already has the skill that you are trying to assign.

Solution: Try to choose a different skill to that Collaborator or assign that initial skill to another Collaborator.

5.5 Error message “Failed to generate Team proposal”

Possible cause: Team must contain, at least, one Collaborator and one Skill.

Solution: The next team proposal should have at least one Collaborator and one Skill.

5.6 Error message “Invalid plate format” when trying to register a Vehicle

Possible cause: Set the plate in the wrong format.

Solution: Verify the plate and try again using the correct format (NN-NN-LL, two numbers, two numbers and two uppercase letters).

5.7 Error message "Date must not be in the future." when trying to register a vehicle check-up.

Possible cause: The check-up date must be in the past; the program won't accept future dates.

Solution: Make sure that the date you entered doesn't come after the future date.

5.8 Error message "No vehicle needing check-up" when showing the list of vehicles needing check-up

Possible cause: No vehicle registered needs check-up.

Solution: Make sure that the vehicle is previously registered.

5.9 Error message "Area value must be a number greater than 0" when registering a green space

Possible cause: The value entered for the area is less than or equal to 0.

Solution: The area value inserted must be a number greater than 0.

5.10 To-Do entry doesn't appear

Possible cause: If the To-Do entry doesn't appear it shows that isn't registered yet.

Solution: Add a Task Entry to the To-Do List

5.11 Ensure that the same task entry can't be added twice in to the agenda

Possible cause: Trying to add the same Task Entry twice to the agenda.

Solution: Add a different Task Entry to those already in the agenda

5.12 Error message "No teams. Team assignment aborted." when assigning a Team to an Entry in the Agenda

Possible cause: There is no Team registered in the system.

Solution: Register a Team in the system

5.13 Error message "Postponed date can't be before current date" when postponing an entry in the agenda

Possible cause: The date that you chose to Postpone an Entry is before the current date

Solution: Make sure that the date you will choose to Postpone an Entry must be in the future

5.14 Error message “No tasks in the agenda for a green space managed by you” when trying to Cancel an Entry

Possible cause: There is no Tasks in the agenda.

Solution: Make sure that exist Tasks in the agenda to change the state of the Task to Cancel.

5.15 Error message “No Vehicles. Vehicle assignment aborted.” When assigning a vehicle to an Entry

Possible cause: There is no Vehicle registered in the system.

Solution: Register a Vehicle in the system.

5.16 Green spaces don’t appear when listing green spaces

Possible cause: When listing all green spaces, the system only shows the ones associated with the current green space manager (GSM) logged in.

Solution: Make sure that the green spaces that you pretend to list are associated to the green space manager current logged in.

5.17 Error message “ Null fields not allowed” when completing a Task

Possible cause: The Task cannot have its parameters set to null.

Solution: Fill in the Tasks parameters with the correct values.

6. Frequently Asked Questions

6.1 Can I use the GreenGuardian app in on my mobile phone?

Answer: No, mobile phone app is not available yet.

6.2 What does the error message "Error: Invalid option." mean?

Answer: The error message "Error: Invalid option." means that you have selected an option that is not available in the current context.

6.3 What are the key features of the software system?

Answer: The software system's key features encompass employee management, vehicle management, user roles and permissions, park resource management, statistical analysis, irrigation system management, data analysis, and emergency planning.

6.4 How does the software system handle errors and exceptions?

Answer: The software system handles errors and exceptions by displaying appropriate error messages and providing options to resolve them.

6.5 What are the security measures implemented in the software system?

Answer: The security measures implemented in the software system include user authentication and data encryption.

6.6 What are the performance indicators of the software system?

Answer: The performance indicators of the software system include the speed of task completion, the efficiency of resource utilization, and the responsiveness of the user interface.