Database Management

CSE303

Air Quality Monitoring System

Final Report

Section – 03 Group – 03

Name	ID
S.M.A Sayed Al Banna	2021591
Injamam ul Haque	2021397
Syed Niaz Mohtasim	2021607
Akib Raihan	2020367
Anannya Preeta	2020977

Contents

CHAPTER 1: INTRODUCTION

a. BACKGROUND OF THE ORGANIZATION

One of the most important problems of this decade is air pollution. It is dangerous for both humans and the environment itself. CASE stands for Clean Air and Sustainable Environment. It is a World Bank funded project started in 2009 with an initial of investment of USD $62.20 million with the intention of improving air condition and refine the processes that produce significant pollution such brick production and traffic congestion.

b. BACKGROUND OF THE PROJECT

The project in its current state collects real-time air quality data and monitors pollutants using sensors. The data is passed along to multiple entities and representatives before being entered into the system. The data is then used to calculate the Air Quality Index, which is a tool for reporting daily air quality of any city or country. The system also generates atmospheric maps and various charts on request. (CASE, n.d.)

c. OBJECTIVE OF THE PROJECT

The primary goal of this project is to construct a fully automated system that can take input of weather data directly and generate AQI, weather charts, tables, or graphs of locations as required by the user without error.

- To allow weather data collectors to entry the data directly into the system through a form without having to go through multiple channels, thus streamlining the process and reducing red tape.
- To bring in multiple sources of data like private weather stations and verified research organizations.
- To bring in weather data combined with location data from vehicles around the city in order to produce a route wise AQI map.
- To allow the relevant ministries and city corporations to propose changes to the system and templates of the reports directly through a comment box without having to go through multiple channels.
- To have the system verify the data by itself through software removing the need for it to be done manually.
- To let the data collectors know about any faults in the sensors (detected after the automated data verification) through the generated reports.

d. SCOPE OF THE PROJECT

The scope is to make the existing system more efficient and user-friendly and introduce new features to ensure the proposed system is a valid upgrade.

- Improve data collection and bring in more data sources.
- Improve storages of the data by keeping less physical copies, thus using less paper.
- Keeping the data in a relational database.
- Streamlining the entire process, reducing number of people involved.

- Automating the process as much as possible.
- Building unique interfaces for all different stakeholders involved.
- Ensuring data and system security.
- Generating necessary reports instantly.
- Allowing the option to propose changes immediately and also making said changes as soon as possible.

CHAPTER 2: REQUIREMENT ANALYSIS

a. RICH PICTURE (AS IS)

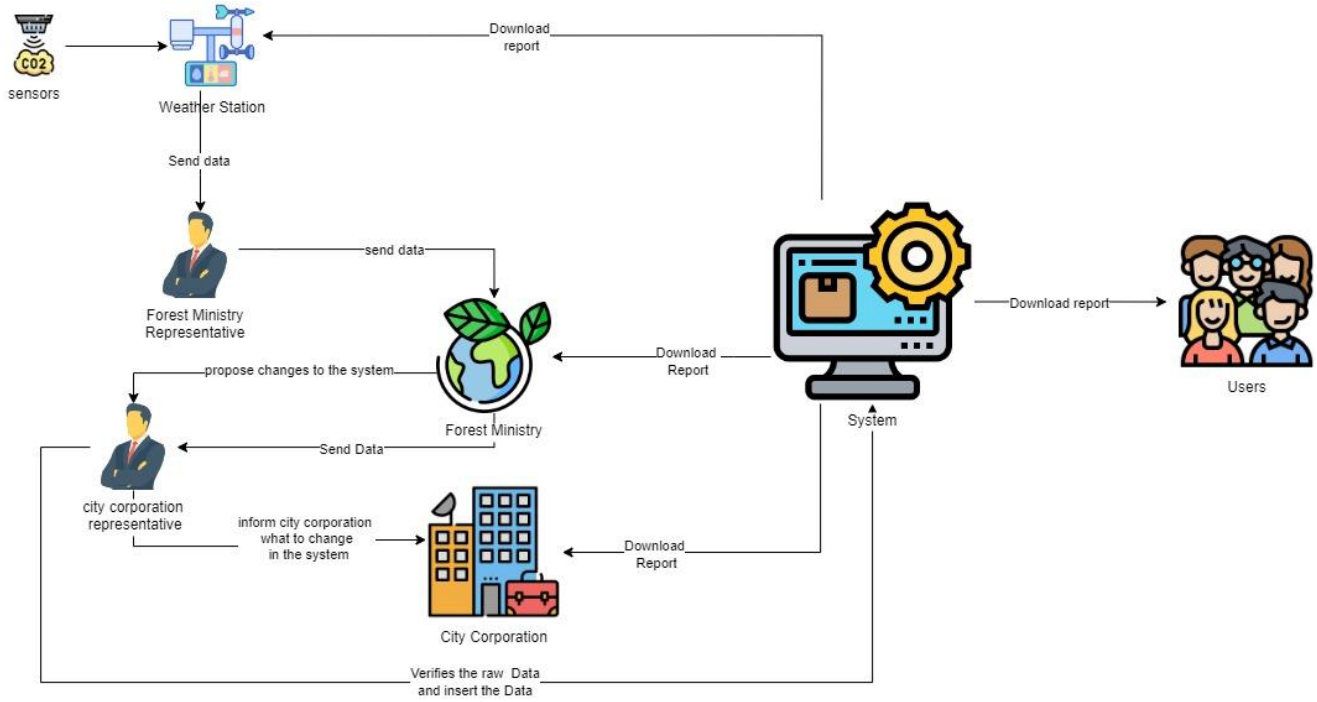


Figure 1: Rich Picture AS IS

b. SIX ELEMENTS ANALYSIS (AS IS)

Process	System Roles					
	Human	**Non-Computing Hardware**	**Computing Hardware**	**Software**	**Database**	**Communication & Network**
Data Entry	**A. Weather stations** 1. Send data collected from sensors to ministry representative. **B. Forest Ministry Representative** 1. Collect data from weather station. 2. Send data to forest ministry. **C. Forest Ministry** 1. Send data to city corporation representative. **D. City Corporation Representative** 1. Input data to the system. **D. Internal IT Expert** 1. The IT experts make sure the data is protected in the system. 2. They must make sure the website is always running. 3. They keep a backup ready in case of power failures.	**A. Paper** 1. Data sheet is printed on paper and this is stored as backup. **B. File Holder** 1. Data sheets are kept in organised file holders. **C. Cabinets** 1. The files are kept in the cabinets. **D. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. Sensors** 1. To collect the weather data, these devices are needed. Data is collected by weather stations only. **B. PC/ Laptop/ Other computing device** 1. The data from the sensors are stored on storage devices of computers. **C. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the data sheet. **D. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system. **E. Pen Drives** 1. This is used as another medium by the users of system to pass the data.	**A. Microsoft Excel / Google Sheets** 1. All data collected is stored on computers in .CSV files which can be accessed using Excel/Sheets **B. Operating System** 1. To operate the computer where data is collected and stored, we need an operating system like Windows/ Linux **C. Printing software** 1. Printing software needed if data sheet is wanted in physical form or copies are to be made. **Servers** 1. Database servers used by system for storing data and data entry by city corporation representative.	**A. Microsoft Excel / Google Sheets** 1. All data collected is stored on computers in .CSV files which can be accessed using Excel/Sheets. **B. System database** 1. Representative can use the system database in order to input and update data. **C. Data files/ Log files (physical copies)** 1. Paper copies of data is printed and stored in holders and cabinets.	**A. Telecommunication/phone calls** 1. Representative and ministry can communicate with each other by making phone calls. **B. Internet** 1. Internet will be needed for representative to entry data into system. **C. Emails** 1. Representative and ministry can communicate with each other by sending emails.

