University of Asia Pacific

Department of Computer Science & Engineering

Project Report – Database Systems Lab (CSE - 212)

Project Name : Shopner Bangladesh Database System
Team Name : Team_Innova_Trio

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Shopner Bangladesh

Database Management System

1 . Project Description :

Shopner Bangladesh is a centralized database system designed to manage and analyze comprehensive information on Bangladesh's districts, upazilas, and villages. It encompasses a wide range of data, including demographics, economic activities, infrastructure, education, healthcare, water and sanitation, digital connectivity, and agriculture.

The system tracks critical infrastructure such as schools, hospitals, roads, and water systems, while also providing insights into local economic conditions, literacy rates, healthcare facilities, and digital readiness. Additionally, it evaluates agricultural viability and climate risks.

By aggregating this data, the platform offers a development summary for each village, supporting data-driven decision-making for researchers, policymakers, and local authorities to prioritize and implement targeted development initiatives across the country.

2 . Database Name :

The name of the database is **“SB_Database”**. It contains 11 tables that store comprehensive information about Bangladesh’s districts, upazilas, and villages.
This database will enable seamless integration of diverse data sources, facilitate system interoperability, and support data-driven decision-making for sustainable development and resource allocation across the country.

3 . Users for SB_Database:

The **Shopner Bangladesh Database** will serve a diverse group of users, each playing a critical role in driving development across Bangladesh's

districts, upazilas, and villages. The primary users of this database include:

- **Government Authorities**
  - Central and local government officials responsible for regional development and resource allocation can use the database to identify underdeveloped areas and plan targeted investments.
- **Foreign Aid Organizations**
  - International organizations and NGOs focused on social welfare and rural development can leverage the data to implement projects aimed at improving living standards and infrastructure in remote areas.
- **Local Authorities and Administrators**
  - Upazila and union-level administrators can access village-specific data to monitor progress, assess resource distribution, and prioritize community needs.
- **Philanthropists and Corporate Investors**
  - Wealthy individuals, corporate social responsibility (CSR) departments, and social investors can identify opportunities for impactful contributions to education, healthcare, infrastructure, and economic growth.
- **Development Researchers and Analysts**
  - Policy researchers, data analysts, and academic institutions can use the database for in-depth analysis of socio-economic conditions, helping to formulate evidence-based recommendations for sustainable development.

By centralizing critical information in a single platform, the database will support data-driven decision-making, streamline development efforts, and foster collaborations across public, private, and international sectors to accelerate progress in rural Bangladesh.

4 . Tables:

There are 11 Tables in this Database,

- District
- Upazila
- Village
- Infrastructure
- EconomicCondition
- Education
- Healthcare
- WaterAndSanitation
- DigitalReadiness
- AgricultureAndClimate
- DevelopmentSummary

5 . Table Attributes:

1. District

(**DistrictID**, Name, Area, Population, DevelopmentIndex)

2. Upazila

(**UpazilaID**, **DistrictID**, Name, Population, EconomicActivity, InfrastructureIndex)

3. Village

(**VillageID**, **UpazilaID**, Name, UnionName, Population, TotalLandArea, DevelopmentPriority)

4. Infrastructure

(**InfrastructureID**, **VillageID**, InfraType, Name, Capacity, Status,

YearBuilt)

5. EconomicCondition

(**EconomicID**, **VillageID**, IndustryPresence, JobDistribution, WealthDistribution, UnemploymentRate, MicrofinanceAvailability)

6. Education

(EducationID, VillageID, SchoolsCount, CollegesCount, LiteracyRate, EnrollmentRate, AdultEducationPrograms)

7. Healthcare

(**HealthcareID**, **VillageID**, FacilitiesCount, DoctorsCount, ChildImmunizationRate, MaternalCare, EmergencyServices)

8. WaterAndSanitation

(**WaterSanitationID**, **VillageID**, CleanWaterAvailability, HouseholdSanitation, DrainageSystem)

9. DigitalReadiness

(**DigitalID**, **VillageID**, InternetCoverage, MobileNetworkStrength, DigitalLiteracyRate, TechTrainingCenters)

10. AgricultureAndClimate

(**AgriClimateID**, **VillageID**, SoilType, IrrigationFacilities, HighYieldCrops, NaturalHazards)

11. DevelopmentSummary

(**SummaryID**, **VillageID**, OverallDevelopmentScore, TopPriorities, MajorChallenges, RecentInitiatives)

6 .Primary key, Foreign key / Relation & Purpose:

1. District

- **Attributes:**
  - `DistrictID` **(Primary Key)**
  - `Name`
  - `Area`
  - `Population`
  - `DevelopmentIndex`
- **Relationships:**
  - Contains: District → Upazila
    Cardinality: One district can contain many upazilas (1:N).
- **Purpose:** Provides a top-level administrative overview, helping to identify which districts need focused development based on population and area.

