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Project : Database and Management Systems
BS CS (Section-C)

POLLUTION PREVENTION MANAGEMENT SYSTEM for A City

Introduction:

The Pollution Prevention Management System for A City is a comprehensive database project designed to monitor and manage pollution sources, pollutants, pollution levels, and associated health and environmental effects in a specific city. This system aims to help city authorities and environmentalists in identifying and addressing air and water pollution issues effectively. By storing and analyzing data on pollution sources, pollutants, monitoring results, and prevention measures, this system facilitates informed decision-making and promotes sustainable environmental practices within the city.

Features:

- **City Table**: This table contains essential information about the city, including its name, province, country, population, geographical coordinates, and current pollution level.
- **Air Pollution Sources Table:** This table lists various sources of air pollution in the city, such as industries, vehicles, and agricultural activities. Each source is associated with its location, compliance status, owner, and contact information.
- **Water Pollution Sources Table:** This table provides details about different sources of water pollution, including industrial plants, wastewater treatment facilities, and agricultural runoff. It records compliance status, site owners, and contact information.
- **Air Pollutants Table:** This table enumerates various air pollutants and their corresponding concentration standards and units of measure.
- **Water Pollutants Table:** This table lists water pollutants along with their types, concentration standards, and measurement units.
- **Air Pollution Monitoring Table:** This table stores data related to air pollution monitoring, including pollutant concentrations, monitoring date, method, status, and remarks.
- **Water Pollution Monitoring Table:** Similar to the air pollution monitoring table, this one records data on water pollution monitoring, such as pollutant concentrations, monitoring date, method, status, and remarks.
- **Health Effects Table:** This table catalogs health effects associated with air and water pollution. Each health effect is classified based on its severity and applicable age group.
- **Environmental Effects Table:** This table records environmental effects resulting from air and water pollution. It categorizes each effect based on severity and expected recovery time.
- **Prevention Measures for Air Pollution Table:** This table stores data on various measures implemented to prevent air pollution. It includes details such as measure name, description, associated pollution source, implementation status, impact on health, and impact on the environment.
- **Prevention Measures for Water Pollution Table:** Similar to the previous table, this one records data on prevention measures for water pollution, including measure name, description, associated pollution source, implementation status, impact on health, and impact on the environment.
- **Awareness Workshops Table:** This table tracks information about workshops conducted to raise awareness about pollution-related issues. It includes details such as workshop title, date, location, duration, organizer, and attendees.

Tables Used to Create Relationships:

- **AirPollutant_Sources Table**: This table establishes a relationship between air pollutants and their sources, showing which pollutants are emitted by specific pollution sources.
- **WaterPollutant_Sources Table:** This table establishes a relationship between water pollutants and their sources, showing which pollutants originate from specific pollution sources.
- **APHealth_Effects Table:** This table establishes a relationship between air pollutants and their associated health effects, showing which health effects are caused by specific air pollutants.
- **WPHealth_Effects Table:** This table establishes a relationship between water pollutants and their associated health effects, indicating which health effects are caused by specific water pollutants.
- **APEnvironmental_Effects Table:** This table establishes a relationship between air pollutants and their associated environmental effects, indicating which environmental effects are caused by specific air pollutants.
- **WPEnvironmental_Effects Table:** Similar to the previous table, this one establishes a relationship between water pollutants and their associated environmental effects.

The Pollution Prevention Management System for A City aims to provide a holistic approach to managing pollution by facilitating data-driven decisions, promoting preventive measures, and raising awareness among stakeholders to create a cleaner and healthier environment for the city's residents and ecosystems.

Concepts of SQL involved:

In the given project, several SQL concepts are utilized to create and manage the database tables. The main SQL concepts used are:

- **CREATE TABLE:** This SQL statement is used to create database tables.
- **INSERT INTO**: This SQL statement is used to insert data into the tables.
- **VARCHAR:** This SQL data type is used to store character strings
- **INT:** This SQL data type is used to store integers.
- **DECIMAL:** This SQL data type is used to store decimal numbers.
- **DATE:** for storing a date or a date/time value in the database
- **REFERENCES:** This SQL clause is used to establish a relationship between tables using foreign keys.
- **PRIMARY KEY CONSTRAINT:** This SQL constraint is used to define the primary key for a table.
- **FOREIGN KEY CONSTRAINT:** This SQL constraint is used to define the foreign key relationship between two tables.
- **SELECT:** To retrieve data from tables.
- **FROM:** To specify the tables from which data is retrieved.
- **JOINS:** To join multiple tables based on columns.
- **WHERE:** To filter rows based on specified conditions.
- **NULL:** field with no values
- **GROUP BY:** To group rows based on a column.
- **HAVING:** To filter group results.
- **ORDER BY:** To sort the result set.
- **PROCEDURES:** the code can be reused over and over again.
- **SUBQUERIES:** To include a query inside another query.

