



Micro Project Report

on

Carbon Footprint Tracker

Skill-Based Lab - IV (Object-Oriented Programming with Java)

by

Name of the Student	Class	Roll No.
PRIYESH SHAH	SYCM3	66
YASH SHINDE	SYCM3	67
HARSHAL VAGHELA	SYCM3	69

Under the guidance of

PRIYANKA GHULE MA'AM



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3. Problem Definition :

One of the most urgent challenges facing humanity today is the growing impact of climate change, which is largely driven by greenhouse gas emissions. A significant portion of these emissions comes from everyday human activities such as commuting, electricity usage, and dietary choices. The combined output of these actions is often referred to as an individual's *carbon footprint*.

At present, most people do not actively monitor their personal emissions because available tools are either too complex, lack user-friendliness, or do not provide immediate feedback. While it is possible to estimate one's footprint manually, this process is inconvenient, prone to mistakes, and offers little guidance for improvement.

The Carbon Footprint Tracker project was developed to address this problem by:

- Offering a digital platform that computes a user's footprint from key lifestyle inputs (transportation habits, power consumption, and food preferences).
- Storing all results securely in a database, making them accessible for long-term tracking and future analysis.
- Providing suggestions and awareness tips that encourage users to make sustainable lifestyle choices.

In short, this project fills the gap by creating a simple, reliable, and educational tool that empowers individuals to understand their contribution to carbon emissions and take meaningful steps toward sustainability.



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4. Scope of Project :

The boundaries of the Carbon Footprint Tracker project were set with careful consideration of time limits, available resources, and the programming expertise in Java. The aim was to create a practical yet achievable application that demonstrates real-world relevance without overextending into overly advanced areas.

User Interface (Frontend):

The application employs Java Swing to provide a straightforward, interactive interface. Screens such as login, data entry, and results are designed to be simple and intuitive, ensuring smooth navigation for users with little technical background.

Core Logic (Backend):

Behind the interface, modular Java classes and methods handle the actual calculations. Input validation routines are built in, so the system checks whether values are numeric, fields are filled, and ranges are valid before running calculations. This improves reliability and prevents user mistakes from breaking the program.

Data Management (Database):

The program connects to a MySQL database through JDBC. Each session's details—covering transport choices, electricity usage, dietary data, and the computed footprint—are stored securely. This persistent storage allows for retrieval and potential long-term analysis.

Excluded Features (Out of Scope):

To keep the project focused, advanced functionalities such as multi-user authentication, graphical comparisons between users, online/cloud integration, and payment-based services were deliberately excluded. While these could be valuable additions in the future, they are not part of the present version.

In summary, the project emphasizes the full cycle of a user interaction: **login** → **data entry** → **footprint calculation** → **database storage** → **result presentation**.



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5. Features Implemented :

The Carbon Footprint Tracker integrates several functional and user-oriented features, designed to ensure both accuracy and ease of use:

Login Module:

- The application begins with a login screen where users enter their name.
- This ensures that each record in the system is linked to a specific user profile.

Data Entry Form:

- Users can input details about their monthly activities, including:
 - Mode of transport and distance traveled.
 - Household electricity consumption in kilowatt-hours (kWh).
 - Frequency of meat-based meals per month.
- Built-in checks prevent invalid or missing entries, reducing the likelihood of errors.

Calculation Mechanism:

- Using predefined emission factors, the system computes the user's monthly carbon footprint.
- The result is expressed in kilograms of CO₂, making it straightforward and understandable.

Database Storage:

- The application connects to a MySQL database through JDBC.
- Each entry, along with its calculated emission value, is stored in a dedicated table called **footprints**.
- This ensures that user data is saved permanently and can be retrieved later.

Result Display and Guidance:

- After calculation, the system presents the user with their total footprint.
- Alongside the numeric result, the application provides actionable tips such as:
 - Using greener modes of transport.



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- Conserving electricity.
- Opting for plant-based meals more often.

