# TITLE PAGE

- **Problem Statement ID – 1692**
- **Problem Statement Title-** Forecasting Future Water Requirements and Assessing Storage Capacities in Reservoirs
- **Theme-** Smart Education
- **PS Category-** Software
- **Team ID-** DJ60
- **Team** Lock N Code

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# IDEA TITLE

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## ML Model Features:

**Data Inputs & Predictive Capabilities:**

- Data on Water usage, precipitation, temperature, extreme weather, sedimentation.
- Predict Future Demand of Water, and amount of urbanisation, deforestation and agricultural water usage.
- Storage simulation and subsequent assessment of infrastructure capacity.

**Scenario Analysis:**

- Identify Risks and Model Effects of extreme events like droughts, floods or infrastructure issues.
- Analyze impact of population growth and urbanization effects. Evaluate water management strategies.

**Outputs:**

- Risk Indicators: Highlight areas at risk.
- Infrastructure Needs: Identify gaps in storage.
- Optimization: Recommend strategies for water management.
- Future Prediction: Water Usage, Energy Usage, Water Evaporation Rates

## Website Features:

**Dashboard:**

- Show usage, storage, and risks with graphs.
- Scenario Selection: Toggle between future scenarios.
- Risk Maps: Interactive maps of vulnerable areas.

**Customization:**

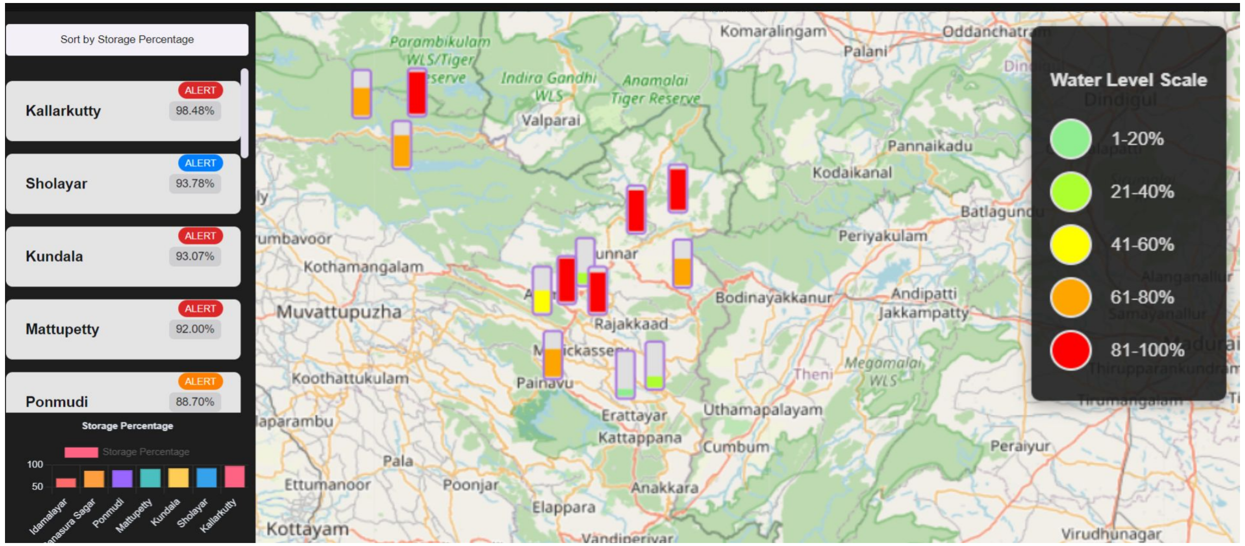
- Custom Scenarios: Users input parameters like growth rates.
- Real-time Monitoring: Updates on water levels and infrastructure.
- Recommendations: Strategies for water management and assess effects of management strategies.

