CE 766 Project Proposal (22B0668)

Project Title

Optimizing Water Resource Allocation in Watershed Management

Problem statement

This project is about the challenges of allocating water resources among various sectors, including domestic, agricultural, and industrial uses. The goal is to balance the available water with the demands of each sector while managing costs and maintaining efficiency.

XLRM Framework

X-

- **Water Allocation (Q):** The amount of water allocated to each sector from different sources (e.g., groundwater, surface water).
- **Water Demand (D):** The amount of water required by each sector.
- **Cost of Water Allocation (C):** The cost associated with extracting and distributing water.

L-

- **Minimize Deficits:** minimizing difference between the water demand and the available water.
- **For now, Objective Function=$\alpha \cdot$Deficit+$\beta \cdot$Cost** where:
  - **Deficit** = Total Demand - Available Water
  - **Cost** = Total Cost of Allocation
  - **α** and **β** are weighting factors representing the relative importance of minimizing deficits and controlling costs.

R-

- **Water Availability Constraint:** total amount of water allocated should not exceed the available water.
- **Demand Satisfaction Constraint:** water allocation must meet or exceed the total demand for each sector.
- **Budget Constraint:** cost of water extraction and distribution should not exceed the budget.

M-

- **Deficit Calculation:** The difference between the total demand and the total allocated water.
- **Cost Calculation:** Total cost for extracting and distributing water.
- **Balancing Equations:** water allocation meets demand while staying within budget.

Proposed Analysis

Researching on optimization of model for Optimizing Water Resource Allocation in Watershed Management and maybe building a model to optimize water allocation by balancing demand and availability, minimizing deficits, and managing costs. Providing insights into the trade-offs between meeting demand and controlling costs.

Data Needs:

1. **Water Availability Data:** Information on the volume of water from each source.
2. **Water Demand Data:** Details on the water requirements for each sector.
3. **Cost Data:** Costs associated with water extraction and distribution.

Proposed Deliverables:

Description of the optimization model, assumptions, and methods used, overview, results, and conclusions of the water allocation optimization Optimization coding part (maybe) , Analysis of the performance of different allocation strategies. Analysis of Breaks down costs and evaluates benefits of optimal water allocation