

[Climate Change Monitoring and Analysis]

Project submitted to the
SRM University – AP, Andhra Pradesh
for the partial fulfillment of the requirements to award the degree of
Bachelor of Technology/Master of Technology

In

**Computer Science and Engineering
School of Engineering and Sciences**

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[May,2024]

Certificate

Date: 02-05-2024

This is to certify that the work present in this Project entitled “**Climate Change Monitoring and Analysis**” has been carried out by [**Ameer roshan,Yuvaraja Simha Reddy,Abhiram Maddukuri,Harsha Vardhan**] under my/our supervision. The work is genuine, original, and suitable for submission to the SRM University – AP for the award of Bachelor of Technology/Master of Technology in **School of Engineering and Sciences**.

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Acknowledgements

The satisfaction that accompanies the successful completion of any task would be incomplete without introducing the people who made it possible and whose constant guidance and encouragement crowns all efforts with success.

I am extremely grateful and express my profound gratitude and indebtedness to my project guide, Mr Hema Kumar Yarnagula, Department of Computer Science & Engineering, SRM University, Andhra Pradesh, for her kind help and for giving me the necessary guidance and valuable suggestions in completing this project work.

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SOFTWARE REQUIREMENTS SPECIFICATION FOR

Climate Change Monitoring and Analysis

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1. Introduction

The Software **CCMA 1.0™** is to be developed to create a solution that leverages data analytics and visualization tools to monitor and analyze climate change data, helping researchers and policymakers make informed decisions. Apart from key statistics of climate change, we also provide basic weather reports for general users with a user-friendly interface that enables them to access their weather forecast and other essential information.

1.1 Purpose

This SRS defines External Interface, Performance and Software System Attributes requirements of **CCMA 1.0™**. This document is intended for the following group of people:-

- ✓ Researchers and policymakers, offering valuable insights into weather conditions for informed decision-making.
- ✓ Developers, aiding in software maintenance and future releases.
- ✓ Documentation writers, contributing to the creation of user manuals.
- ✓ Testers, ensuring the functionality and reliability of the Weather Forecast System

1.2 Scope

This document applies to **CCMA 1.0™** (Climate Change Monitoring and Analysis) . This software focuses on two groups of users. One group consists of policy makers and researchers. The other group consists of the general public. The motto of the software is to provide necessary data to both sets of groups. For policy makers and researchers we provide them with key essential data regarding climate change like graphs, charts and other analytics which help them in research and policy making decisions. Whereas for the general public we provide them with a basic weather report which comprises attributes such as temperature, precipitation, humidity, etc which helps them to plan their daily schedule.

The software takes as input the login Id of the user for login purposes. The outputs then comprise an interactive display that lets the user view data regarding climate change and weather forecast.

1.3 Definitions, Acronyms, and Abbreviations.

CO2e	Carbon Dioxide Equivalent - A metric used to compare the impact of various greenhouse gases by expressing their warming potential in terms of the amount of CO2 that would have the same global warming potential over a specified time period.
CCMA	CCMA (Climate change Monitoring and analysis) is to be developed to create a solution that leverages data analytics and visualization tools to monitor and analyze climate change data, helping researchers and policymakers make informed decisions.
IPCC	Intergovernmental Panel on Climate Change - A scientific body established by the United Nations to assess and report on the scientific understanding of climate change

UNFCCC	United Nations Framework Convention on Climate Change - An international treaty aimed at addressing climate change and its impacts through negotiations and agreements among member countries.
NOAA	National Oceanic and Atmospheric Administration - A U.S. government agency that provides data and research on climate, weather, oceans, and atmospheric conditions.

1.4 References

The references for the above software are as follows:-

- i. www.google.co.in
- ii. www.openweathermap.org
- iii. www.data.nasa.gov
- iv. IEEE. Software Requirements Specification Std. 830-1993.

1.5 Overview

Section 1.0 discusses the purpose and scope of the software.

Section 2.0 describes the overall functionalities and constraints of the software and user characteristics.

Section 3.0 details all the requirements needed to design the software.

2. The Overall Description

2.1 Product Perspective

- ✓ The Climate Change Analysis System is a comprehensive software solution comprising multiple interrelated components.
- ✓ This software empowers users to remotely access and analyze climate data without requiring manual intervention. It serves as a centralized platform for monitoring and understanding various aspects of climate change.
- ✓ In addition to providing access to climate data, the system facilitates various functions beyond basic monitoring. Users can perform tasks such as analyzing carbon emissions, assessing temperature trends, and evaluating the impact of climate change on specific regions.
- ✓ The Climate Change Analysis System establishes communication with diverse environmental monitoring stations, satellites, and data repositories, creating a networked infrastructure for seamless data exchange.