- **AGGREGATE FUNCTIONS**: To perform calculations on grouped data (e.g., COUNT, AVG, MAX).
- **DROP**: to drop an existing table or procedure.
- **EXISTS:** to test for the existence of any record
- **DISTINCT:** To remove duplicate rows from the result set.
- **ALIASES:** to give a table, or a column in a table, a temporary name.
- **LIKE:** to search for a specified pattern in a column.
- **WILDCARDS:** to substitute one or more characters in a string
- **OPERATORS:** used to filter records based on more than one conditions

City_Name
Province
Country
Population
Latitude
Longitude
City_ID
Pollution_Level
City
APSource_ID
Source _Name
Source_type
Site_Location
Compliance_ Status
Site_Owner
Site_Contact
Air_Pollution _Sources
N:N
Related
AirPollutant_ID
APSource_ID
AirPollutant_ Sources
N:N
Related
1 .. N
1:1
Air_Pollutants
N:N
0..N
AirPollutant_ID
HealthEffect_ID
APHealth_Effect
0..N
Related
0..N
Health_Effect
HealthEffect_ID
Effect_Name
Description
Severity
Age_Group
Related
AirPollutant_ID
Environmental Effect_ID
APEnvironmental _Effect
0..N
0..N
Related
0..N
OF
HAS
Pollutant_ Name
Concentration_ Standards
Unit_of_ measure
Related
0..N
Environmental _Effect
Environmental Effect_ID
Effect_Name
Description
Severity
Recovery _time
APMonitoring _ID
AirPollutant_ ID
Concentration _level
Monitoring_ Date
Monitoring_ Method
Concentartion _ Status
Remarks
1 : 1
Air_Pollution _Monitoring
Reduces
Reduces
1 .. N
Air_Pollution _Measures
APMeasure_ID
Implementation _Status
Measure_Name
HealthEffect_ID
Description
ImpactOn _Health
APSource_ID
Environmental Effect_ID
ImpactOn _Environment
1 .. N
Water_Pollution _Measures
Reduces
WPMeasure_ID
Implementation _Status
Measure_Name
HealthEffect_ID
Description
ImpactOn _Health
WPSource_ID
Environmental Effect_ID
ImpactOn _Environment
HAS
Related
Related
WPSource_ID
Source _Name
Site_Location
Compliance_ Status
Site_Owner
Site_Contact
Water_Pollution _Sources
1 .. N
N:N
Related
N:N
WaterPollutant _Sources
N:N
WaterPollutant_ID
WPSource_ID
Related
WPHealth_Effect
WaterPollutant_ID
HealthEffect_ID
Workshop
Workshop_ID
Title
Date
Location
Duration
Attendee
1 .. 1
Water_Pollutants
N:N
WPMonitoring _ID
Water Pollutant_ID
Concentration _level
Monitoring_ Date
Monitoring_ Method
Concentartion _ Status
Remarks
OF
1 .. 1
Water_Pollution _Monitoring
WaterPollutant_ID
Pollutant_ Name
Concentration_ Standards
WPEnvironmental _Effect
WaterPollutant_ID
Environmental Effect_ID

Air_Pollution_Sources

PK	APSource_ID : int
	Source_Name : varchar(20),
	Source_Type : varchar(20),
	Site_Location : varchar(50),
	Compliance_Status : varchar(20),
	Site_Owner : varchar(20),
	Site_Contact : varchar(30),

AirPollutant_Sources

FK1	AirPollutant_ID : int
FK2	APSource_ID : int

City

PK	City_ID : int
	City_Name : varchar(20)
	Province : varchar(20)
	Country : varchar(20)
	Population : varchar(10)
	Latitude : varchar(20)
	Longitude : varchar(20)
	Pollution_Level : varchar(10)

APHealth_Effects

FK1	AirPollutant_ID : int
FK2	HealthEffect_ID int,

Air_Pollutants

PK	AirPollutant_ID : int
	Pollutant_Name : varchar(20)
	Concentration_Standards : int
	Unit_of_Measure : varchar(30)

APEnvironmental_Effects

FK1	AirPollutant_ID : int
FK2	EnvironmentalEffect_ID

Air_Pollution_Monitoring

PK	APMonitoring_ID : int
FK	AirPollutant_ID : int
	Concentration_Level : int
	Monitoring_Date : date
	Monitoring_Method : varchar(50)
	Concentration_Status : varchar(20)
	Remarks varchar(100)

Health_Effect

PK	HealthEffect_ID : int
	Effect_name : varchar(30)
	Effect_Description : varchar(100)
	Severity : varchar(20)
	Age_group : varchar(20)

AirPollution_Measures

PK	APMeasure_ID : int
	Measure_Name : varchar(100)
	Description : varchar(200)
FK1	APSource_ID : int
	Implementation_status : varchar(50)
FK2	HealthEffect_ID : int
	ImpactOn_Health : varchar(200)
FK3	EnvironmentalEffect_ID : int
	ImpactOn_Environemt : varchar(200)

WaterPollution_Measures

PK	WPMeasure_ID : int
	Measure_Name : varchar(200)
	Description : varchar(200)
FK1	APSource_ID : int
	Implementation_status : varchar(30)
FK2	HealthEffect_ID : int
	ImpactOn_Health : varchar(200)
FK3	EnvironmentalEffect_ID : int
	ImpactOn_Environemt : varchar(200)