	E. External IT Expert 1. The internet service providers provides internet connection to the representative to do entry data.					
Data Verification	**A. City Corporation Representative** 1. After receiving data and before inputting data, representative verifies the data manually.	**A. Pen and Paper** 1. Verifies that data is alright and processed with stamps and signatures. **B. Data Sheet in Printed Version** 1. Data sheet is collected in a printed form. **C. File Holder** 1. Data sheets are kept in organised file holders **D. Cabinets** 1. The files are kept in the cabinets **E. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. Printers/Copiers** 1. Printers and copiers are used to make copies of the verified data sheet.	**A. Printing software** 1. Printing software needed if data is wanted in physical form or copies are to be made.	**A. Data files/ Log files (physical copies)** 1. Paper copies of data is printed and stored in holders and cabinets.	**A. Telecommunication/phone calls** 1. If necessary, representative can communicate with ministry and other stakeholders by making phone calls.
Generate reports	**A. Forest Ministry** 1. Downloads reports to analyse any changes are needed to the system.	**A. Paper** 1. Users and other stakeholders have the options to print physical copies of reports.	**A. PC/ Laptop/ Other computing device** 1. PC is used to access the system and view and print	**A. Operating System** 1. To operate the computer, we need an operating system like	**A. HDD** 1. Soft copies of reports are the data the users and stakeholders have access to at this stage. **A. Reports (physical copies)** 1. Paper copies of reports are the data the users and stakeholders	**A. Internet** 1. Internet will be needed for stakeholders to access the system and the data. **B. Telecommunic**

	B. City Corporation 1. Downloads reports for making decisions and announcing if people of the city should be wary about atmosphere. **C. Weather stations** 1. Downloads reports as well for making important decisions. **D. Users** 1. Users are able to generate weather reports and make relevant decisions. **E. Internal IT Expert** 1. Creates the report template for to be downloaded. 2. Maintains the system so that if there is any problem they can fix that. **F. External IT Expert** 1. The internet service providers provides internet connection to the representative to access system and download relevant reports.	**B. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	relevant reports. **B. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the reports. **C. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system.	Windows/ Linux **B. Printing software** 1. Printing software needed if report is wanted in physical form or copies are to be made.	have access to at this stage.	**ation/phone calls** 1. Forest ministry, city corporations and representatives can communicate with each other by making phone calls. **C. Emails** 1. Forest ministry, city corporations and representatives can communicate with each other through emails.

Propose changes to system	**A. Forest Ministry** 1. After analysing the report, propose changes to system and send it to city corporation representative. **B. City Corporation Representative** 1. Receive proposed changes from ministry and passes it along to the city corporation. **C. City Corporation** 1. Receive proposed changes from representative and implement it. **D. Internal IT Expert** 1. Apply the proposed changes to the system. **E. External IT Expert** 1. The internet service providers provides internet connection to the stakeholders' emails and access to system.	**A. Paper** 1. Document of proposed changes is printed on paper and sent out. 2. A copy of this document is stored as backup. **B. File Holder** 1. Documents are kept in organised file holders. **D. Cabinets** 1. The holders are kept in the cabinets. **D. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. PC/ Laptop/ Other computing device** 1. PC is used to access the system and view and print relevant reports. **B. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the reports. **C. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system.	**A. Operating System** 1. To operate the computer, we need an operating system like Windows/ Linux **B. Printing software** 1. Printing software needed if report is wanted in physical form or copies are to be made. **C. Microsoft Word** 1. The document is drafted on a text editing software and the most used software is Microsoft Word.	**A. Microsoft Word** 1. The document for changes is the only form of data and can be accessed using Word. **B. Physical copies of document** 1. Paper copies of document is printed and stored in holders and cabinets.	**A. Internet** 1. Internet will be needed for stakeholders to access the system and the data. **B. Telecommunication/phone calls** 1. If necessary, stakeholders can communicate with each other by making phone calls. **C. Emails** 1. If necessary, stakeholders can communicate with each other emails.

c. PROCESS DIAGRAM (AS IS)