2.2 Product Functions

The major functions that **CSMA 1.0™** performs are described as follows:-

- ✓ **Login:** Registered users can log in securely using their credentials. And Implement additional security features, such as two-factor authentication, to enhance user account protection.
- ✓ **Real-time Weather Overview:** Upon login, users are greeted with a comprehensive real-time weather overview, including temperature, humidity, wind speed, and atmospheric conditions for their default location.
- ✓ **Climate Data Exploration:** Users can explore various climate parameters such as temperature, precipitation, and atmospheric conditions. The website offers interactive visualizations to display real-time weather information, including perceptions, thunder, and other relevant data.
- ✓ **Location-Based Analysis:** The website allows users to input or select a location for detailed climate analysis. It provides localized data, helping users understand the climate conditions in specific regions.
- ✓ **Weather Alerts:** Users can set personalized weather alerts based on specific criteria like temperature thresholds, precipitation levels, or severe weather warnings.
- ✓ **Climate Status Enquiry:** Users can check the current and historical climate status for a selected location, providing valuable insights for climate monitoring and analysis.

2.3 User Characteristics

There are different kinds of users that will be interacting with the system. The intended user of the software are as follows:-

- ✓ **User A:** Common People: Common users, representing the general public, are not required to go through a login process. The website aims to provide a user-friendly and direct entry into the webpage, recognizing that these users may have limited experience with climate monitoring tools. The interface is designed to be intuitive, featuring straightforward visuals and audio assistance. Interactive teaching mechanisms are embedded to guide common users through the exploration of weather data, making the website accessible and informative for individuals with varying levels of familiarity with climate analysis tools.
- ✓ **User B:** Researcher and Policy Maker: For users categorized as researchers and policy makers, a comprehensive login system is implemented. These individuals are presumed to have a deep understanding of climate monitoring tools. The website caters to their expertise by providing advanced functionalities and features. The login mechanism ensures secure access to sensitive climate data, meeting the requirements of a more controlled and specialized user group. Researchers and policy makers can utilize the platform to analyze intricate climate patterns, contributing to informed decision-making

2.4 Constraints

The major constraints that the project has are as follows:-

- ✓ **Real-Time Data Processing :** The website must handle real-time data processing to provide up-to-date information on climate conditions. Through API Delays in data retrieval and analysis could impact the accuracy of results.
- ✓ **User Access Limits:** To maintain server performance and prevent overloading, the website imposes constraints on the number of simultaneous users accessing and analyzing climate data.
- ✓ **Data Resolution:** The website is limited by the available resolution of climate data. Higher resolution datasets may require additional processing resources, influencing the website's efficiency.
- ✓ **Accessibility:** The website aims to be accessible to users with various levels of technical expertise and diverse needs. Constraints on accessibility may arise if the website design does not adequately cater to a wide range of users.

2.5 Assumptions and Dependencies

The requirements stated in the SRS could be affected by the following factors:

The successful implementation of the climate change monitoring and analysis website is contingent upon various assumptions and dependencies, which are crucial to acknowledge for the project's seamless operation:

· **Policy Changes and Updates:** The project is dependent on the timely incorporation of any changes in climate monitoring policies and regulations. As governmental or environmental policies evolve, the system must be updated promptly to align with the new standards. Failure to implement these changes in a timely manner could lead to inaccurate analysis and may impact the credibility of the website. Developers should be vigilant in adapting the system to the latest policies to ensure the website's relevance and reliability.

3. External Interface Requirements

3.1.1 User Interface Requirements

The interface provided to the user should be a very user-friendly one and it should provide optional content or information depending on type of user. Fundamental parameters of a weather report are provided to the general public, whereas major visuals tools and graphs are provided to the policymakers which help them to make informed decisions. The interface provided is a menu driven one and the following screens will be provided:-

1. A login/signup screen is provided in the beginning for entering the required credentials.
2. A signup screen comprises all fundamental details of the users and an OTP field. Successful signup pushes back to the login/signup page where the user needs to login with his new credentials.
3. Upon proper login, a new screen appears with an option to select any city of the user's choice to display the corresponding weather/ climate data of the entered city.
4. The main screen is an interactive display which provides essential information such as climate change parameters, graphs and visual tools and indicators if the user is a policymaker or researcher, or set of parameters related to day to day weather report if the user is general public.
5. In the case the user is done with his or her activities, he/she can choose to logout from the account using the logout button provided in the menu bar. This logout button pushes back to the login/signup screen from which new users can sign up whereas existing users can sign up.
6. Additional screens can be added to the software based future requirements or existing requirement changes. All the integral work is done in the database and backend of the software