2. Upazila

- **Attributes:**
  - `UpazilaID` **(Primary Key)**
  - `DistrictID` **(Foreign Key → District)**
  - `Name`
  - `Population`
  - `EconomicActivity`
  - `InfrastructureIndex`
- **Relationships:**

  - Contains: Upazila → Village
    Cardinality: One upazila can contain many villages (1:N).
- **Purpose:** Serves as a middle-tier administrative unit, summarizing economic activities and infrastructure for strategic planning.

3. Village

- **Attributes:**
  - `VillageID` **(Primary Key)**

- `UpazilaID` **(Foreign Key → Upazila)**
- `Name`
- `UnionName`
- `Population`
- `TotalLandArea`
- `DevelopmentPriority`

- **Relationships:**
  - Contains: Village → Other Detailed Tables
    Cardinality: One village links to multiple detailed records (1:N). ●

Purpose: Acts as the core unit of development, consolidating all essential information at the village level.

4. Infrastructure

- **Attributes:**
  - `InfrastructureID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `InfraType`
  - `Name`
  - `Capacity`
  - `Status`
  - `YearBuilt`
- **Relationships:**

  - LocatedIn: Infrastructure → Village
    Cardinality: Each village can have multiple infrastructure records (1:N).
- **Purpose:** Tracks physical development like roads, electricity, and water supply, highlighting gaps for improvement.

5. EconomicCondition

- **Attributes:**
  - `EconomicID` **(Primary Key)**

- `VillageID` **(Foreign Key → Village)**
- `IndustryPresence`
- `JobDistribution`
- `WealthDistribution`
- `UnemploymentRate`
- `MicrofinanceAvailability`

- **Relationships:**
  - RelatedTo: EconomicCondition → Village
    Cardinality: Each village has one economic condition record (1:1).
- **Purpose:** Evaluates the village's economic structure, helping to identify areas for financial aid or investment.

6. Education

- **Attributes:**
  - `EducationID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `SchoolsCount`
  - `CollegesCount`
  - `LiteracyRate`
  - `EnrollmentRate`
  - `AdultEducationPrograms`
- **Relationships:**

  - RelatedTo: Education → Village
    Cardinality: Each village has one education record (1:1).
- **Purpose:** Provides data on education facilities and literacy, crucial for human capital development.

7. Healthcare

- **Attributes:**
  - `HealthcareID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `FacilitiesCount`

- `DoctorsCount`
- `ChildImmunizationRate`
- `MaternalCare`
- `EmergencyServices`

- **Relationships:**
  - RelatedTo: Healthcare → Village
    Cardinality: Each village has one healthcare record (1:1).
- **Purpose:** Identifies health-related needs and ensures the availability of critical medical services.

8. WaterAndSanitation

- **Attributes:**
  - `WaterSanitationID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `CleanWaterAvailability`
  - `HouseholdSanitation`
  - `DrainageSystem`
- **Relationships:**
  - RelatedTo: WaterAndSanitation → Village
    Cardinality: Each village has one water and sanitation record (1:1). ● **Purpose:** Evaluates access to clean water and sanitation, crucial for quality of life improvements.

9. DigitalReadiness

- **Attributes:**
  - `DigitalID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `InternetCoverage`
  - `MobileNetworkStrength`
  - `DigitalLiteracyRate`
  - `TechTrainingCenters`
- **Relationships:**
  - RelatedTo: DigitalReadiness → Village

Cardinality: Each village has one digital readiness record (1:1). ●

Purpose: Tracks digital connectivity and skills, promoting e-governance and tech-based education or services.

10. AgricultureAndClimate

- **Attributes:**
  - `AgriClimateID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `SoilType`
  - `IrrigationFacilities`
  - `HighYieldCrops`
  - `NaturalHazards`
- **Value:** Supports agricultural planning and disaster preparedness, making it valuable for both investors and government agencies.

11. DevelopmentSummary

- **Attributes:**
  - `SummaryID` **(Primary Key)**
  - `VillageID` **(Foreign Key → Village)**
  - `OverallDevelopmentScore`
  - `TopPriorities`

  - `MajorChallenges`
  - `RecentInitiatives`
- **Relationships:**
  - Aggregates: DevelopmentSummary → Village
    Cardinality: Each village has one development summary record (1:1).
- **Purpose:** Summarizes all data for quick decision-making, highlighting development priorities and recent progress.