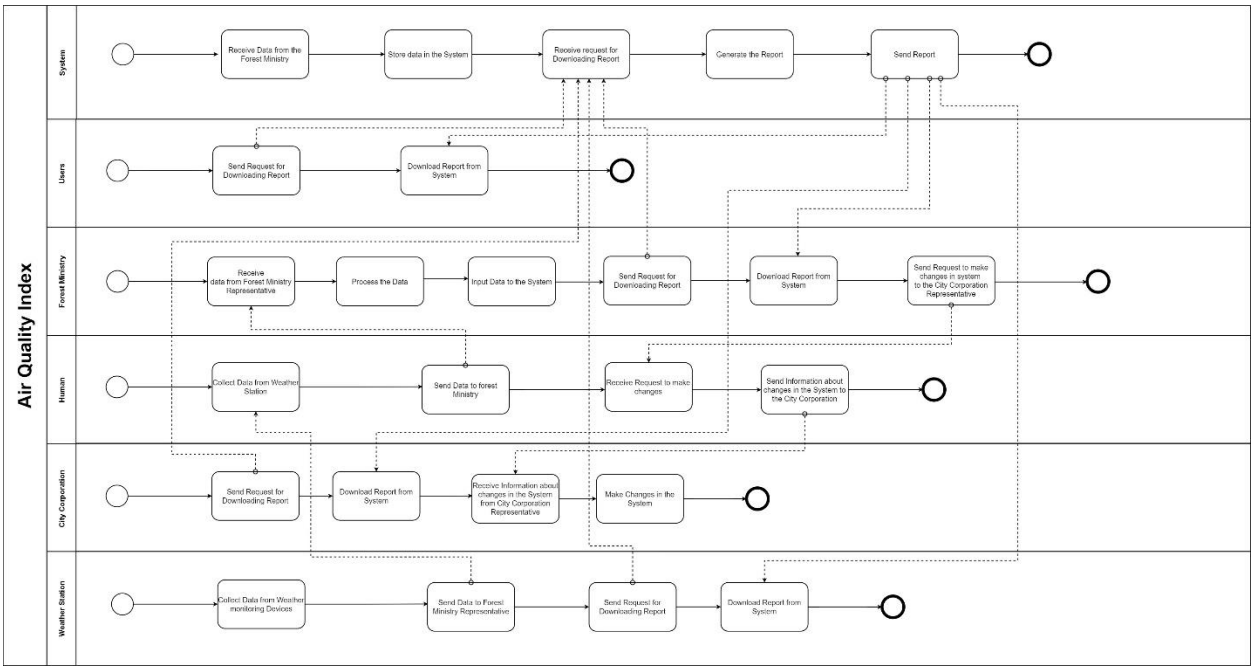


Figure 2: Process Diagram AS IS

d. PROBLEM ANALYSIS

Process Name	Stakeholders	Concerns (Problems)	Analysis (Reason of the Problem)	Proposed Solution
Data Entry	A. Weather station B. Forest Ministry Representative C. Forest Ministry D. City Corporation Representative	1. Time Consuming 2. Too many entities involved 3. No direct way to entry data.	1. Data has to be collected and then sent from one source to another and then another source for verification before entry. 2. There is no process for data collectors to directly entry data into the system and to know whether their sensors are working perfectly.	1. Make the process more streamlined, no need to involve so many entities. 2. Create a form through which data can be entered by data collectors directly.
Data Verification	A. City Corporation Representative	1. Manual Checking 2. Lack of relevant communication.	1. Data has to be collected and then sent from one source to another and then another source for verification before entry. 2. There is no process for data collectors to directly entry data into the system and to know whether their sensors are working perfectly.	1. This verification can be done automatically by the system through checking software. 2. Any issues or changes in data or sensors can be caught and can be informed to the data collectors through reports.
Generate reports	A. Forest Ministry B. City Corporation C. Weather stations D. Users	1. No way to edit templates of reports. 2. Reports do not have information regarding data verification.	1. There is no way to make changes or additions to the reports in case more information is asked to be represented on the report. 2. After data verification, if there is problem with sensors there is no way to inform data collectors.	1. Allow option for city corporation to make changes to template of reports as required. 2. Include information about data verification and sensors to the reports to be downloaded by data collectors.
Propose changes to system	A. Forest Ministry B. City Corporation Representative C. City Corporation	1. Time Consuming. 2. Too many entities involved	1. Information about changes has to be proposed by ministry and then sent to representative and then to city corporation for actually implementing changes, very slow process.	1. Make the process more streamlined, no need to involve so many entities. 2. Make a comment box in the system where city corporation can directly send in proposed changes.

e. RICH PICTURE (TO BE)

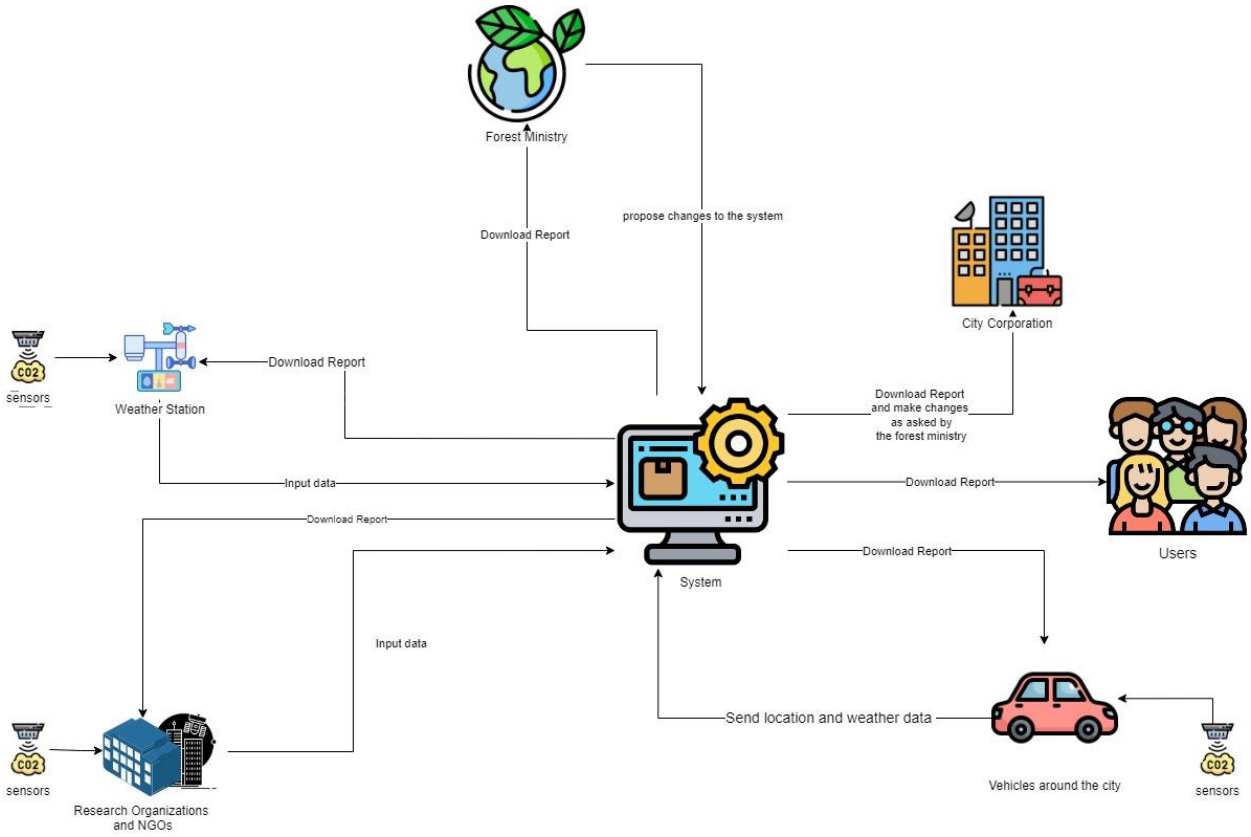


Figure 3: Rich Picture TO BE

f. SIX ELEMENTS ANALYSIS (TO BE)

Process	System Roles					
	Human	**Non-Computing Hardware**	**Computing Hardware**	**Software**	**Database**	**Communication & Network**
Data Entry	**A. Weather station** 1. Collect information from sensors 2. Save a copy of the data (.CSV file and physical). 3. Send weather data (.CSV file) to the system directly using a form. **B. Research Organizations and NGOs** 1. Collect information from sensors. 2. Save a copy of the data (.CSV file and physical). 3. Send weather data (.CSV file) to the system directly using a form. **C. Drivers around the city** 1. Data is collected when these people drive around the city with their vehicles through a sensor connected on the vehicle. Both weather and	**A. Paper** 1. Physical copy of data sheet is also kept as backup. **B. File Holder** 1. Data sheets are kept in organised file holders. **C. Cabinets** 1. The files are kept in the cabinets. **D. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. Sensors** 1. To collect the weather data, these devices are needed. **B. PC/ Laptop/ Other computing device** 1. The data from the sensors are stored on storage devices of computers. 2. PCs are used by stakeholders access the system and to input weather data to the system. **C. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the data sheet. **D. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system. **E. Pen Drives** 1. This is used as another medium by the	**A. Microsoft Excel / Google Sheets** 1. All data collected is stored on computers in .CSV files which can be accessed using Excel/Sheets **B. Operating System** 1. To operate the computer where data is collected and stored, we need an operating system like Windows/ Linux. **C. Google Forms** 1. Data is collected by system through a provided Google Form. **D. Printing software** 1. Printing software needed if data is wanted in physical form	**A. Microsoft Excel / Google Sheets** 1. All data collected through Google Forms is stored on computers in .CSV files which can be accessed using Excel/Sheets. **B. System database** 1. Representative can use the system database in order to input and update data. 2. System keeps a cumulative data file in its own database. **C. Data files/ Log files (physical copies)** 1. Paper copies of data is printed and stored in holders and cabinets for backup purposes.	**A. Internet** 1. Internet will be needed for stations and organisations to access the system and form and send the data. 2. The data collecting vehicles will also need internet connection through WIFI or mobile network to send weather and location data to the system. **B. Telecommunication/phone calls** 1. Stakeholders can communicate with each other using by making phone calls. **C. Emails** 1. Stakeholders can communicate with each other through email.