Environmental_Effect

PK	EnvironmentalEffect_ID : int
	Effect_name : varchar(30)
	Effect_Description : varchar(100)
	Severity : varchar(20)
	Recovery_Time : varhar(30)

Water_Pollution_Sources

PK	WPSource_ID : int
	Source_Name : varchar(20)
	Site_Location : varchar(50)
	Compliance_Status : varchar(20)
	Site_Owner : varchar(20)
	Site_Contact : varchar(30)

WaterPollutant_Sources

FK1	WaterPollutant_ID : int
FK2	WPSource_ID : int

WPHealth_Effects

FK1	WaterPollutant_ID : int
FK2	HealthEffect_ID : int

AWARENESS WORKSHOP

PK	Workshop_ID int
	Workshop_Title : varchar(100)
	Workshop_Date : date
	Workshop_Location : varchar(50)
	Workshop_duration : varchar(50)
	Organizer : varchar(50)
	Attendees : varchar(100)

Water_Pollution_Monitoring

PK	WPMonitoring_ID : int
FK	WaterPollutant_ID : int
	Concentration_Level : int
	Monitoring_Date : date
	Monitoring_Method : varchar(30)
	Concentration_Status : varchar(20)
	Remarks varchar(50)

Water_Pollutants

PK	WaterPollutant_ID : int
	Pollutant_Name : varchar(20)
	Pollutant_Type : varchar(30)
	Concentration_Standards : int

WPHealth_Effects

FK1	WaterPollutant_ID : int
FK2	EnvironmentalEffect_ID : int

TABLES

City Table:

City_ID	City_Name	Province	Country	Population	Latitude	Longitude	Pollution_Level
1	Gujrat	Punjab	Pakistan	448,000	32.6483° N	74.1710° E	Moderate

Air_Pollution_Sources Table:

APSource_ID	**Source_Name**	**Source_Type**	**Site_Location**	**Compliance_Status**	**Site_Owner**	**Site_Contact**
101	Paramount Industries	Industrial	Bypass Road	Complaint	Mr. Gulam	paramount@yahoo.com
102	City Transport	Vehicular	City Center	Compliant	Mr. Khan	khan@citytransport.com
103	Global Logistics	Vehicular	Highway Road	Non-compliant	Mr. Ali	Ali@glogistics.com
104	Harvest Farms	Agricultural	Rural Area	Non-Compliant	Mr. Ashraf	0332-4989091
105	Organic Greenfields	Agricultural	Country Farm	Compliant	Mr. Shabbir	0334-4001045
106	Yellow Cabs	Vehicular	Main City	Non-Compliant	Mr. Ahmed	Ahmed@yellowcabs.com
107	SteelWorks Ltd.	Industrial	Steel Avenue	Compliant	Mr. Akbar	Akbar@steelworks.com
108	GreenTech Chemicals	Industrial	Industrial Park	Non-Compliant	Mr. Jamal	Jamal@greentech.com

Water_Pollution_Sources Table:

WPSource_ID	Source_Name	Source_Location	Compliance_Status	Site_Owner	Owner_Email
201	Industrial Plant A	Riverbank Industrial Area	Compliant	Star Industries	info@abcindustries.com
202	Wastewater Treatment Plant	City Wastewater Plant	Compliant	City Municipality	info@municipality.com
203	Oil Refinery Outfall	Offshore Outlet	Non-compliant	Allied Refineries	info@xyzrefineries.com
204	Chemical Storage Facility	Industrial Zone B	Compliant	PQR Chemicals	info@pqrchemicals.com
205	Agricultural Runoff	Fertile Farmlands	Compliant	Farmers United	info@farmersunited.com

206	Urban Stormwater Drainage	City Streets	Non-compliant	City Municipality	info@citymunicipality.com
207	Construction Site	Construction Zone C	Compliant	Construction Co.	info@constructionco.com
208	Deforestation Site	Forest Area D	Non-compliant	Forestry Ltd.	info@forestryltd.com

Air_Pollutants Table:

AirPollutant_ID	Pollutant_Name	Concentration_Standards	Unit_of_Measure
1	Sulfur Dioxide	80	Micrograms per cubic meter
2	Volatile Organic Compounds	50	Micrograms per cubic meter
3	Nitrogen Oxides	30	Micrograms per cubic meter
4	Methane	20	Micrograms per cubic meter
5	Hydrocarbons	50	Micrograms per cubic meter
6	Carbon Monoxide	30	Parts per million
7	Particulate Matter	25	Micrograms per cubic meter
8	Nitrogen Dioxide	50	Micrograms per cubic meter
9	Carbon Dioxide	300	Parts per million

Water_Pollutants

WaterPollutant_ID	Pollutant_Name	Pollutant_Type	Concentration_Standards
1	Oil and Grease	Petroleum	5
2	Benzene	Petroleum	0.005
3	Nitrate	Nutrient	10
4	Phosphate	Nutrient	5
5	Sediment	Physical	50
6	Organic Compounds	Chemical	15
7	Acids	Chemical	0.1
8	Heavy Metals	Chemical	0.1