7 . Entity Relationships :

1. District → Upazila

Entity Names: District (strong entity), Upazila (strong entity)
Relationship Name: Contains

Relationship Type: One-to-Many (1:N)
Participation: Total participation for District (Every District must have at least one Upazila), Partial participation for Upazila (An Upazila must belong to a District, but a District can exist without being fully populated).

2. Upazila → Village

Entity Names: Upazila (strong entity), Village (strong entity)
Relationship Name: Contains
Relationship Type: One-to-Many (1:N)
Participation: Total participation for Upazila (Every Upazila must have at least one Village), Partial participation for Village (A Village must belong to an Upazila, but an Upazila can exist without a fully populated Village).

3. Village → Infrastructure

Entity Names: Village (strong entity), Infrastructure (weak entity)
Relationship Name: LocatedIn
Relationship Type: One-to-Many (1:N)
Participation: Total participation for Infrastructure (Every Infrastructure must belong to a Village), Partial participation for Village (Not every Village has to have all infrastructures).

4. Village → EconomicCondition

Entity Names: Village (strong entity), EconomicCondition (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)
Participation: Total participation for EconomicCondition (Every EconomicCondition must belong to a Village), Partial participation for Village (Not every Village may have a defined EconomicCondition record).

5. Village → Education

Entity Names: Village (strong entity), Education (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)
Participation: Total participation for Education (Every Education entity must belong to a Village), Partial participation for Village (Not every Village may have an Education record).

6. Village → Healthcare

Entity Names: Village (strong entity), Healthcare (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)
Participation: Total participation for Healthcare (Every Healthcare entity must belong to a Village), Partial participation for Village (Not every Village may have a Healthcare record).

7. Village → WaterAndSanitation

Entity Names: Village (strong entity), WaterAndSanitation (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)
Participation: Total participation for WaterAndSanitation (Every Water and Sanitation entity must belong to a Village), Partial participation for Village (Not every Village may have Water and Sanitation details).

8. Village → DigitalReadiness

Entity Names: Village (strong entity), DigitalReadiness (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)

Participation: Total participation for DigitalReadiness (Every DigitalReadiness entity must belong to a Village), Partial participation for Village (Not every Village may have DigitalReadiness details).

9. Village → AgricultureAndClimate

Entity Names: Village (strong entity), AgricultureAndClimate (weak entity)
Relationship Name: RelatedTo
Relationship Type: One-to-One (1:1)
Participation: Total participation for AgricultureAndClimate (Every Agriculture and Climate entity must belong to a Village), Partial participation for Village (Not every Village may have Agriculture and Climate details).