	data location data is sent to the system. **D. Internal IT Expert** 1. The IT experts make sure the data is protected in the system. 2. They must make sure the website is always running. 3. They keep a backup ready in case of power failures. **E. External IT Expert** 1. The internet service providers provides internet connection to the representative to do entry data.		users of system to pass the data.			
Data Verification			**A. PC/ Laptop/ Other computing device** 1. Data Verification is done automatically in the system using software. To access the system, a computing device is required. **B. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or	**A. Operating System** 1. To operate the computer where data is collected and stored, we need an operating system like Windows/ Linux. **B. Verifying Software** 1. Software is added to the system in new version, which verifies the inputted data without any manual input.	**A. System database** 1. System keeps the verified data file in its own database.	**A. Internet** 1. Internet will be needed for stations and organisations to access the system.

			switch used by the users of system.			
Generate reports	**A. Forest Ministry** 1. Downloads reports to analyse any changes are needed to the system. **B. City Corporation** 1. Downloads reports for checking if any changes to system have been proposed by ministry. 2. Downloads reports for making decisions and announcing if people of the city should be wary about atmosphere. **C. Weather stations** 1. Downloads reports as to check if data verification has spotted any issues in their sensors. **D. Drivers around the city** 1. Downloads reports as to check if data verification has spotted any issues in their sensors (location and weather). **E. Research Organizations**	**A. Paper** 1. Users and other stakeholders have the options to print physical copies of reports. **B. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. PC/ Laptop/ Other computing device** 1. PC is used to access the system and view and print relevant reports. **B. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the reports. **C. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system.	**A. Operating System** 1. To operate the computer, we need an operating system like Windows/ Linux **B. Printing software** 1. Printing software needed if report is wanted in physical form or copies are to be made.	**A. HDD** 1. Soft copies of reports are the data the users and stakeholders have access to at this stage. **A. Reports (physical copies)** 1. Paper copies of reports are the data the users and stakeholders have access to at this stage.	**A. Internet** 1. Internet will be needed for stakeholders to access the system and the data. **B. Telecommunication/phone calls** 1. Forest ministry, city corporations and representatives can communicate with each other by making phone calls. **C. Emails** 1. Forest ministry, city corporations and representatives can communicate with each other through emails.

	and NGOs 1. Downloads reports as to check if data verification has spotted any issues in their sensors. **F. Users** 1. Users are able to generate weather reports and make relevant decisions. **G. Internal IT Expert** 1. Creates and makes changes (if asked) the report template for to be downloaded. 2. Maintains the system so that if there is any problem they can fix that. **H. External IT Expert** 1. The internet service providers provides internet connection to the representative to access system and download relevant reports.					
Propose changes to system	**A. Forest Ministry** 1. After analysing the report, propose changes to system through a comment box in the system.	**A. Telephone/ Cell Phones** 1. If there is need for telecommunication, telephones will be needed.	**A. PC/ Laptop/ Other computing device** 1. PC is used to access the system and view and print relevant reports.	**A. Operating System** 1. To operate the computer, we need an operating system like Windows/ Linux	**A. System database** 1. System keeps the verified data file in its own database. 2. Changes proposed through comment box are also kept in the same database, which can be viewed in the generated reports.	**A. Internet** 1. Internet will be needed for stakeholders to access the system and the data. **B. Telecommunication/phone calls**

	B. City Corporation 1. View proposed changes in the downloaded report and implement it. **D. Internal IT Expert** 1. Apply the proposed changes to the system. **E. External IT Expert** 1. The internet service providers provides internet connection to the stakeholders' emails and access to system.		**B. Printers/Copiers** 1. Printers and copiers are used to print and make copies of the reports. **C. Router/ Internet Cables by ISP Providers/ Switch** 1. From networking side, internet cables by the ISP providers or router or switch used by the users of system.	**B. Printing software** 1. Printing software needed if report is wanted in physical form or copies are to be made.		1. Forest ministry and city corporation can communicate with each other by making phone calls. **C. Emails** 1. Forest ministry and city corporations can communicate with each other through emails.

g. PROCESS DIAGRAM (TO BE)

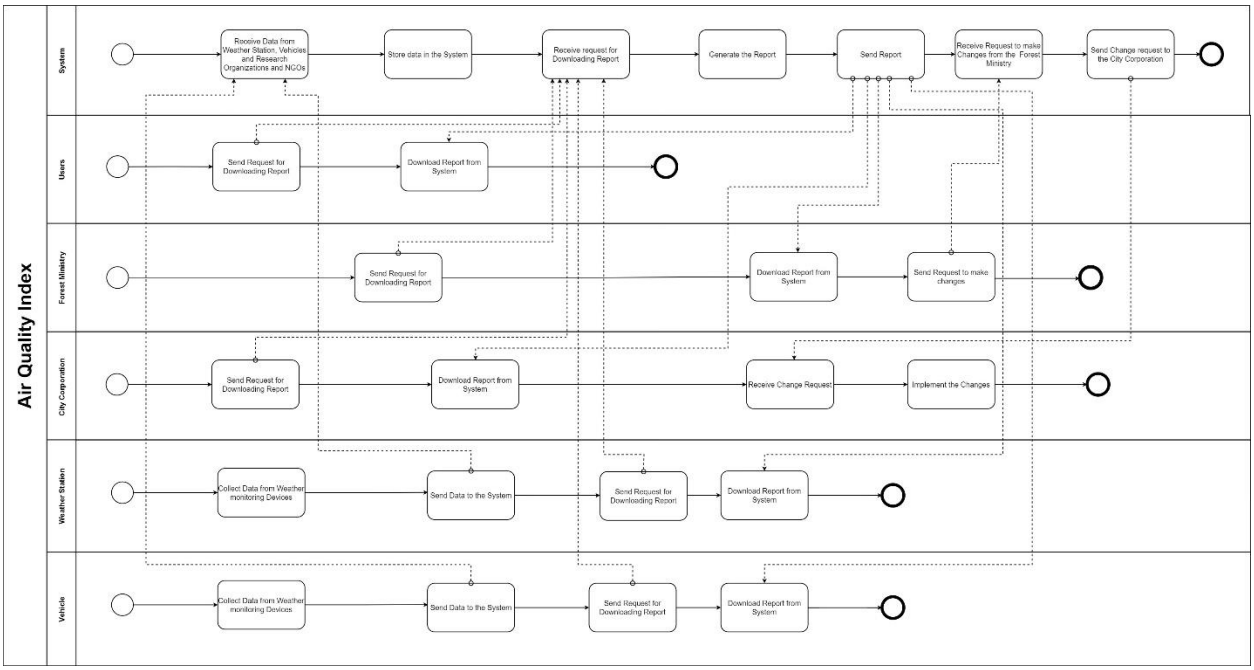


Figure 4: Process Diagram (TO BE)

CHAPTER 3: LOGICAL SYSTEM DESIGN

a. BUSINESS RULES

Business rules describe the operations, definitions and constraints that govern the data model. As opposed to the ERD, they are made using regular English sentences so that a non-technical stakeholder can decipher information about the data model without notation knowledge. The business rules that govern our data model are as follows