3.1.3 Software Interface Requirements

In order to perform various different functions, this software needs to interact with various other softwares. So there are certain software interface requirements that need to be fulfilled which are listed as follows:-

- ❑ For all the parameters related to day to day weather our **CCMA 1.0™** software must interact with certain open source API such as OpenWeather. This data is helpful for the general Public.
- ❑ When it comes to policymakers and researchers we need to provide with essential analytical information regarding climate change for such information we rely on datasets provide by NASA
- ❑. For storing information such as user details and credentials, we useDBs which helps in organizing , maintaining, updating and traversing the database.

4. System Features

1. Weather Report and Climate Statistics

Description

The system is designed to provide the user with the information regarding weather and climate change. The information of day to day weather report helps the general public to plan their daily schedule whereas the information regarding climate change helps the researchers in their research purpose whereas for policymakers it helps them in making informed decisions and policy making. The functioning of the system shall be as follows:-

At the start, the user is provided with a login/signup screen and he is required to enter his login details if he is an existing user, else he needs to sign up. For sign up the user is pushed to the sign up page where needs to provide his details along with mail id. AN OTP verification setup has been added to the signup page for authentication purposes. After sign up the user is again pushed back to the login/signup page where he needs to login with his credentials. In the signup process itself we bifurcate the users as general public or policymakers /researchers.

After a successful log in, the user is presented with a search and select option to find the city or area he wanted to view data. The user can select any one city or area in the list for the entire session.

After the selection the user is presented with an interactive display which provides essential information such as climate change parameters, graphs and visual tools and indicators if the user is a policymaker or researcher, or set of parameters related to day to day weather report if the user is general public.

After the user is finished with his work, for security purposes, he is required to log out and then take his card out of the slot. Additional implementation can be added to the software based future requirements or existing requirement changes.

Validity Checks

In order to gain access to the system, the user is required to enter his/her correct user id/pin no and account no failing which his card may be blocked.

The user can access only one account at a time and can enter only one city. Also he must logout to start another session.

Sequencing Information

The information about the users and their account should be entered into the database prior to granting access into the web page and the backup be maintained for all account information

Error Handling/ Response to Abnormal Situations

If any of the above validation/sequencing flow does not hold true, appropriate error messages will be prompted to the user for doing the needful.

2. Data Generation

After each selection user has performed, data is generated that contains all the information about the weather/climate.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

The following list provides a brief summary of the performance requirements for the software:

5.1.1 Capacity

- ❑ The Software shall provide services only to a limited number of users.

5.1.2 Quality – The primary objective is to produce quality software. As the quality of a piece of software is difficult to measure quantitatively, the following guidelines will be used when judging the quality of the software:

1. Consistency – All code will be consistent with respect to the style.
(This is implied when adhering to the standard).
2. Test cases – All functionality will be thoroughly tested

5.2 Software System Attributes

5.2.1 Reliability

- ❑ The System is linked to OpenWeather API and NASA climate related dataset which are open source and highly reliable, thus increasing reliability of the product.
- ❑ Our product is very simple and basic. So proper error checking is done.
So we can expect the initial product to be bug free.

5.2.2 Security

- ❑ The system shall be protected from fake users and email misuseage with the help of OTP system.
- ❑ We ensure proper safety for the user details and credentials.

5.2.3 Maintainability

- ❑ **CCMA 1.0TM** mostly relies on an API for weather reports and datasets for climate Change information. So these open source tool kits must be observed and maintained inorder to ensure smooth and proper function of the software. Alternative sources must be placed as a backup in case any current source of data goes down.
- ❑ The database must be managed and organised so that there would be no hassles with user experience and also with increasing no of users we must expand the database size at the same time.