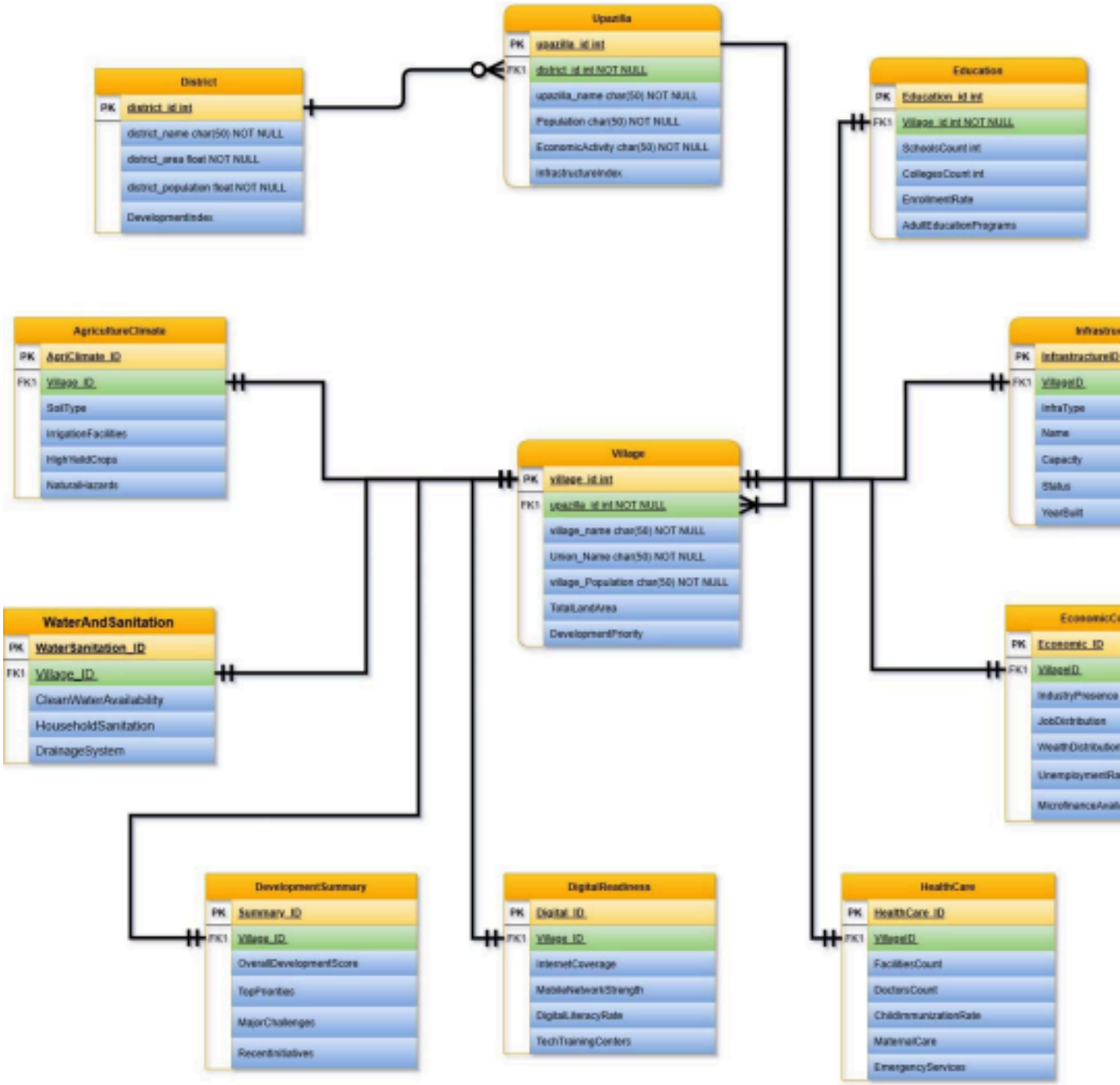
10. Village → DevelopmentSummary

Entity Names: Village (strong entity), DevelopmentSummary (weak entity)

Relationship Name: Aggregates
Relationship Type: One-to-One (1:1)
Participation: Total participation for DevelopmentSummary (Every DevelopmentSummary entity must belong to a Village), Partial participation for Village (Not every Village may have a DevelopmentSummary).

8 . ER Diagram:

9 . Schema Diagram:



10 . Queries :

1. Find the total population of all villages in each Upazila

```
SELECT UpazilaID, SUM(Population) AS TotalPopulation
FROM Village
GROUP BY UpazilaID;
```

UpazilaID	TotalPopulation
1	1000
2	500
3	1500
4	1000
5	1200
6	1300
7	800
8	600
9	1400
10	1100

2. List the villages where the total land area is greater than 200

```
SELECT Name, TotalLandArea
FROM Village
WHERE TotalLandArea > 200;
```

Name	TotalLandArea
Brahmanpara	250.00
Kaliarpathar	300.00
Chakla	220.00
Dohagram	250.00
Ujania	260.00
Jadabpur	230.00

3. Find the average literacy rate for each village and sort it in descending order

```
SELECT VillageID, AVG(LiteracyRate) AS AverageLiteracy
FROM Education
GROUP BY VillageID
```



```
ORDER BY AverageLiteracy DESC;
```

VillageID	AverageLiteracy
9	83.000000
3	80.000000
7	78.000000
1	75.000000
5	72.000000
6	70.000000
2	68.000000
10	65.000000
4	60.000000
8	55.000000

4. Show the names of villages where the unemployment rate is less than 15%

```
SELECT V.Name, E.UnemploymentRate
FROM Village V
JOIN EconomicCondition E ON V.VillageID = E.VillageID
WHERE E.UnemploymentRate < 15;
```

Name	UnemploymentRate
Kaliarpathar	10.00
Chakla	12.00
Janjgir	10.00
Ujania	14.00

5. Find villages that have more than 1 school and list their name and school count

```
SELECT V.Name, E.SchoolsCount
FROM Village V
JOIN Education E ON V.VillageID = E.VillageID
WHERE E.SchoolsCount > 1;
```