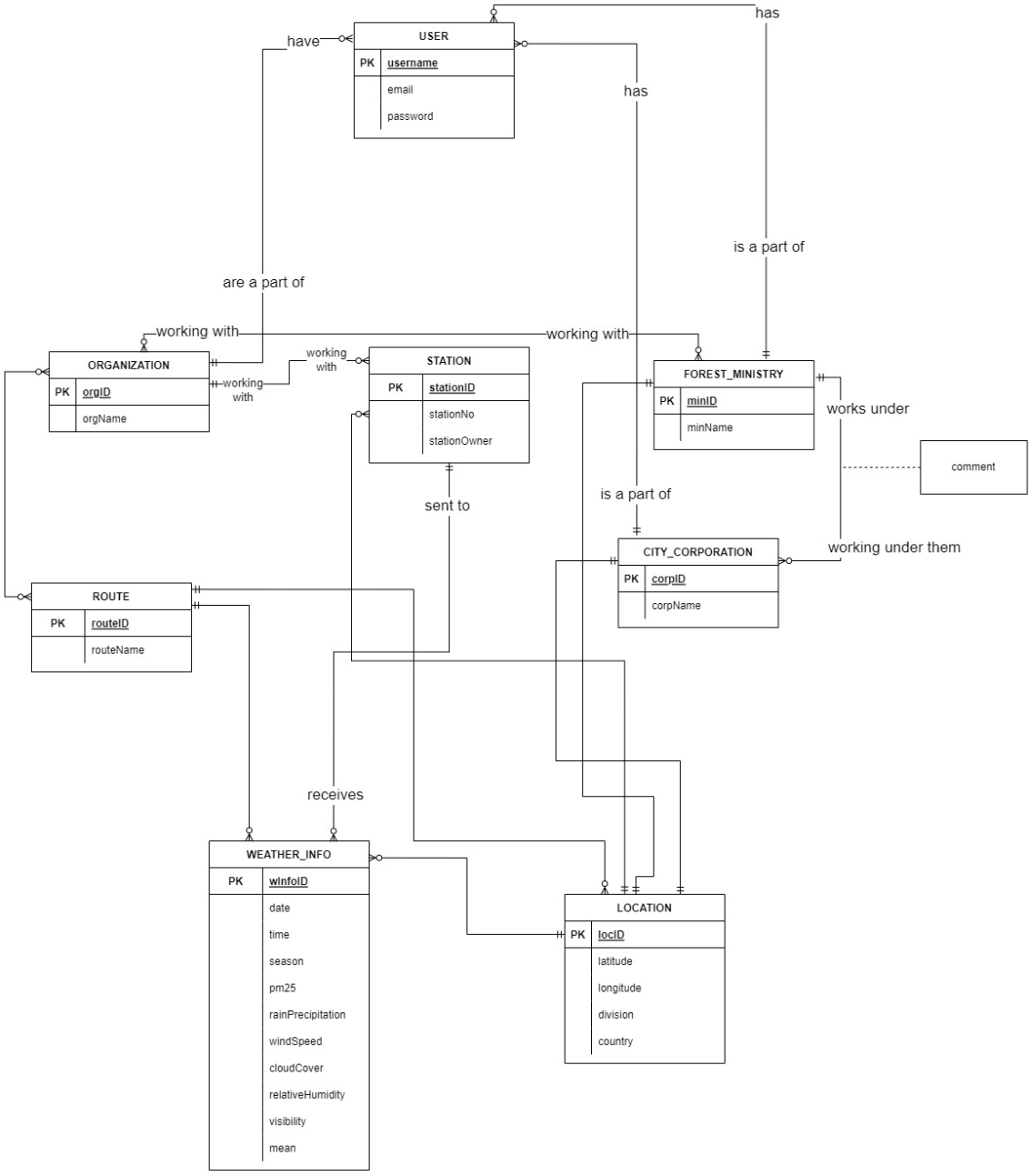
USER has username, email and password. USER must be a part of a CITY CORPORATION. CITY CORPORATION may have many USERS. USER must be a part of a FOREST MINISTRY. FOREST MINISTRY may have many USERS. USER may be part of multiple ORGANIZATIONS and ORGANIZATIONS may have multiple USERS.

FOREST MINISTRY has minID and minName. MINISTRY may have multiple CITY CORPORATION working under them while CITY CORPORATION will be working under one MINISTRY. MINISTRY may be working with many ORGANIZATIONS and ORGANIZATIONS may be working with many MINISTRY.

CITY CORPORATION has corpID and corpName. STATION might receive WEATHER INFO from multiple source, while WEATHER INFO is sent to one STATION. STATION has stationID, stationNo and stationOwner.

ORGANIZATION has orgID and orgName. ORGANIZATION may work with multiple STATIONS and STATION will work with one ORGANIZATION.

b. ENTITY RELATIONSHIP DIAGRAM (ERD)



c. ENTITY RELATIONSHIP DIAGRAM (ERD) TO RELATIONAL SCHEMA

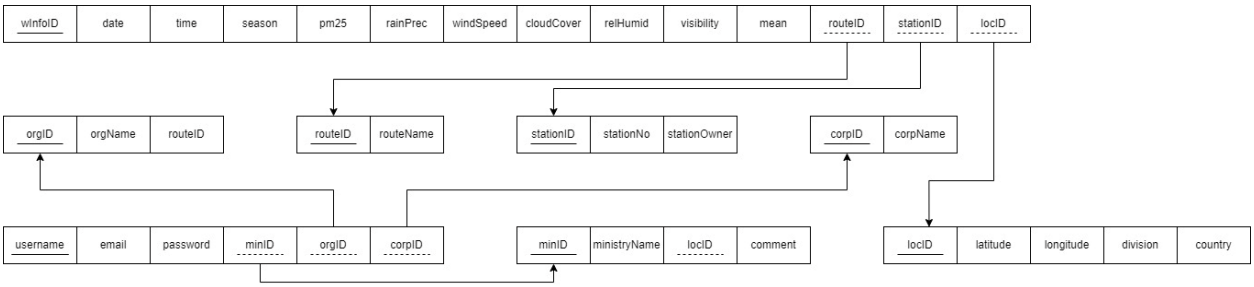
d. NORMALIZATION

1NF AND 2NF

username	email	password	minID	orgID	corpID	orgName	routeID	routeName	corpName	comment	ministryName

wInfoID	date	time	season	pm25	rainPrec	windSpeed	cloudCover	relHumid	visibility	mean	routeID	stationID	locID	stationNo	stationOwner	locID	latitude	longitude	division	country

3NF AND BCNF



e. DATA DICTIONARY

Tblcity_corporation

Name	Data Type	Size	Remark
corpID	VARCHAR	10	This is the primary key for the City Corporation table. E.g: “corpBan1”
corpName	TEXT		This is the name for the City Corporation. E.g: “Barishal City Copororation”
minID	VARCHAR	10	This is a foreign key from Forest Ministry table. E.g. “fminBan”
locID	VARCHAR	10	This is a foreign key from Location table. E.g. “cntBan”

Tblforest_ministry

Name	Data Type	Size	Remark
minID	VARCHAR	10	This is the primary key for the Forest Ministry table. E.g: “fminBan”
ministryName	TEXT		This is the name for the Forest Ministry. E.g: “Forest Ministry of Bangladesh”
locationID	VARCHAR	10	This is a foreign key from Location table. E.g. “cntBan”

Tbllocation

Name	Data Type	Size	Remark
locID	VARCHAR	10	This is the primary key for the Location table. E.g. “cntBan”
latitude	TEXT		This is the latitude for Location table. E.g: “41.965193”
longitude	TEXT		This is the longitude for Location table. E.g: “-87.876265”
division	TEXT		This is the division for Location table. E.g: “Sylhet”
country	TEXT		This is the county for Location table. E.g: “Bangladesh”

Tblorg_ministry

Name	Data Type	Size	Remark
orgID	VARCHAR	10	This is part of the primary key for the Organization Ministry table. E.g. “org1” This is also a foreign key referencing Organization table.
minID	VARCHAR	10	This is part of the primary key for the Organization Ministry table. This is a foreign key from Forest Ministry table. E.g: “fminBan”
comment	TEXT		This is the comment column, where feedback is to be stored.