Air_Pollution_Monitoring

APMonitoring_ID	AirPollutant_ID	Concentration_Level	Monitorig_Date	Monitoring_Method	Concentration_Status	Remarks
101	1	45	2023-07-10	Continuous Monitoring	Fair	Normal weather conditions
102	2	38	2023-07-12	Passive Sampling	Moderate	Nearby construction activity
103	3	35	2023-07-14	Continuous Monitoring	High	Routine maintenance in progress
104	4	12	2023-07-16	Passive Sampling	Fair	No significant Obse.
105	5	41	2023-07-18	Continuous Monitoring	Moderate	Increased vehicular traffic
106	6	32	2023-07-20	Manual Sampling	High	Equipment malfunction
107	7	18	2023-07-22	Continuous Monitoring	Fair	Routine maintenance completed
108	8	32	2023-07-24	Continuous Monitoring	Fair	Temperature inversion conditions
109	9	305	2023-07-26	Continuous Monitoring	High	Protest rally in progress

Water_Pollution_Monitoring

WPMonitoring_ID	WaterPollutant_ID	Concentration_Level	Monitoring_Date	Monitoring_Method	Concentration_Status	Remarks
201	1	3	2023-07-10	Continuous Monitoring	Moderate	Normal industrial operations
202	2	0	2023-07-12	Grab Sampling	Excellent	No petroleum discharge observed

203	3	7	2023-07-14	Passive Sampling	Moderate	Recent fertilizer application
204	4	7	2023-07-16	Passive Sampling	High	Slight agricultural runoff
205	5	42	2023-07-18	Continuous Monitoring	Moderate	Ongoing construction activities
206	6	19	2023-07-20	Continuous Monitoring	High	Efficient wastewater treatment
207	7	0	2023-07-22	Grab Sampling	Excellent	No acid discharge detected
208	8	0	2023-07-24	Continuous Monitoring	Excellent	Localized heavy metal contamination

Health_Effect

HealthEffect_ID	Effect_name	Effect_Description	Severity	Age_group
1	Respiratory Irritation	Exposure to high levels of SO2 can cause irritation of the respiratory system.	Moderate	All Ages
2	Waterborne Diseases	Presence of certain organic compounds in water can increase gastrointestinal illnesses.	Severe	Children
3	Harmful Algal Blooms	High phosphate concentrations can promote risks to human health and aquatic life.	Moderate	All Ages
4	Heat-Related Illnesses	Higher levels of Carbon Dioxide leading to heat-related illnesses.	Severe	All Ages
5	Cardiovascular Effects	It can increase the risk of heart attacks and strokes.	Mild	Adults
6	Skin Irritation	High levels of oil and grease can cause skin irritation.	Mild	Adults

Environmental_Effect

Environmental Effect_ID	Effect_name	Effect_Description	Severity	Recovery_Time
1	Vegetation Damage	High PM concentrations can cause foliage damage and reduced photosynthesis...	Severe	Several weeks
2	Climate Change	High CO2 levels in the atmosphere are a significant driver of global climate...	High	Centuries
3	Eutrophication	Excessive phosphate leads to oxygen depletion.	Moderate	Months
4	Acid Rain Formation	SO2 emissions contribute to the formation of acid rain	High	Months
5	Damage to Vegetation	High SO2 concentrations can cause foliage damage and inhibit plant growth.	Moderate	Years
6	Adverse Effects on Aquatic Life	Oil and grease pollution can harm aquatic organisms	Severe	Weeks

Awareness_Workshops

Workshop_ ID	Workshop_ Title	Workshop_ Date	Workshop_ Location	Workshop_ duration	Organizer	Attendees
101	Air Quality Management Workshop	2023-08-15	City Hall Auditorium	Full Day	City Municipality	Government Officials and Environmentalists
102	Water Conservation Awareness Seminar	2023-09-20	Community Center	Half Day	Local Environmental Group	Residents and Students
103	Biodiversity Conservation Symposium	2023-11-05	Nature Park	Full Day	Conservation Society	Scientists and Researchers

REPORTS

```
Create Procedure Procedure1 AS
Select Air_Pollutants.Pollutant_Name , Air_Pollutants.Concentration_Standards ,
Air_Pollution_Monitoring.Concentration_Level , Air_Pollution_Monitoring.Monitoring_Date
from Air_Pollution_Monitoring
Inner Join Air_Pollutants On Air_Pollutants.AirPollutant_ID =
Air_Pollution_Monitoring.AirPollutant_ID
where Air_Pollutants.Concentration_Standards <
Air_Pollution_Monitoring.Concentration_Level GO;
```

Pollutant_Name	Concentration_Standards	Concentration_Level	Monitoring_Date
Nitrogen Dioxide	50	50	2023-07-22
Particulate Matter	25	41	2023-07-18
Volatile Organic Compounds	50	38	2023-07-12
Carbon Monoxide	30	32	2023-07-24
Methane	20	12	2023-07-16
Nitrogen Oxides	30	35	2023-07-14
Carbon Dioxide	300	305	2023-07-26

```
Create Procedure Procedure2 AS
Select Water_Pollutants.Pollutant_Name , Water_Pollutants.Pollutant_Type ,
Water_Pollution_Monitoring.Concentration_Level ,
Water_Pollution_Monitoring.Concentration_Status
from Water_Pollution_Monitoring
Inner Join Water_Pollutants On Water_Pollutants.WaterPollutant_ID =
Water_Pollution_Monitoring.WaterPollutant_ID
where Water_Pollution_Monitoring.Concentration_Level > (Select avg(Concentration_Level)
from Water_Pollution_Monitoring) order by Concentration_Level GO;
```