Name	SchoolsCount
Brahmanpara	2
Kaliarpathar	3
Chakla	2
Kotalipara	2
Ujania	2

6. Find the number of villages in each district

```
SELECT D.Name AS DistrictName, COUNT(V.VillageID) AS NumberOfVillages
FROM District D
JOIN Upazila U ON D.DistrictID = U.DistrictID
JOIN Village V ON U.UpazilaID = V.UpazilaID
GROUP BY D.Name;
```

DistrictName	NumberOfVillages
Kurigram	2
Rangpur	2
Dinajpur	2
Gaibandha	2
Lalmonirhat	2

7. Display villages where Infrastructure capacity is more than 500 and order them by Capacity in descending order

```
SELECT V.Name, I.Capacity
FROM Village V
JOIN Infrastructure I ON V.VillageID = I.VillageID
WHERE I.Capacity > 500
ORDER BY I.Capacity DESC;
```

Name	Capacity
Dohagram	1000.00

8. Find the average development score of each village and display only those with a score above 70

```
SELECT V.Name, D.OverallDevelopmentScore
FROM Village V
JOIN DevelopmentSummary D ON V.VillageID = D.VillageID
WHERE D.OverallDevelopmentScore > 70;
```

Name	OverallDevelopmentScore
Brahmanpara	78.50
Kaliarpathar	82.00
Chakla	72.10
Kotalipara	74.00
Ujania	80.00

9. Use a CASE statement to classify villages based on their population

```
SELECT Name,
    CASE
      WHEN Population < 500 THEN 'Small'
      WHEN Population BETWEEN 500 AND 1000 THEN 'Medium'
      ELSE 'Large'
    END AS PopulationCategory
FROM Village;
```

Name	PopulationCategory
Brahmanpara	Medium
Char Zoraghat	Medium
Kaliarpathar	Large
Sonahar	Medium
Chakla	Large
Dohagram	Large
Kotalipara	Medium
Janjgir	Medium
Ujania	Large
Jadabpur	Large

10. Find villages that have both clean water and sanitation available

```
SELECT V.Name
FROM Village V
JOIN WaterAndSanitation W ON V.VillageID = W.VillageID
WHERE W.CleanWaterAvailability = 'Available' AND W.HouseholdSanitation = 'Basic
Sanitation';
```

Name
Brahmanpara
Char Zoraghat
Kotalipara

11.List Districts with Low Development Index

```
SELECT Name, DevelopmentIndex
FROM District
WHERE DevelopmentIndex < 50;
```

Name	DevelopmentIndex
Kurigram	4.00
Rangpur	5.00
Dinajpur	3.00
Gaibandha	3.00
Lalmonirhat	4.00

12. List Upazilas with Low Infrastructure Index

```
SELECT Name, InfrastructureIndex
FROM Upazila
WHERE InfrastructureIndex < 40;
```

Name	InfrastructureIndex
Kurigram Sadar	3.00
Chilmari	2.00
Rangpur Sadar	4.00
Pirgachha	4.00
Dinajpur Sadar	5.00
Kaharol	3.00
Gaibandha Sadar	3.00
Shaghata	2.00
Lalmonirhat Sadar	3.00
Hatibandha	2.00

13. Villages with High Development Priority

```
SELECT Name, DevelopmentPriority
FROM Village
WHERE DevelopmentPriority > 1;
```

Name	DevelopmentPriority
Brahmanpara	4
Char Zoraghat	3
Kaliarpathar	5
Sonahar	3
Chakla	4
Dohagram	3
Kotalipara	4
Janjgir	2
Ujania	5
Jadabpur	3

14. Villages with No Healthcare Facilities

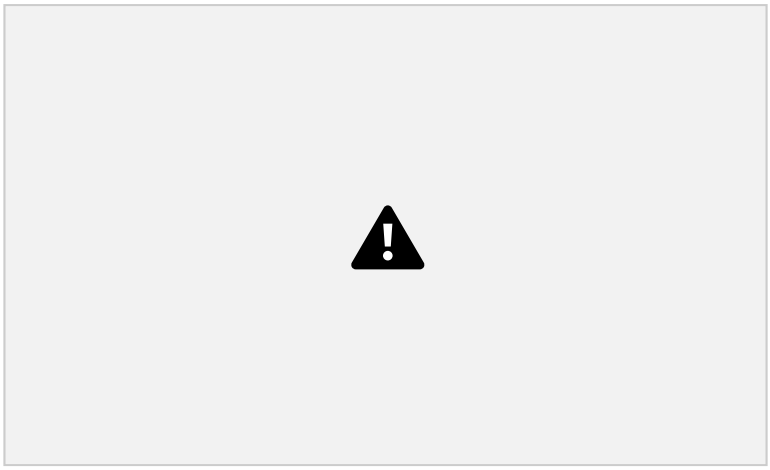
```
SELECT Village.Name
FROM Village
JOIN Healthcare ON Village.VillageID = Healthcare.VillageID
WHERE Healthcare.FacilitiesCount = 0;
```