Tblorg_route

Name	Data Type	Size	Remark
orgID	VARCHAR	10	This is part of the primary key for the Organization route table. E.g. “org1” This is also a foreign key referencing Organization table.
routeID	VARCHAR	10	This is part of the primary key for the Organization route table. E.g. “r10” This is a foreign key from Route table.

Tblorganization

Name	Data Type	Size	Remark
orgID	VARCHAR	10	This is the primary key for the Organization table. E.g. “org1”
orgName	TEXT		This is the name for the Organization. E.g: “Purple Air”

Tblstation

Name	Data Type	Size	Remark
stationID	VARCHAR	10	This is the primary key for the Station table. E.g. “EPAbar10”
stationName	TEXT		This is the name for the Station. E.g: “EPA Barishal 10”
stationNo	INT		This is the number assigned to the Station. E.g. “10”

stationOwner	TEXT		This is the name for the Station Owner. E.g: “EPA”
locID	VARCHAR	10	This is a foreign key from Location table. E.g. “divbar”
orgID	VARCHAR	10	This is a foreign key from Organization table. E.g. “org1”

Tbluser

Name	Data Type	Size	Remark
username	VARCHAR	10	This is the primary key for the User table. E.g. “corp1”
email	TEXT		This is the email of the User. E.g. “corp1@gmail.com”
password	TEXT		This is the password of the User. E.g. “1proc”
minID	VARCHAR	10	This is a foreign key from Forest Ministry table. E.g: “fminBan”
orgID	VARCHAR	10	This is a foreign key from Organization table. E.g. “org1”
corpID	VARCHAR	10	This is a foreign key from City Corporation table. E.g: “corpBan7”

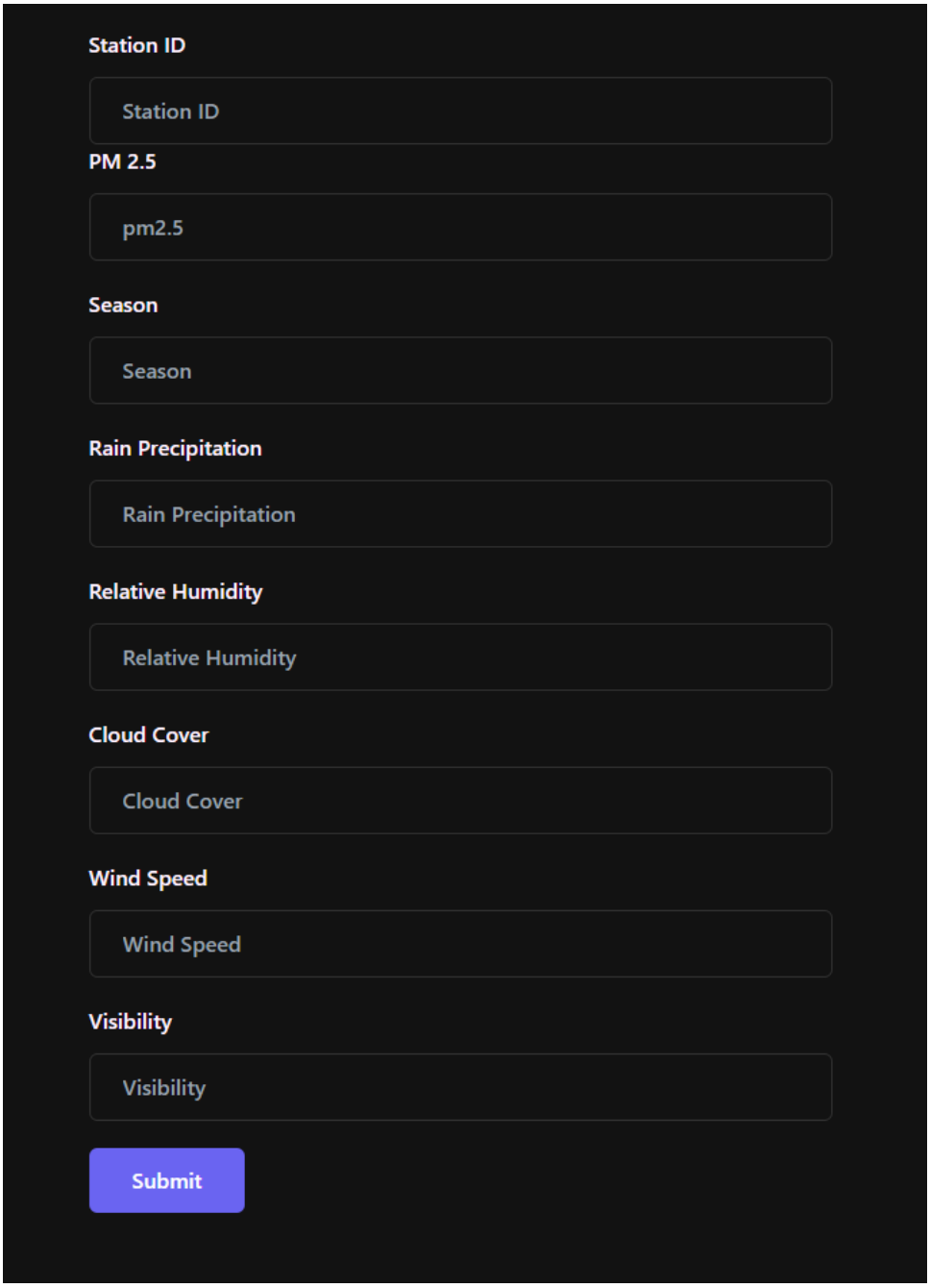
Tblweather_info

Name	Data Type	Size	Remark
WInfoID	INT		This is the primary key for the Weather Info table. E.g. “11”
daily	TIMESTAMP		This is the daily times of the collected weather data. E.g. “2019-10-21 21:06:35”

season	TEXT		This is the attribute indicating season. E.g “Winter”
pm25	DOUBLE		PM2.5 refers to atmospheric particulate matter (PM) that have a diameter of less than 2.5 micrometers. E.g. “135.9”
rainPrec	DOUBLE		This attribute measures the rainfall. E.g. “0.6”
cloudCover	DOUBLE		This attribute contains how much (%) of the sky is covered by clouds. E,g, “35.3”
windSpeed	DOUBLE		This attribute contains the wind speed at the time of data collection. E,g. “9.2”
relHumid	DOUBLE		This attribute contains how much (%) humid it is in a region. E,g. “56.56”
visibility	DOUBLE		This attribute contains the measure of the distance at which an object or light can be clearly detected. E.g. “2.5”
mean	DOUBLE		This attribute contains mean data. E.g. “24.8”
routeID	VARCHAR	10	This is a foreign key from Route table. E.g. “divbar”
locID	VARCHAR	10	This is a foreign key from Location table. E.g. “divbar”
stationID	VARCHAR	10	This is a foreign key from Station table. E.g. “divbar”