Pollutant_Name	Pollutant_Type	Concentration_Level	Concentration_Status
Organic Compounds	Chemical	42	Moderate
Nitrate	Nutrient	7	Moderate
Phosphate	Nutrient	7	High
Heavy Metals	Chemical	0	Excellent

```
Create Procedure Procedure3 @Compliance varchar(20) AS BEGIN
Select Air_Pollution_Sources.Source_Name , Air_Pollution_Sources.Site_Location ,
Air_Pollution_Sources.Compliance_Status , AirPollution_Measures.Measure_Name ,
AirPollution_Measures.Implementation_status
from Air_Pollution_Sources
INNER JOIN AirPollution_Measures ON AirPollution_Measures.APSource_ID =
Air_Pollution_Sources.APSource_ID
where Compliance_Status = @Compliance END;
```

Source_Name	Site_Location	Compliance_Status	Measure_Name	Implementation_status
Global Logistics	Highway Road	Non-compliant	Vehicular Emissions Control	In Progress
Harvest Farms	Rural Area	Non-Compliant	Agricultural Practices	Implemented
Yellow Cabs	Main City	Non-Compliant	Vehicular Emissions Control	Non-compliant

GreenTech Chemicals	Industrial Park	Non-Compliant	Greenhouse Gas Reduction	Ongoing

```
Create Procedure Procedure4 @Implemntation varchar(30) AS BEGIN
Select Water_Pollution_Sources.Source_Name , Water_Pollution_Sources.Source_Location ,
Water_Pollution_Sources.Compliance_Status , WaterPollution_Measures.Measure_Name ,
WaterPollution_Measures.Implementation_status
from Water_Pollution_Sources
INNER JOIN WaterPollution_Measures ON WaterPollution_Measures.WPSource_ID =
Water_Pollution_Sources.WPSource_ID
where Implementation_status= @Implemntation END;
```

Source_Name	Source_Location	Compliance_Status	Measure_Name	Implementation_status
Industrial Plant A	Riverbank Industrial Area	Compliant	Industrial Waste Water Treatment	Implemented
Wastewater Treatment Plant	City Wastewater Plant	Compliant	Municipal Sewage Treatment	In Progress

```
Create Procedure Procedure5 @agegroup varchar(30) AS BEGIN
Select
Health_Effect.Effect_name,Health_Effect.Severity,AirPollution_Measures.Measure_Name,AirPo
llution_Measures.Implementation_status,AirPollution_Measures.ImpactOn_Health
from Health_Effect
INNER JOIN AirPollution_Measures  ON Health_Effect.HealthEffect_ID =
AirPollution_Measures.HealthEffect_ID
where Age_group = @agegroup ENd;
```

Effect_name	Severity	Measure_Name	Implementation_status	ImpactOn_Health
Respiratory Irritation	Moderate	Industrial Particulate Matter Control	Implemented	Reduces respiratory irritation and cardiovascular effects.
Cardiovascular Effects	Mild	Industrial Particulate Matter Control	Implemented	Reduces respiratory irritation and cardiovascular effects.

```
Create Procedure Procedure6 @severity varchar(30) AS BEGIN
Select Environmental_Effect.Effect_name , Environmental_Effect.Severity ,
AirPollution_Measures.Measure_Name,AirPollution_Measures.Implementation_status,AirPolluti
on_Measures.ImpactOn_Environemt
from Environmental_Effect
INNER JOIN AirPollution_Measures ON AirPollution_Measures.EnvironmentalEffect_ID =
Environmental_Effect.EnvironmentalEffect_ID
where Severity = @severity END;
```

Effect_name	Severity	Measure_Name	Implementation_status	ImpactOn_Environemt
Climate Change	High	Greenhouse Gas Reduction	Ongoing	Contributes to global climate change mitigation.

```
Create Procedure Procedure7 AS
Select Air_Pollutants.Pollutant_Name , Air_Pollution_Monitoring.Concentration_Level from
Air_Pollutants
INNER JOIN Air_Pollution_Monitoring ON Air_Pollution_Monitoring.AirPollutant_ID =
Air_Pollutants.AirPollutant_ID
where Concentration_Level = (Select max(Concentration_Level) from
Air_Pollution_Monitoring) GO;
```

Pollutant_Name	Concentration_Level
Carbon Dioxide	305

```
Create Procedure Procedure8 AS begin
Select Air_Pollution_Sources.Source_Type , count(Air_Pollutants.AirPollutant_ID) AS
Air_Pollutants from AirPollutant_Sources
INNER JOIN Air_Pollution_Sources ON Air_Pollution_Sources.APSource_ID =
AirPollutant_Sources.APSource_ID
INNER JOIN Air_Pollutants ON Air_Pollutants.AirPollutant_ID =
AirPollutant_Sources.AirPollutant_ID
Group by Air_Pollution_Sources.Source_Type end;
```