15. Villages with No Clean Water Access

```
SELECT Village.Name
FROM Village
JOIN WaterAndSanitation ON Village.VillageID = WaterAndSanitation.VillageID
WHERE CleanWaterAvailability = 'Not Available';
```

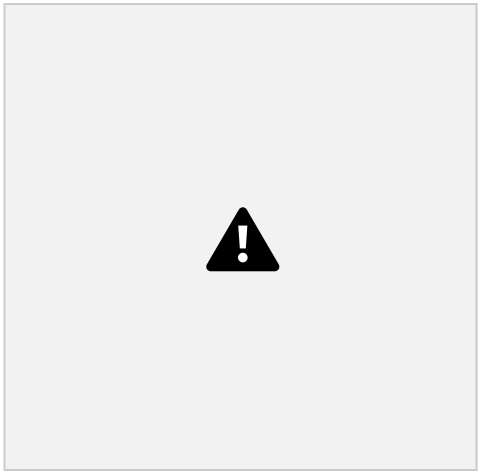
16. Upazilas with High Population and Economic Activity

```
SELECT Name, Population, EconomicActivity
FROM Upazila
WHERE Population > 50000;
```



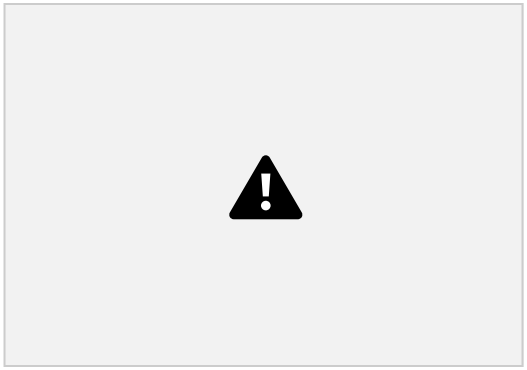
17. Villages with Internet Coverage

```
SELECT Village.Name, InternetCoverage
FROM Village
JOIN DigitalReadiness ON Village.VillageID = DigitalReadiness.VillageID;
```



18. Districts with Highest Population Density

```
SELECT Name, Population / Area AS PopulationDensity
FROM District
ORDER BY PopulationDensity DESC
LIMIT 5;
```



19. Villages with Low Literacy Rate

```
SELECT Village.Name, LiteracyRate
FROM Village
JOIN Education ON Village.VillageID = Education.VillageID
WHERE LiteracyRate < 60;
```

20. Villages with High Unemployment Rate

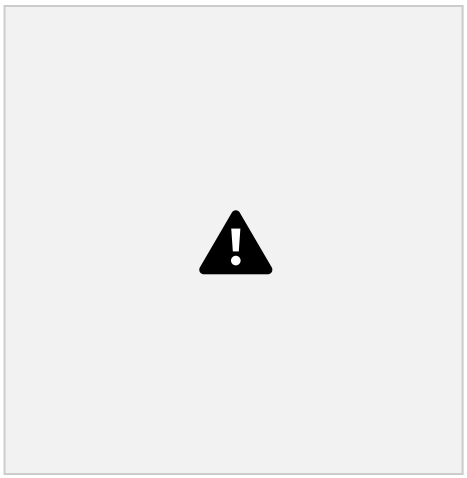
```
SELECT Village.Name, UnemploymentRate
FROM Village
JOIN EconomicCondition ON Village.VillageID = EconomicCondition.VillageID
WHERE UnemploymentRate > 20;
```

21. Villages with Non-functional Drainage System

```
SELECT Village.Name
FROM Village
JOIN WaterAndSanitation ON Village.VillageID = WaterAndSanitation.VillageID
WHERE DrainageSystem = 'Non-functional';
```