CHAPTER 4: PHYSICAL SYSTEM DESIGN

a. INPUT FORM



form > formview.py > forms

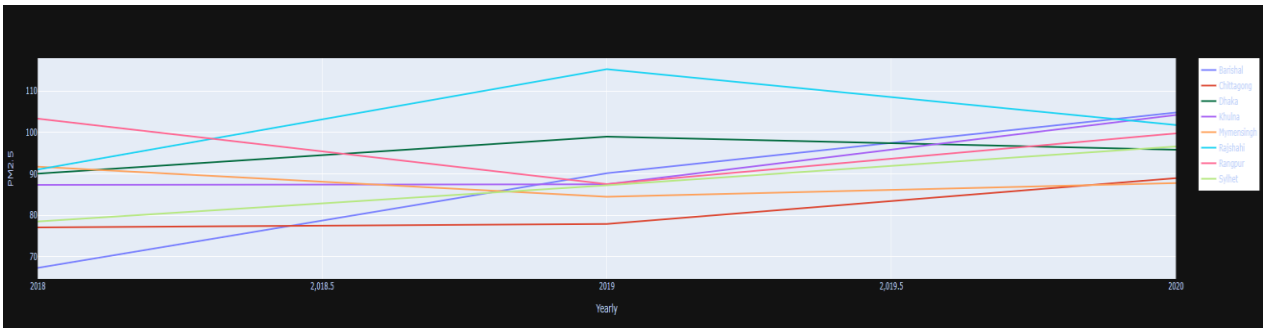
```python
from django.shortcuts import render
from django.http import HttpResponseRedirect
import mysql.connector

# Create your views here.
def forms(request):
    mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
    mycursor=mydb.cursor()
    if request.method =="POST":
        stationID = request.POST['stationID']

        pm25 = request.POST['pm25']
        season = request.POST['season']
        rain = request.POST['rain']
        humidity = request.POST['humidity']
        cloud = request.POST['cloud']
        wind = request.POST['wind']
        visibility = request.POST['visibility']
        sql=('INSERT INTO weather_info (pm25,season,rainPrec,relHumid,cloudCover,windSpeed,visibility,stationID) VALUES (%s,%s,%s,%
        val=(pm25,season,rain,humidity,cloud,wind,visibility,stationID)
        mycursor.execute(sql,val)

        return render(request, 'form.html')
    return render(request, 'form.html')
```

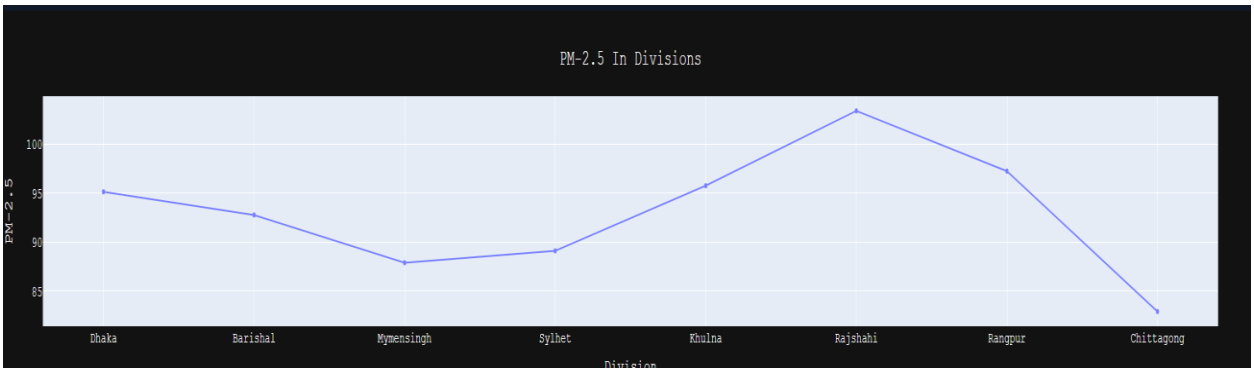
b. select division, year(daily), avg(pm25) from location inner join weather_info as w using(locID) group by division,year(daily) order by year(daily),division



Code

```
yearlyComp > yearlyviews.py > ...
1   from django.shortcuts import render
2   import mysql.connector
3   import pandas as pd
4   import plotly.graph_objects as go
5   from plotly.offline import plot
6   import plotly.express as px
7
8   def lineChart(request):
9       mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
10      mycursor=mydb.cursor()
11      mycursor.execute('select division, year(daily), avg(pm25) from location inner join weather_info as w using(locID) group by divi
12      data = mycursor.fetchall()
13      tracing = []
14      div = []
15      for divi, x, y in data:
16          if divi not in div and divi is not None:
17              div.append(divi)
18      for division in div:
19          x1=[]
20          y1=[]
21          for divi, x, y in data:
22              if(divi==division):
23                  x1.append(x)
24                  y1.append(y)
```

c. select division,avg(pm25) as pm from location as l inner join weather_info as w using(locID) group by division

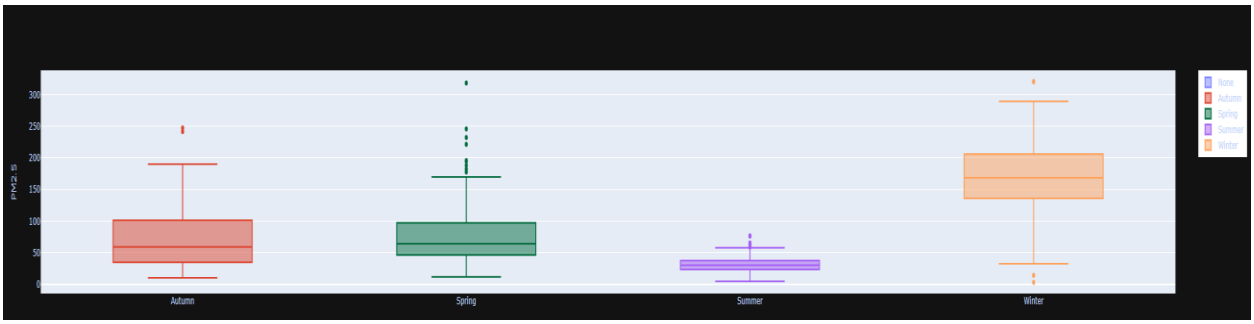


Code

DivisionLineChart > divisionlineviews.py > ...

```python
from django.shortcuts import render
import mysql.connector
import pandas as pd
import plotly.graph_objects as go
from plotly.offline import plot
import plotly.express as px
# Create your views here.
def divisonLineChart(request):
    mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
    mycursor=mydb.cursor()
    mycursor.execute('select division,avg(pm25) as pm from location as l inner join weather_info as w using(locID) group by divisio
    data =mycursor.fetchall()
    x1 = []
    y1 = []
    for division, avgpm in data:
        x1.append(division)
        y1.append(avgpm)
    fig = go.Figure(go.Scatter(
        x = x1,
        y = y1
    ))
    fig.update_layout(
        title={
            'text': "PM-2.5 In Divisions",
```