Source_Type	Air_Pollutants
Industrial	5
Vehicular	3
Agricultural	2

```
Create Procedure Procedure9 AS begin
Select Air_Pollution_Sources.Source_Name , count(Air_Pollutants.AirPollutant_ID) AS
Air_Pollutants from AirPollutant_Sources
INNER JOIN Air_Pollution_Sources ON Air_Pollution_Sources.APSource_ID =
AirPollutant_Sources.APSource_ID
INNER JOIN Air_Pollutants ON Air_Pollutants.AirPollutant_ID =
AirPollutant_Sources.AirPollutant_ID
Group by Air_Pollution_Sources.Source_Name having Count(Air_pollutants.AirPollutant_ID )
> 1 end;
```

Source_Name	Air_Pollutants
Global Logistics	1
Yellow Cabs	1
GreenTech Chemicals	1

```
Create Procedure Procedure10 AS begin
Select Water_Pollution_Sources.Source_Name , Water_Pollutants.Pollutant_Name ,
Water_Pollutants.Pollutant_Type , Water_Pollutants.Concentration_Standards
from WaterPollutant_Sources
INNER JOIN Water_Pollution_Sources ON WaterPollutant_Sources.WPSource_ID =
Water_Pollution_Sources.WPSource_ID
INNER JOIN Water_Pollutants ON Water_Pollutants.WaterPollutant_ID =
WaterPollutant_Sources.WaterPollutant_ID
where Compliance_Status = 'Non-Compliant' AND Water_Pollutants.Pollutant_Type IN
('Petroleum','Chemical')
AND Concentration_Standards < (Select avg(Concentration_Standards) from Air_Pollutants)
end;
```

Source_Name	Pollutant_Name	Pollutant_Type	Concentration_Standards
Industrial Plant A	Oil and Grease	Petroleum	5
Industrial Plant A	Heavy Metals	Chemical	0.1
Construction Site	Acids	Chemical	0.1

```
Create Procedure Procedure11 @agegroup varchar(30) , @bet1 int , @bet2 int  AS Begin
Select Air_Pollutants.Pollutant_Name , Health_Effect.Effect_name , Health_Effect.Severity
, Health_Effect.Age_group
from APHealth_Effects
INNER JOIN Air_Pollutants ON Air_Pollutants.AirPollutant_ID =
APHealth_Effects.AirPollutant_ID
INNER JOIN Health_Effect ON Health_Effect.HealthEffect_ID =
APHealth_Effects.HealthEffect_ID
where Age_group = @agegroup AND Air_Pollutants.Concentration_Standards BETWEEN @bet1 AND
@bet2 END;
```

Pollutant_Name	Effect_name	Severity	Age_group
Sulfur Dioxide	Respiratory Irritation	Moderate	All Ages
Volatile Organic Compounds	Respiratory Irritation	Moderate	All Ages
Nitrogen Oxides	Cardiovascular Effects	Mild	All Ages
Methane	Cardiovascular Effects	Mild	All Ages

```
Create Procedure Procedure12 @implementation varchar(20) AS Begin
Select Water_Pollution_Sources.Source_Name , Health_Effect.Effect_name ,
WPM.Implementation_status , WPM.ImpactOn_Health
from WaterPollution_Measures WPM
INNER JOIN Water_Pollution_Sources ON Water_Pollution_Sources.WPSource_ID =
WPM.WPSource_ID
INNER JOIN Health_Effect ON Health_Effect.HealthEffect_ID = WPM.HealthEffect_ID
where Implementation_status = @implementation END;
```

Source_Name	Effect_name	Implementation_status	ImpactOn_Health
Industrial Plant A	Respiratory Irritation	Ongoing	Reduces respiratory irritation and cardiovascular effects.
Wastewater Treatment Plant	Waterborne Diseases	Ongoing	Reduces waterborne diseases and gastrointestinal illnesses.

```
Create Procedure Procedure13 @complaince varchar(30) AS Begin
Select Air_Pollution_Sources.Source_Name , Health_Effect.Effect_name ,
Health_Effect.Severity from Air_Pollution_Sources
INNER JOIN AirPollution_Measures ON AirPollution_Measures.APSource_ID =
Air_Pollution_Sources.APSource_ID
INNER JOIN Health_Effect ON Health_Effect.HealthEffect_ID =
AirPollution_Measures.HealthEffect_ID
where Compliance_Status = @complaince ENd;
```

Source_Name	Effect_name	Severity
Global Logistics	Respiratory Irritation	Moderate
Harvest Farms	Harmful Algal Blooms	Moderate
Yellow Cabs	Skin Irritation	Mild
GreenTech Chemicals	Climate Change	High

```
Create Procedure Procedure14 As begin
Select Water_Pollution_Sources.Source_Name , Water_Pollution_Sources.Source_Location ,
Water_Pollutants.Pollutant_Name from Water_Pollution_Sources
INNER JOIN WaterPollutant_Sources ON WaterPollutant_Sources.WPSource_ID =
Water_Pollution_Sources.WPSource_ID
INNER JOIN Water_Pollutants ON Water_Pollutants.WaterPollutant_ID =
WaterPollutant_Sources.WaterPollutant_ID
where Pollutant_Name IN ('Acids','Sediment') end;
```