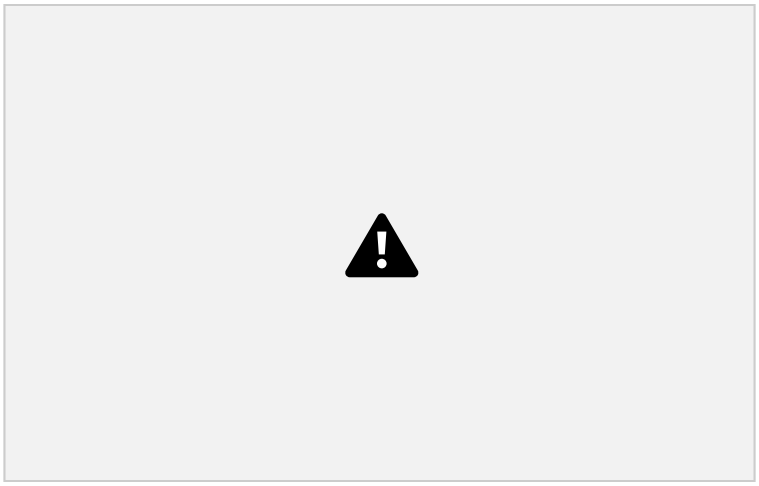
22. Villages Prone to Natural Hazards

```
SELECT Village.Name, NaturalHazards
FROM Village
JOIN AgricultureAndClimate ON Village.VillageID = AgricultureAndClimate.VillageID;
```



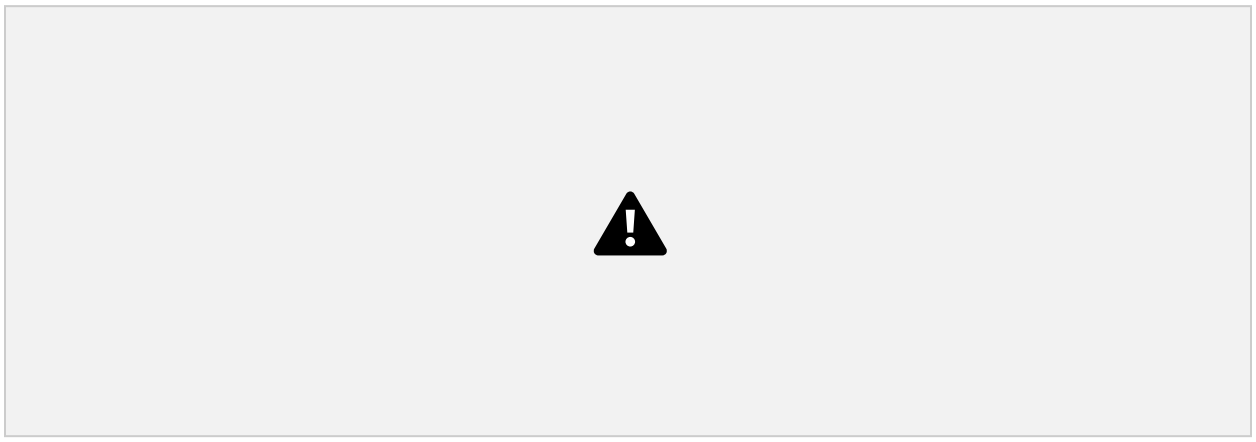
23. Villages with Agriculture Potential

```
SELECT Village.Name, HighYieldCrops, IrrigationFacilities
FROM Village
JOIN AgricultureAndClimate ON Village.VillageID = AgricultureAndClimate.VillageID;
```



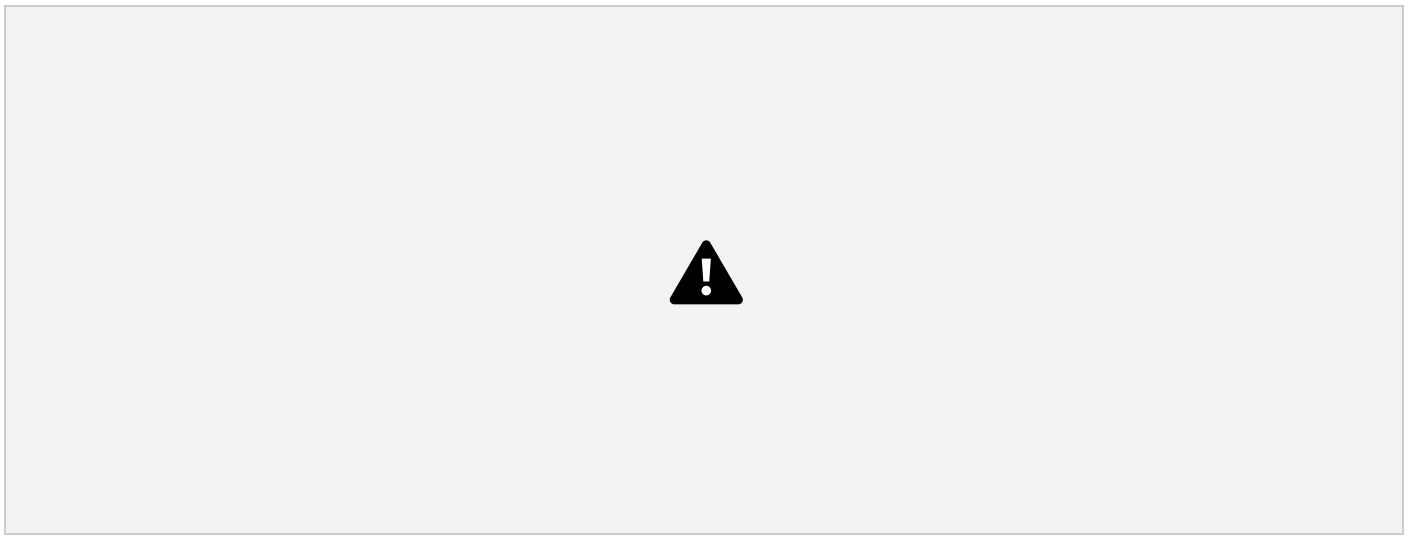
24. Summary of Villages with Major Challenges

```
SELECT Village.Name, OverallDevelopmentScore, MajorChallenges
FROM Village
JOIN DevelopmentSummary ON Village.VillageID = DevelopmentSummary.VillageID WHERE
OverallDevelopmentScore < 80;
```