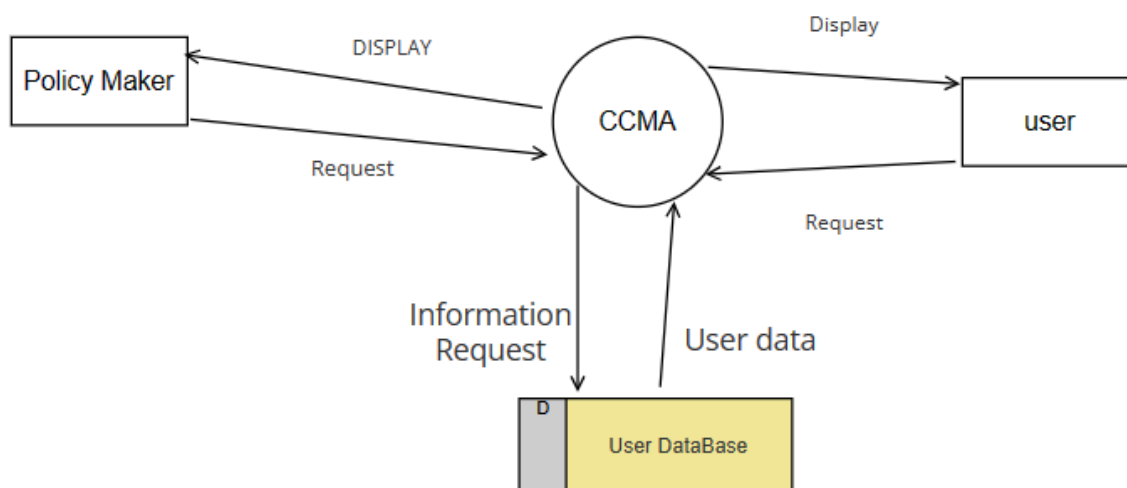
ABSTRACT:

Our project is all about creating a web page that's easy to use. Think of it as a design with Html and CSS smart. It is special that it uses advanced tricks with data and cool visuals to keep an eye on climate change data in a detailed way. The main idea is to make things clear and Simple for both scientists and decision makers. We want to show them the important details about climate change in an easy-to-understand way. So, when they are making decisions, they have the best info right in front of them. Our hope is that the tool doesn't just Share information but also motivates People to take action. By making climate data more understandable we want to help everyone make smart choices for a better and more Sustainable future.

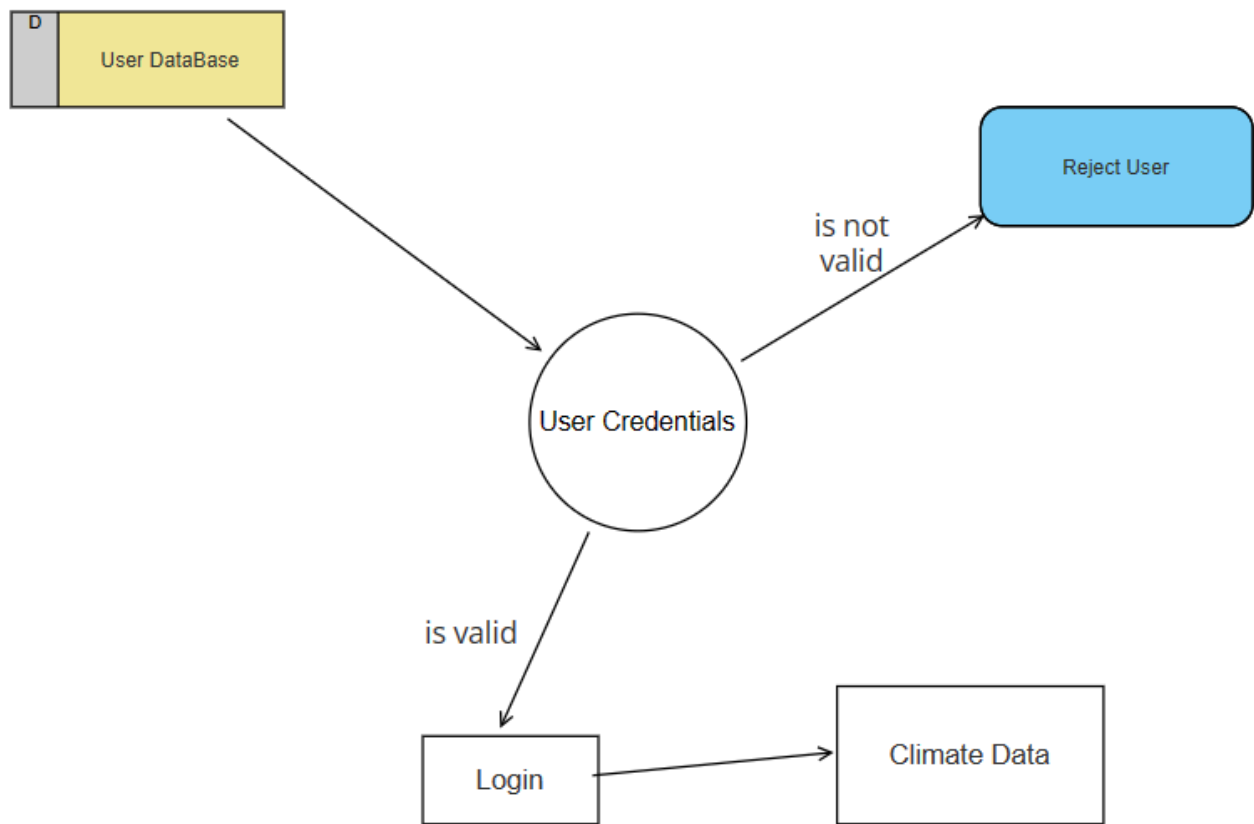
The main goal of our project is creating a webpage for researchers and policymakers focused on climate change. Our goal is to display temperature and precipitation data, aiding in understanding and specifically helping with information related to cyclones. Through a user-friendly interface, we aim to empower users to make informed decisions and take proactive measures to climate challenges.