**Education and Awareness:**

- Resources: Info on sustainable practices.
- Stakeholder Engagement: Collaboration platform.
- Reports: Downloadable water projections. Access model details and assumptions

## Unique Selling Point [USP] :

- Silt deposit detection/prediction and Eutrophication Analysis and remedies.
- Regular and timely data integration.
- Energy production prediction
- Field visit data updation by government officials: Eg- gangapur dam
- Predicting water lost to evaporation reduction.




The above image depicts water level based on storage percentage, maps real time data and can be changed to display different variables.

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# TECHNICAL APPROACH

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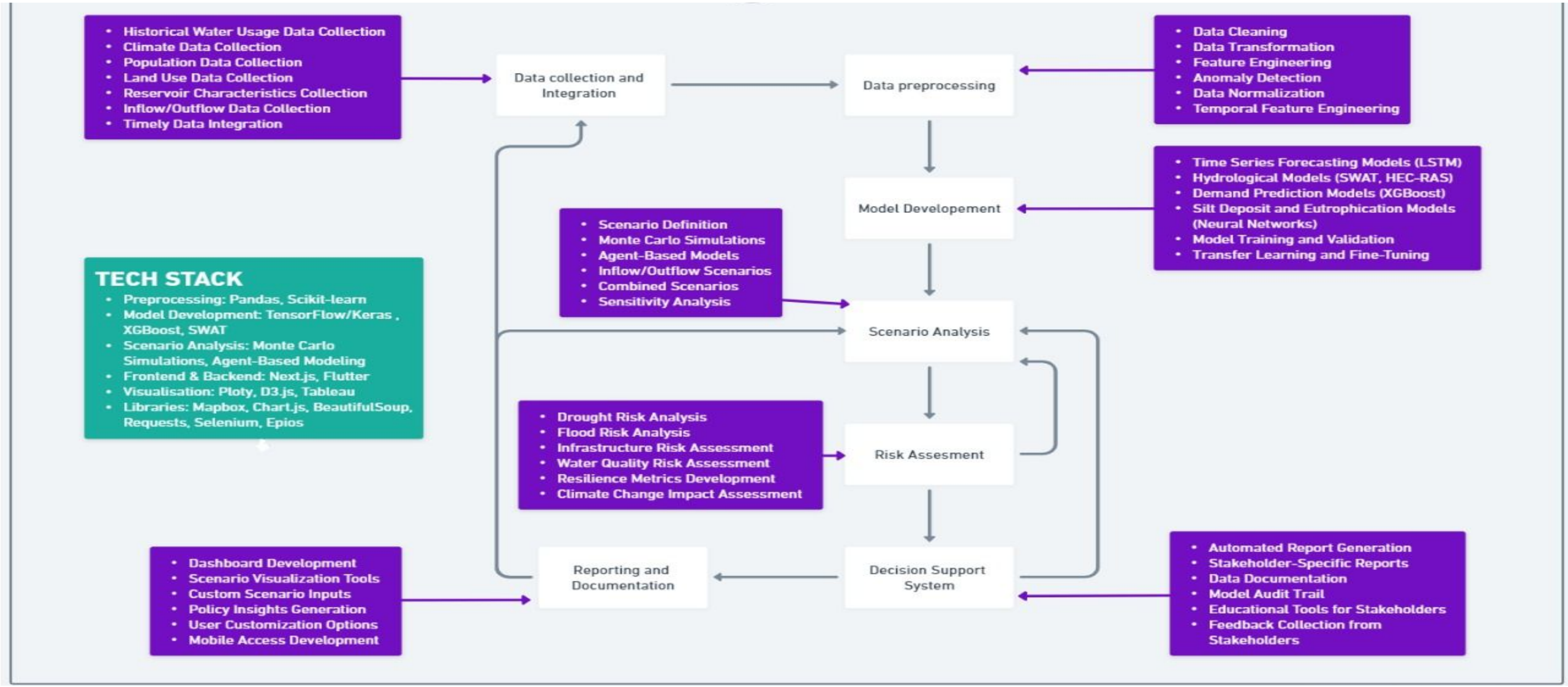