Confirmation Feedback:

- Once the data is saved successfully, the user receives an instant confirmation message.
- This feedback reinforces reliability and improves the user experience.

Collectively, these features make the application both a **functional calculator of emissions** and a **practical guide for promoting sustainable living**.

6. Implementation (Complete Source Code) :

```
135 private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {
136
137     String username = jTextField1.getText().trim();
138     String password = new String(jPasswordField1.getPassword()).trim();
139
140     if(username.isEmpty() || password.isEmpty()) {
141         JOptionPane.showMessageDialog(this, "Please enter username and password!");
142         return;
143     }
144
145     try {
146         // Load driver
147         Class.forName("com.mysql.cj.jdbc.Driver");
148
149         // Connect to database carbon_tracker
150         Connection con = DriverManager.getConnection(
151             "jdbc:mysql://localhost:3306/carbon_tracker?useSSL=false&serverTimezone=UTC",
152             "root", "" // change password if needed
153         );
154
155         // Check if user exists in login table
156         String sql = "SELECT * FROM login WHERE username=? AND password=?";
157         PreparedStatement pst = con.prepareStatement(sql);
158         pst.setString(1, username);
159         pst.setString(2, password);
160
161         ResultSet rs = pst.executeQuery();
162
163         if(rs.next()) {
164             // User already exists → Login success
165             JOptionPane.showMessageDialog(this, "Login Successful!");
166
167             // Open Carbon Tracker JFrame
168             NewJFrame tracker = new NewJFrame();
169             tracker.setVisible(true);
170
171             // Close login window
172             this.dispose();
173         } else {
174             // No user found → Save new user inside 'login'
175             String insertSql = "INSERT INTO login(username, password) VALUES(?, ?)";
176             PreparedStatement insertPst = con.prepareStatement(insertSql);
177             insertPst.setString(1, username);
178             insertPst.setString(2, password);
179             insertPst.executeUpdate();
180
181             JOptionPane.showMessageDialog(this, "New user registered in 'login' table and logged in!");
182         }
183     } catch (Exception ex) {
184         JOptionPane.showMessageDialog(this, "Error: " + ex.getMessage());
185     }
186 }
```

Activate Windows
Go to Settings to activate



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```
private void jButton1ActionPerformed(java.awt.event.ActionEvent evt) {  
  
    String username = jTextField2.getText().trim();  
    String transport = jComboBox1.getSelectedItem().toString();  
    String distanceStr = jTextField2.getText().trim();  
    String electricityStr = jTextField3.getText().trim();  
    String mealsStr = jTextField4.getText().trim();  
  
    // Validation  
    if(username.isEmpty() || distanceStr.isEmpty() || electricityStr.isEmpty() || mealsStr.isEmpty()){  
        JOptionPane.showMessageDialog(this, "Please fill all fields!");  
        return;  
    }  
  
    try {  
        double distance = Double.parseDouble(distanceStr);  
        double electricity = Double.parseDouble(electricityStr);  
        int meals = Integer.parseInt(mealsStr);  
  
        // Calculation  
        double footprint = 0;  
  
        // Transport emissions  
        if(transport.equals("Car")) {  
            footprint += distance * 0.21;  
        } else if(transport.equals("Bus")) {  
            footprint += distance * 0.10;  
        } else if(transport.equals("Bike") || transport.equals("Walk")) {  
            footprint += 0;  
        }  
  
        // Electricity  
        footprint += electricity * 0.82;  
  
        // Food  
        footprint += meals * 5;  
  
        // Show result in label  
        resultLabel.setText("Your footprint is: " + footprint + " kg CO2/month");  
  
        // =====  
        // SAVE TO DATABASE  
        // =====  
        try {  
            Class.forName("com.mysql.cj.jdbc.Driver");  
            Connection con = DriverManager.getConnection(  
                "jdbc:mysql://localhost:3306/carbon_tracker","root","" // use your DB username & password  
            );  
  