DFD:

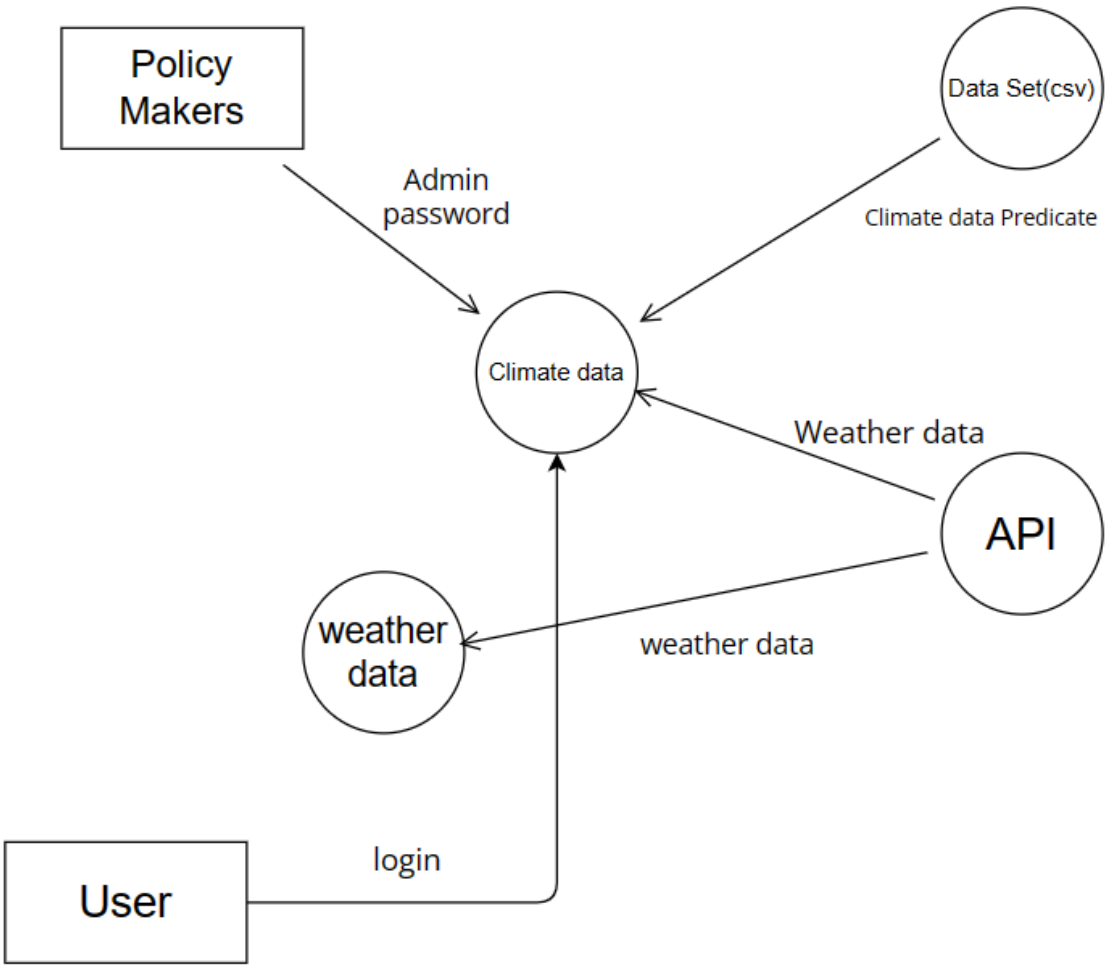
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