25. Villages with Recent Development Initiatives

```
SELECT Village.Name, RecentInitiatives
FROM Village
JOIN DevelopmentSummary ON Village.VillageID = DevelopmentSummary.VillageID WHERE
RecentInitiatives IS NOT NULL;
```



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11 . CEP Mapping :

1. How Knowledge Profiles (K’s) are addressed through the project and mapping among K’s, COs and POs:

K's Attributes	How K's are addressed through our project	CO PO
K3 Engineering Fundamentals	Our project involves a systematic formulation of engineering fundamentals like database design, entity-relationship modeling, and problem-solving techniques to structure data for development.	CO1, CO2, CO3 PO1, PO2
K4 Specialist Knowledg	The project requires special knowledge of socio-economic factors, including the study of economic conditions, infrastructure, and resource distribution in Bangladesh, to aid development decisions.	CO6, CO7 PO6, PO8
K5 Engineering Design	The Entity-Relationship (ER) Diagram & Schema design are	CO3, CO4 PO3, PO2

	essential components in the design of the database system, ensuring logical structure and data consistency.	

K6 Engineering Practice	The project involves practical database implementation using MySQL, where we create tables, insert data, and perform queries using DDL and DML commands.	CO1, CO2, CO5 PO1
K7 Comprehension	The engineering activity impacts economic growth by facilitating infrastructure development, business operations, and trade, which in turn supports national development goals.	CO7, CO6 PO6, PO8

2. How Complex Engineering Problem solving (P's) are addressed through the project and mapping among P's, COs and POs:

P's Attributes	**How P's are** **addressed through our project**	**CO PO**
P1 Depth of knowledge required	The project involves applying database design fundamentals (K3) and engineering design (K5). We also implement the design using MySQL,	CO3, CO4, CO5 PO1, PO2, PO3, PO7

	requiring both conceptual and practical knowledge

P3 Depth of analysis required	The project requires analyzing and adapting the design for various sectors (e.g., agriculture, healthcare, education) based on the local context of the villages.	CO3, CO5 PO3
P6 Extent of stakeholder involvement and conflicting requirements	The project involves multiple stakeholders, including government bodies, local authorities, and development agencies, each with different data needs and priorities.	CO3, CO5 CO3, CO5
P7 Interdependence	The database structure includes interconnected tables related to districts, upazilas, villages, and various sectors like healthcare, education, and infrastructure, creating a complex system.	CO3, CO4, CO5 PO2, PO7

3. How Complex Engineering Activities (A's) are addressed through the project and mapping among A's, COs and POs:

A's Attributes	**How A's are addressed through our project**	**CO PO**

A1 Range of resources	The project requires various resources such as MySQL software, servers, technical documentation, and inputs from development agencies, local authorities, and sector experts.	CO1 PO5
A4 Consequences for the society & the environment	The database is designed to support sustainable economic development by tracking social, infrastructure, economic, and agricultural data, ultimately aiding in effective governance and development	CO6, CO7 PO6, PO8
A5 Familiarity	The project requires familiarity with database systems and the socio-economic context of Bangladesh, especially regarding rural development and resource management	CO8, CO9 PO11

Drive Link : Database Project
Github Link : https://github.com/mrjisan12/Database_Project_CSE-212