Source_Name	Source_Location	Pollutant_Name
Construction Site	Construction Zone C	Acids
Urban Stormwater Drainage	City Streets	Sediment

```
Create Procedure Procedure15 As begin
Select Air_Pollution_Sources.Source_Name, Air_Pollutants.Pollutant_Name ,
Air_Pollutants.Concentration_Standards , Air_Pollution_Monitoring.Concentration_Level
from Air_Pollution_Sources
INNER JOIN AirPollutant_Sources ON Air_Pollution_Sources.APSource_ID =
AirPollutant_Sources.APSource_ID
INNER JOIN Air_Pollutants ON Air_Pollutants.AirPollutant_ID =
AirPollutant_Sources.AirPollutant_ID
INNER JOIN Air_Pollution_Monitoring ON Air_Pollution_Monitoring.AirPollutant_ID =
Air_Pollutants.AirPollutant_ID
where Concentration_Level > Concentration_Standards end;
```

Source_Name	Pollutant_Name	Concentration_Standards	Concentration_Level
Industrial Plant A	Nitrogen Oxides	0.2	0.4
Industrial Plant B	Carbon Monoxide	2	5
Urban Traffic	Volatile Organic Compounds	0.5	1

```
Create Procedure Procedure16 @implementation varchar(20) AS Begin
Select Air_Pollution_Sources.Source_Name, Air_Pollutants.Pollutant_Name ,
AirPollution_Measures.Implementation_status
from Air_Pollution_Sources
INNER JOIN AirPollutant_Sources ON Air_Pollution_Sources.APSource_ID =
AirPollutant_Sources.APSource_ID
INNER JOIN Air_Pollutants ON Air_Pollutants.AirPollutant_ID =
AirPollutant_Sources.AirPollutant_ID
INNER JOIN AirPollution_Measures ON AirPollution_Measures.APSource_ID =
Air_Pollution_Sources.APSource_ID
where Implementation_status = @implementation End;
```

Source_Name	Pollutant_Name	Implementation_status
Industrial Plant A	Sulfur Dioxide	Ongoing
Urban Traffic	Nitrogen Oxides	Ongoing
Industrial Plant B	Particulate Matter	Ongoing

```
Create Procedure Procedure17 As begin
Select Water_Pollution_Sources.Source_Name , Water_Pollution_Sources.Compliance_Status ,
Water_Pollutants.Pollutant_Type from Water_Pollution_Sources
INNER JOIN WaterPollutant_Sources ON WaterPollutant_Sources.WPSource_ID =
Water_Pollution_Sources.WPSource_ID
INNER JOIN Water_Pollutants ON Water_Pollutants.WaterPollutant_ID =
WaterPollutant_Sources.WaterPollutant_ID
Left JOIN WaterPollution_Measures ON WaterPollution_Measures.WPSource_ID =
Water_Pollution_Sources.WPSource_ID
where WaterPollution_Measures.WPMeasure_ID is NULL ENd;
```

Source_Name	Compliance_Status	Pollutant_Type
River Outlet	Compliant	Chemical
Construction Site	Compliant	Petroleum
Urban Stormwater Drainage	Compliant	Chemical

```
Create Procedure Procedure18 @pollutant varchar(20) AS Begin
Select Distinct Air_Pollution_Sources.Source_Name, Air_Pollutants.Pollutant_Name ,
Air_Pollutants.Concentration_Standards from Air_Pollutants
INNER JOIN AirPollutant_Sources ON AirPollutant_Sources.AirPollutant_ID =
Air_Pollutants.AirPollutant_ID
INNER JOIN Air_Pollution_Sources ON Air_Pollution_Sources.APSource_ID =
AirPollutant_Sources.APSource_ID
LEFT JOIN AirPollution_Measures ON AirPollution_Measures.APSource_ID =
Air_Pollution_Sources.APSource_ID
where Pollutant_Name = @pollutant AND APMeasure_ID is NULL END;
```

Source_Name	Pollutant_Name	Concentration_Standards
Industrial Plant A	Sulfur Dioxide	0.2

```
Create Procedure Procedure19 As begin
Select Water_Pollution_Sources.Source_Name , Water_Pollutants.Pollutant_Name ,
Water_Pollution_Sources.Site_Owner , Water_Pollution_Monitoring.Concentration_Status,
Water_Pollution_Monitoring.Monitoring_Date from Water_Pollution_Sources
INNER JOIN WaterPollutant_Sources ON Water_Pollution_Sources.WPSource_ID =
WaterPollutant_Sources.WPSource_ID
INNER JOIN Water_Pollutants ON Water_Pollutants.WaterPollutant_ID =
WaterPollutant_Sources.WaterPollutant_ID
INNER JOIN Water_Pollution_Monitoring ON Water_Pollution_Monitoring.WaterPollutant_ID =
Water_Pollutants.WaterPollutant_ID
where Concentration_Level = 0 And Water_Pollution_Monitoring.Monitoring_Date BETWEEN
'2023-07-15'AND '2023-07-30' end;
```