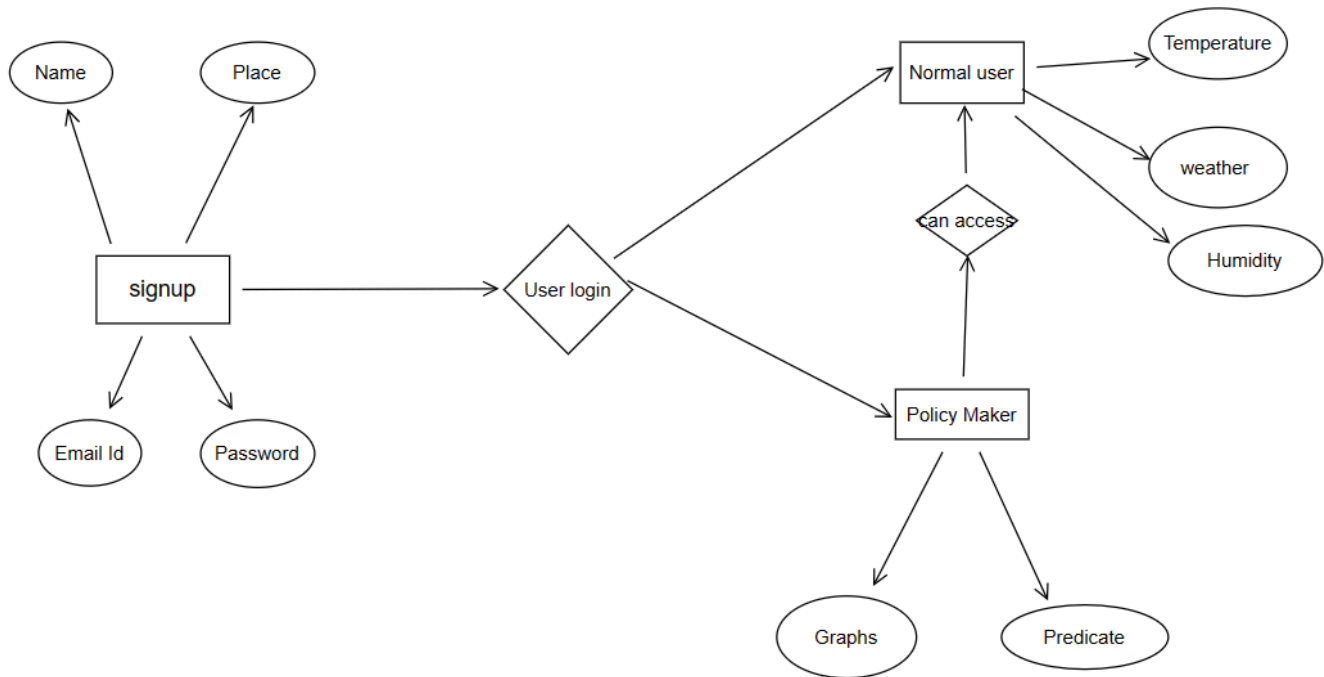
level 1 :