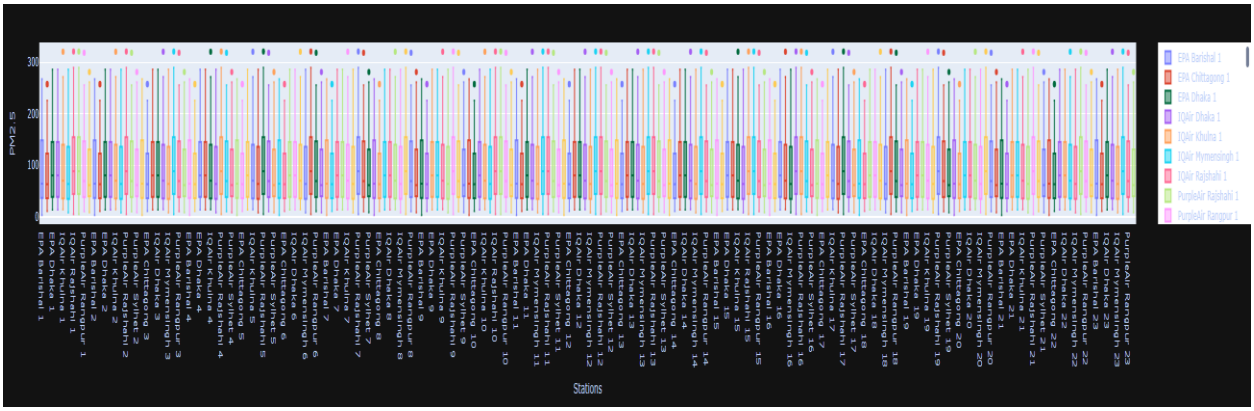
d. SELECT season,pm25 from weather_info order by season



Code

```
SeasonBoxPlot > seasonview.py > ...
1   from django.shortcuts import render
2   import mysql.connector
3   import pandas as pd
4   import plotly.graph_objects as go
5   from plotly.offline import plot
6   import plotly.express as px
7
8   # Create your views here.
9   def boxPlotSeason(request):
10      fig = go.Figure()
11      mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
12      mycursor=mydb.cursor()
13      mycursor.execute('SELECT season,pm25 from weather_info order by season ;')
14      data = mycursor.fetchall()
15      dataseason =[]
16      for season, pm in data:
17          if season not in dataseason:
18              dataseason.append(season)
19
20      for season in dataseason:
21          y1=[]
22          for sta, pm in data:
23              if sta==season:
24                  y1.append(pm)
```

e. SELECT stationName,pm25 as pm25 from station inner join weather_info using(locID) order by stationNo

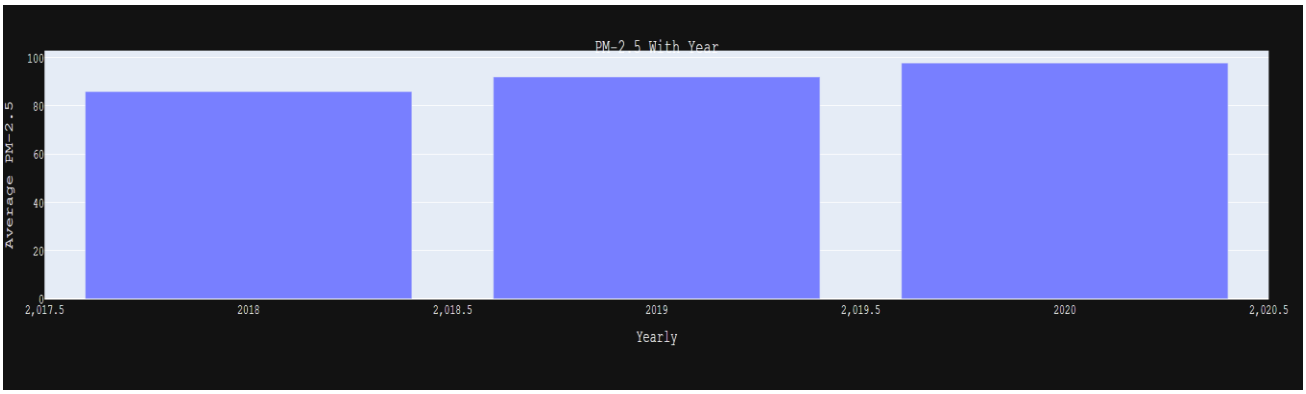


StationBoxPlot > stationview.py > ...

```python
from django.shortcuts import render
import mysql.connector
import pandas as pd
import plotly.graph_objects as go
from plotly.offline import plot
import plotly.express as px
# Create your views here.
def boxPlotStation(request):
    fig = go.Figure()
    mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
    mycursor=mydb.cursor()
    mycursor.execute('SELECT stationName,pm25 as pm25 from station inner join weather_info using(locID) order by stationNo')
    data = mycursor.fetchall()
    dataStation =[]
    for station, pm in data:
        if station not in dataStation:
            dataStation.append(station)

    for station in dataStation:
        y1=[]
        for sta, pm in data:
            if sta==station:
                y1.append(pm)
        fig.add_trace(go.Box(y=y1, name=str(station)))
```

f. select year(daily) as yyyy,avg(pm25) as pm from location as l inner join weather_info as w using(locID) group by year(daily)



DivisionBarChart > divisionbarchartviews.py > ...

```python
from django.shortcuts import render
import mysql.connector
import pandas as pd
import plotly.graph_objects as go
from plotly.offline import plot
import plotly.express as px

# Create your views here.
def barChart(request):
    mydb=mysql.connector.connect(host='localhost',user='root',password='inja',database='redsight')
    mycursor=mydb.cursor()
    mycursor.execute('select year(daily) as yyyy,avg(pm25) as pm from location as l inner join weather_info as w using(locID) group
    data =mycursor.fetchall()
    x1 = []
    y1 = []
    for year, avgpm in data:
        x1.append(year)
        y1.append(avgpm)
    fig = px.bar(data, x1, y1)
    fig.update_layout(
        title={
            'text': "PM-2.5 With Year",
            'y':0.9,
            'x':0.5,
```

CHAPTER 5: CONCLUSION

a. PROBLEM AND SOLUTION

1. Since some of us heard about this project for the first time from our faculty, it took quite a long time for us to grasp what this government project was about. The required information and database was provided by our faculty.

2. Since we were instructed to use Django and Plotly, we were unable to implement some of the required features due to lack of availability of documentation and dataset of Bangladesh.

b. ADDITIONAL FEATURES AND FUTURE DEVELOPMENT.

1. Since we used Django and Plotly, we did not have the opportunity to implement route map. We would like to do that if given the chance.

2. We would like to create a more general version of the software so that it can be used by anyone around the world.

3. Use machine learning and artificial intelligence algorithms to use old data to predict future data, produce weather data and graphs as well.

REFERENCES

CASE. (n.d.). Retrieved from CASE: http://case.doe.gov.bd/index.php?option=com_content&view=article&id=9&Itemid=31