            String sql = "INSERT INTO footprints(username, transport, distance, electricity, meals, footprint) VALUES (?, ?, ?, ?, ?, ?)";  
            PreparedStatement pst = con.prepareStatement(sql);  
  
            pst.setString(1, username);  
            pst.setString(2, transport);  
            pst.setDouble(3, distance);  
            pst.setDouble(4, electricity);  
            pst.setInt(5, meals);  
            pst.setDouble(6, footprint);  
  
            pst.executeUpdate();  
            JOptionPane.showMessageDialog(this, "Data saved successfully!");  
  
            con.close();  
        } catch (Exception ex) {  
            JOptionPane.showMessageDialog(this, "Database Error: " + ex.getMessage());  
        }  
  
    } catch (NumberFormatException e) {  
        JOptionPane.showMessageDialog(this, "Please enter valid numbers!");  
    }  
}
```



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7. Database(Screenshot of database) :

				id	username	transport	distance	electricity	meals	footprint
<input type="checkbox"/>				1	1	BUS	1	2	23	116.64
<input type="checkbox"/>				2	22	CAR	22	3	14	72.46
<input type="checkbox"/>				3	1	CAR	1	2	123	616.64
<input type="checkbox"/>				4	1	CAR	1	2	123	616.64
<input type="checkbox"/>				5	1	CAR	1	2	123	616.64
<input type="checkbox"/>				6	1	CAR	1	2	12	61.64
<input type="checkbox"/>				7	1	TRAIN	1	2	40	201.64
<input type="checkbox"/>				8	1	BUS	1	2	40	201.64
<input type="checkbox"/>				9	1	BUS	1	2	40	201.64
<input type="checkbox"/>				10	1	TRAIN	1	2	40	201.64
<input type="checkbox"/>				11	1	WALK	1	2	40	201.64
<input type="checkbox"/>				12	1	WALK	1	2	4	21.64
<input type="checkbox"/>				13	1	WALK	1	2	40	201.64
<input type="checkbox"/>				14	1	CAR	1	2	41	206.64
<input type="checkbox"/>				15	1	CAR	1	2	41	206.64
<input type="checkbox"/>				16	2	MOTORCYCLE	2	2	34	171.64
<input type="checkbox"/>				17	1	CAR	1	3	2	12.46
<input type="checkbox"/>				18	1	CAR	1	2	23	116.64
<input type="checkbox"/>				19	2	CAR	2	2	23	116.64
<input type="checkbox"/>				20	2	CAR	2	2	23	116.64

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
<input type="checkbox"/>	1 id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
<input type="checkbox"/>	2 username	varchar(50)	utf8_general_ci		No	None			Change Drop More
<input type="checkbox"/>	3 transport	varchar(20)	utf8_general_ci		Yes	NULL			Change Drop More
<input type="checkbox"/>	4 distance_km	float			No	None			Change Drop More
<input type="checkbox"/>	5 electricity_kwh	float			No	None			Change Drop More
<input type="checkbox"/>	6 meat_meals	int(11)			No	None			Change Drop More
<input type="checkbox"/>	7 footprint	float			No	None			Change Drop More



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8. Results (Snapshots of All Output Screens) :

LOGIN

USERNAME:

PASSWORD:

CARBON FOOTPRINT TRACKER

USERNAME:

TRANSPORT:

DISTANCE(KM):

ELECTRICITY(KWH):

NO OF MEALS(throughout the day):

Message
Data saved successfully!

CALCULATED FOOTPRINT:- Your footprint is: 116.64 kg CO₂/month



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FOOTPRINT REVIEW

USERNAME:

CALCULATED FOOTPRINT:- RESULT

- ▢ Your Carbon Footprint Review
- ▢ Recommendations to Reduce Your Footprint:
 1. Transport:
 - If you mostly use a Car, consider carpooling, using public transport, or switching to biking/walking for short distances.
 - If you already use Bus, Bike, or Walk, great job! 🌱🌱
 2. Electricity:
 - Reduce unnecessary electricity usage.
 - Switch off appliances when not in use.
 - Try energy-efficient devices (like LED bulbs, star-rated appliances).
 3. Food:
 - Eating more plant-based meals lowers carbon impact.
 - Avoid food waste wherever possible.
 4. Lifestyle:
 - Plant trees or participate in green initiatives.
 - Track your progress every month and aim to improve gradually.
- ▢ Every small step counts towards a cleaner, greener planet!

9. Conclusion:

The Carbon Footprint Tracker demonstrates how software development can be applied to address urgent global issues such as climate change. By combining a simple interface with accurate computational logic and reliable database storage, the application proves that technology can support individuals in making informed and sustainable choices.

The use of Swing made the interface engaging and user-friendly, while object-oriented programming ensured modularity and clarity in the underlying logic. JDBC and MySQL integration provided permanent data storage, enabling continuity and future expansion of the application.

Beyond technical learning, the project carried a strong social message—highlighting the importance of personal responsibility in reducing environmental impact. It not only strengthened skills in Java programming, database connectivity, and GUI design but also reinforced awareness of sustainable living.



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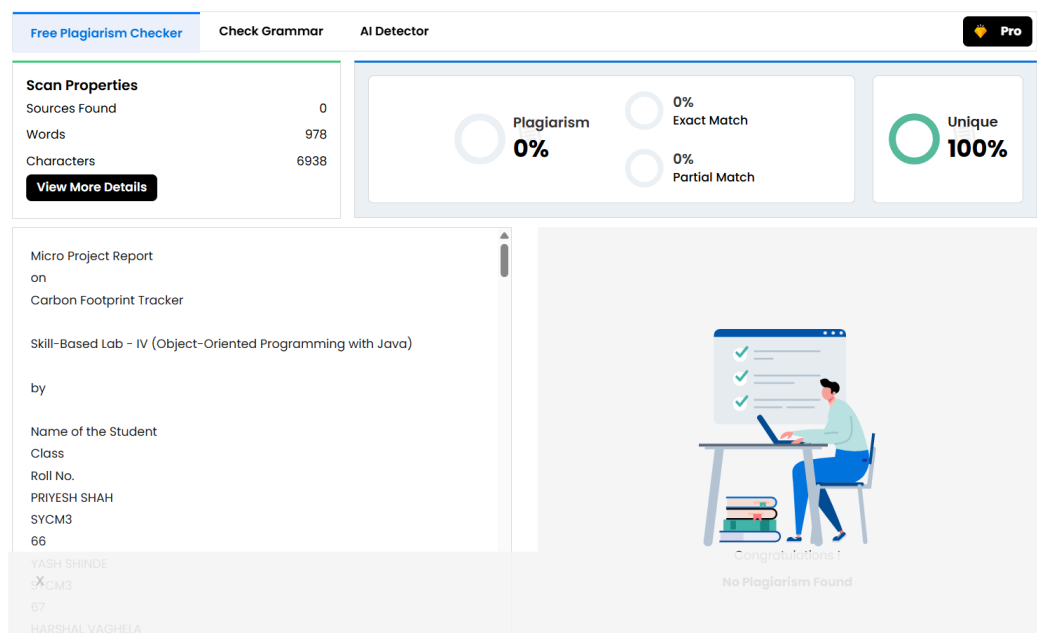
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Looking ahead, the project can be extended to include:

- Cloud-based storage for remote access.
- Graphical tools for visualizing trends and comparisons.
- A community module that allows users to compare results and collaborate toward emission reduction.

Ultimately, this project serves as both a technical achievement and a step toward environmental awareness, showing how software solutions can inspire positive real-world change.

10. Plagiarism Report :



11. References :

- Oracle Java Documentation (Swing, JDBC).
- MySQL Documentation (phpMyAdmin, XAMPP).
- Research articles and official databases on CO₂ emission factors for transport, electricity, and diet.



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