Level 2:



ER DIAGRAM:



DATA DICTIONARY:-

1.user signup

column name	Data Type	Primary Key	Unique	Not Null	Description
User Name	Varchar[50]	Yes	Yes	Yes	Name of the user
User Place	Varchar[50]	No	No	Yes	Name of user place
User Email	Varchar[50]	Yes	Yes	Yes	Email of the user

2.user login

Column name	Data Type	PrimaryKey	Unique	Not Null	Description
Email	Varchar[50]	Yes	Yes	Yes	Email of the user
Password	Varchar[50]	No	No	Yes	Password of the user

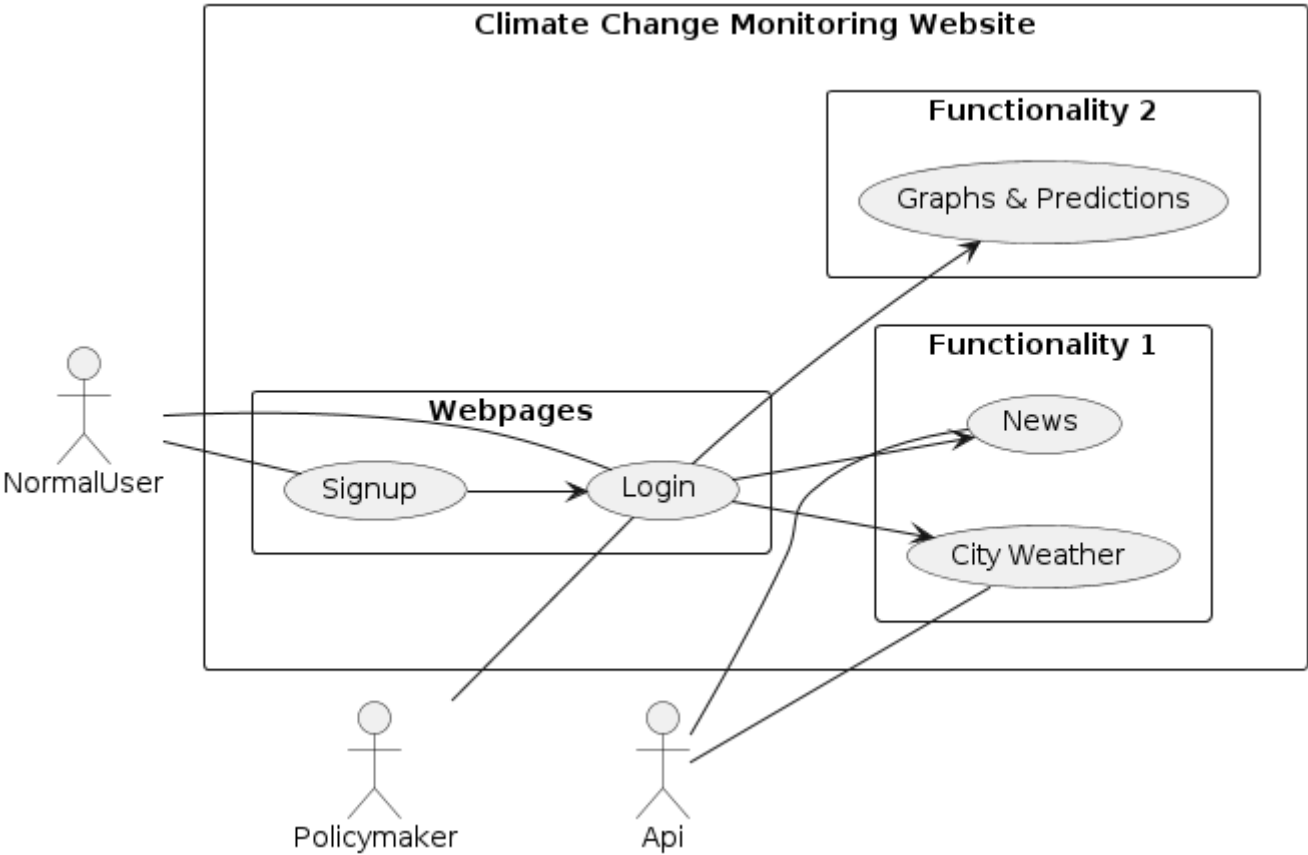
3.Normal User

Column name	Data Type	Primary key	Not Null	Unique	Description
city	String	Yes	Yes	Yes	city of the user
temperature	Float	Yes	Yes	Yes	city temperature of user
Humidity	int	Yes	Yes	Yes	city of the user
Wind Speed	int	Yes	Yes	Yes	wind speed of the user

4.Policy Maker/Researcher

Column name	Data Type	Description
Observation Data	int,float	
Graph		
Prediction of weather		

Use Case Diagram:



USE CASE Diagram Scenario

Use Case ID	Use Case	Actors	Description
UC-101	User Signup	Normal User	New user registers for an account on the website
UC-102	User Login	Normal User	Registered user logs into the website using their credentials
UC-103	View Current Weather of Their City	Normal User	User accesses the current weather information for their city
UC-104	Predict Future Weather	Policy Makers	Policy makers analyze graphs of historical data to predict future weather patterns