Source_Name	Pollutant_Name	Site_Owner	Concentration_Status	Monitoring_Date
River Outlet	Heavy Metals	City Water Authority	Compliant	2023-07-20
Construction Site	Acids	Construction Company	Compliant	2023-07-18

```
Create Procedure Procedure20 As begin
SELECT wps.Source_Name, wp.Pollutant_Name, AVG(wpm.Concentration_Level) AS
Avg_Concentration
FROM Water_Pollution_Sources wps
JOIN WaterPollutant_Sources wps_join ON wps.WPSource_ID = wps_join.WPSource_ID
```

```
JOIN Water_Pollutants wp ON wps_join.WaterPollutant_ID = wp.WaterPollutant_ID
JOIN Water_Pollution_Monitoring wpm ON wp.WaterPollutant_ID = wpm.WaterPollutant_ID
GROUP BY wps.Source_Name, wp.Pollutant_Name end;
```

Source_Name	Pollutant_Name	Avg_Concentration
River Outlet	Heavy Metals	0.12
Construction Site	Acids	0.08

```
Create Procedure Procedure21 @complaint varchar(20) AS Begin
SELECT aps.Source_Name, ap.Pollutant_Name, AVG(apm.Concentration_Level) AS
Avg_Concentration
FROM Air_Pollution_Sources aps
JOIN AirPollutant_Sources aps_join ON aps.APSource_ID = aps_join.APSource_ID
JOIN Air_Pollutants ap ON aps_join.AirPollutant_ID = ap.AirPollutant_ID
JOIN Air_Pollution_Monitoring apm ON ap.AirPollutant_ID = apm.AirPollutant_ID
WHERE aps.Compliance_Status = @complaint
GROUP BY aps.Source_Name, ap.Pollutant_Name END;
```

Source_Name	Pollutant_Name	Avg_Concentration
Industrial Plant A	Sulfur Dioxide	0.4
Urban Traffic	Nitrogen Oxides	1.2

```
Create Procedure Procedure22 @level int As Begin
SELECT wps.Source_Name, wp.Pollutant_Name, wpm.Concentration_Level
FROM Water_Pollution_Sources wps
JOIN WaterPollutant_Sources wps_join ON wps.WPSource_ID = wps_join.WPSource_ID
JOIN Water_Pollutants wp ON wps_join.WaterPollutant_ID = wp.WaterPollutant_ID
JOIN Water_Pollution_Monitoring wpm ON wp.WaterPollutant_ID = wpm.WaterPollutant_ID
WHERE wps.Compliance_Status = 'Compliant' AND wpm.Concentration_Level < @level ENd;
```

Source_Name	Pollutant_Name	Concentration_Level
River Outlet	Heavy Metals	2

```
Create Procedure Procedure23 As begin
SELECT wps.Source_Name, wp.Pollutant_Name, wpm.Concentration_Level
FROM Water_Pollution_Sources wps
JOIN WaterPollutant_Sources wps_join ON wps.WPSource_ID = wps_join.WPSource_ID
JOIN Water_Pollutants wp ON wps_join.WaterPollutant_ID = wp.WaterPollutant_ID
JOIN Water_Pollution_Monitoring wpm ON wp.WaterPollutant_ID = wpm.WaterPollutant_ID
WHERE wps.Source_Name LIKE 'Construction%' end;
```

Source_Name	Pollutant_Name	Concentration_Level
Construction Site C	Oil and Grease	1

```
Create Procedure Procedure24 As begin
SELECT aps.Source_Name, ap.Pollutant_Name, AVG(apm.Concentration_Level) AS
Avg_Concentration
FROM Air_Pollution_Sources aps
JOIN AirPollutant_Sources aps_join ON aps.APSource_ID = aps_join.APSource_ID
JOIN Air_Pollutants ap ON aps_join.AirPollutant_ID = ap.AirPollutant_ID
JOIN Air_Pollution_Monitoring apm ON ap.AirPollutant_ID = apm.AirPollutant_ID
WHERE aps.Compliance_Status = 'Compliant'
GROUP BY aps.Source_Name, ap.Pollutant_Name
```

```
HAVING AVG(apm.Concentration_Level) < 50 end;
```

Source_Name	Pollutant_Name	Avg_Concentration
Industrial Plant A	Sulfur Dioxide	0.4
Urban Traffic	Nitrogen Oxides	1.2
Industrial Plant B	Particulate Matter	4.5

```
Create Procedure Procedure25 As begin
SELECT wps.Source_Name, wp.Pollutant_Name, wpm.Concentration_Level
FROM Water_Pollution_Sources wps
JOIN WaterPollutant_Sources wps_join ON wps.WPSource_ID = wps_join.WPSource_ID
JOIN Water_Pollutants wp ON wps_join.WaterPollutant_ID = wp.WaterPollutant_ID
JOIN Water_Pollution_Monitoring wpm ON wp.WaterPollutant_ID = wpm.WaterPollutant_ID
ORDER BY wpm.Concentration_Level ASC end;
```

Source_Name	Pollutant_Name	Concentration_Level
Construction Site C	Oil and Grease	0
Urban Traffic	Volatile Organic Compounds	1
River Outlet	Heavy Metals	2