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# FEASIBILITY AND VIABILITY

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| CHALLENGES | SOLUTION |
|---|---|
| 1. <u>Quantifying Data:</u> Accurately measuring and interpreting complex hydrological data is challenging.<br>2. <u>Access to Variety of Data in All Locations (Reservoirs/Dams)</u> : Gathering consistent and comprehensive data from multiple reservoirs and dams can be difficult due to geographic and infrastructural limitations.<br>3. <u>Unpredictable Climate Changes</u> : Sudden and extreme climate events can disrupt predictive models and reduce their reliability.<br>4. <u>Gaps in Data</u> : Incomplete or missing data points can lead to inaccuracies in model predictions and assessments.<br>5. <u>Continuously Varying Conditions/Parameters</u> : The dynamic nature of environmental and operational parameters can complicate model stability and accuracy.<br>6. <u>Scalability</u> : Scaling the model to handle large datasets and numerous scenarios while maintaining performance is a technical challenge.<br>7. <u>Integration of Diverse Data Sources</u> : Combining data from various sources like hydrological, meteorological, and demographic databases can introduce inconsistencies and complexities.<br>8. <u>Computational Demands</u> : Running sophisticated models like Monte Carlo simulations and neural networks can be computationally intensive, requiring significant resources. | 1. <u>Quantifying Data</u> : We will apply advanced data processing algorithms and machine learning techniques to enhance the accuracy of data interpretation.<br>2. <u>Access to Variety of Data in All Locations (Reservoirs/Dams)</u> : We will implement a centralized data repository with real-time data acquisition systems for consistent and accessible data.<br>3. <u>Unpredictable Climate Changes</u> : We will incorporate adaptive models that dynamically adjust to new climate data and emerging patterns.<br>4. <u>Gaps in Data</u> : We will use data imputation techniques and machine learning algorithms to fill in missing data points effectively.<br>5. <u>Continuously Varying Conditions/Parameters</u> : We will regularly update the models with the latest data and use real-time monitoring systems to account for variations.<br>6. <u>Scalability</u> : We will employ cloud computing and distributed processing to efficiently scale the model for larger datasets and scenarios.<br>7. <u>Integration of Diverse Data Sources</u> : We will develop a robust data integration framework that normalizes and harmonizes data from various sources.<br>8. <u>Computational Demands</u> : We will optimize algorithms and leverage high-performance computing (HPC) resources to manage the computational load effectively. |

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# IMPACT AND BENEFITS

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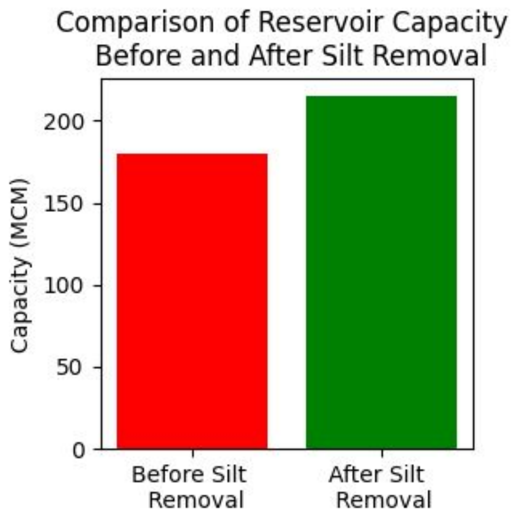
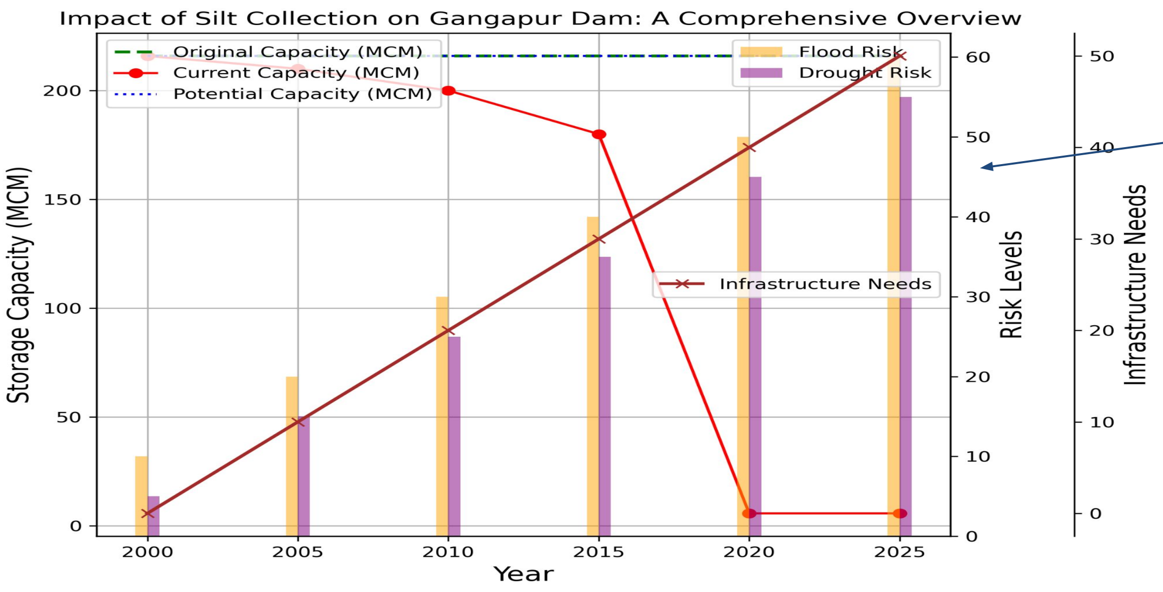
- **Government and policymakers**: Aids in informed decision making, disaster awareness, and efficient resource allocation.
- **Water Resource Management Authorities**: Enables better infrastructure planning and maintenance, and optimization of reservoir operations.
- **Agriculture/Industrial sector**: Ensures reliable & secure water supply, drought mitigation, water usage efficiency, and saving costs.
- **Localities**: Improved water access, flood/drought protection.
- **Adaptive Model**: The versatile nature of the model allows it to integrate new data and ensure that it stays relevant over time




A recent initiative by Jal Samruddhi Abhiyan freed **Silt Deposits** equivalent to **3 crore litres of water** inferring it would suffice the need for drinking water in a village of 3000 adults for a year as per WHO standards (Gangapur Dam).

This gave naturally fertile soil for 30000 acres of farmland and in turn manifold increase in crop production.




- **Anomaly Detection**: Detecting anomalies and handling it will help in making the model more accurate as the model will be habitual of dealing with anomalies and not just the normal trend.
- **Storage Capacity Enhancement**: Removal of silt accumulated in water bodies will free a lot of water storage space which was earlier occupied with silt.
- **Economic Benefits**: By making effective use of resources and pre-planning for water related disasters, a lot of money can be saved.
- **Water Quality Assessment**: By keeping a track of eutrophication, an early warning about potential decrease in water quality will be received.

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# RESEARCH AND REFERENCES

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- https://irrigationap.cgg.gov.in/wrd/dashBoard - District Wise Reservoirs Data Collection
- https://www.isro.gov.in/WaterResources.html - Real Time Water Flow Direction
- https://damstats.amithv.xyz - Real Time Data and Visualization of Dam Water Levels
- https://www.mdpi.com/2071-1050/14/22/14934 - Model Research
- https://www.weap21.org/ - Model Research
- https://www.nature.com/articles/s41598-022-17074-6 - Miscellaneous
- https://www.sciencedirect.com/science/article/abs/pii/S0022169419308832 - Research Paper
- https://appliedsciences.nasa.gov/what-we-do/water-resources/inside-water-resources- Miscellaneous
- https://timesofindia.indiatimes.com/city/nashik/mission-creates-more-storage-in-water-bodies/articleshow/110647913.cms - Silt Deposition Data