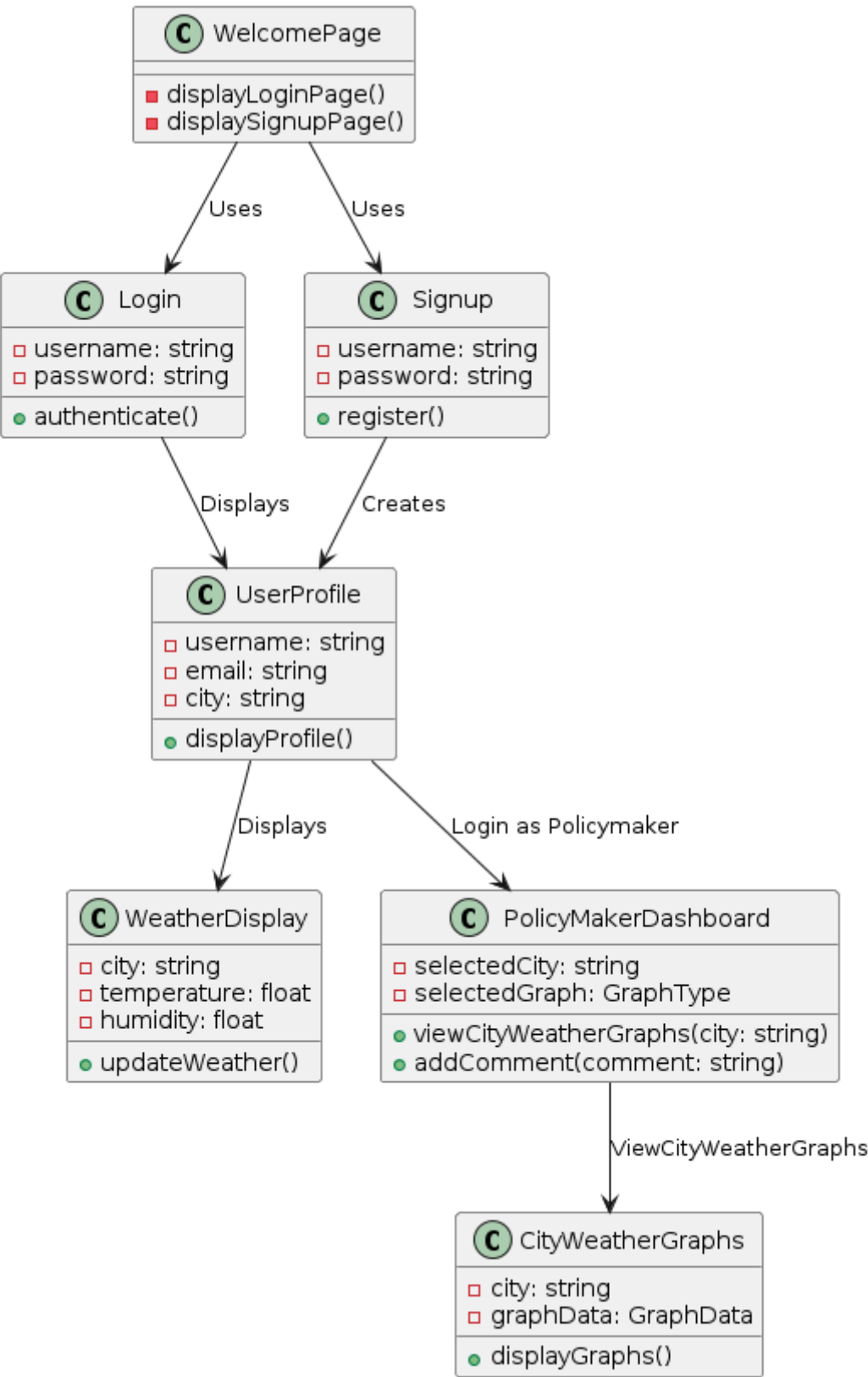
Pre-Condition:

- For Normal Users: The welcome page is displayed.
- For Policy Makers: The welcome page is displayed with an additional option to log in as a policy maker.

Flow of Events:

1. User navigates to the website.
2. On the welcome page:
 - Normal users can see options for login and sign up.
 - Policy makers can see options for login, sign up, and a separate option to log in as a policy maker.
3. If a normal user:
 - User clicks on the sign-up/login button.
 - If signing up:
 - User fills out the registration form.
 - System verifies and creates a new account.
 - If logging in:
 - User enters username and password.
 - System authenticates the user's credentials.
 - System redirects to the user dashboard displaying current weather for their city. Users can view details like temperature, humidity, etc.
4. If a policy maker:
 - Policy maker clicks on the option to log in as a policy maker.
 - Policy maker enters username and password.
 - System authenticates the policy maker's credentials.
 - System redirects to the policy maker dashboard displaying historical weather data graphs.
 - Policy maker can select desired time periods and analyze trends.
 - Policy maker can also add comments or observations.

Structural View Diagram or Class Diagram:



Sequence diagram:

