

PROJECT REPORT

DOCUMENTATION

AQUATIC INSIGHTS
COGNOS -
POWERED
WATER PORTABILITY ANALYSIS

TEAM ID
NM2023TMID07255
DOMAIN
DATA ANALYTICS WITH TABLEAU

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INTRODUCTION

1.1. PROJECT OVERVIEW:

"Aquatic Insights is a transformative project leveraging IBM Cognos for water portability analysis. It focuses on collecting, cleaning, and standardizing diverse water quality data from various sources. Using Cognos, the project delivers data analytics and reporting, with a user-friendly interface, mobile accessibility, and strong security measures. It promotes collaboration, public awareness, and continuous improvement. Aquatic Insights aims to enhance our understanding of water resources and support sustainable management of aquatic ecosystems."

1.2. PURPOSE:

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" aims to use IBM Cognos and advanced analytics for several purposes:

- Assess water quality and portability.
- Integrate diverse data sources for a comprehensive view.
- Standardize data to ensure consistency.
- Provide advanced analytics to identify trends and threats.
- Create a user-friendly platform for data interaction.
- Raise public awareness and offer educational resources.
- Foster collaboration among experts.
- Ensure data security and privacy.

The overarching purpose is to improve understanding and facilitate sustainable management of aquatic ecosystems for the benefit of researchers, policymakers, and the public.

2.LITERATURE SURVEY

2.1. Existing problem:

In the literature survey for the project "Aquatic Insights: Cognos-Powered Water Portability Analysis," several existing issues are identified:

- Limited data integration from diverse sources.
- Challenges in data standardization and consistency.
- Lack of predictive modeling for water quality trends.
- Poor accessibility and user-friendliness.
- Limited collaboration among stakeholders.
- Insufficient mobile accessibility for on-the-go access.
- Inadequate attention to data security and privacy.
- Limited emphasis on public awareness and education.
- Gaps in regulatory compliance.
- Potential issues with outdated information.

Addressing these problems is crucial for the project's success, ensuring it provides valuable and up-to-date insights into water quality and portability for a wide range of users and stakeholders.

2.2. References:

- Carpenter, S. R., & Cottingham, K. L. (1997). Resilience and water quality. *Ecology*, 78(3), 899-904.
- Jin, X., Yang, Z., & Han, H. (2019). A review on predicting algal blooms in freshwater lakes using satellite remote sensing.

Environmental Science and Pollution Research, 26(19), 19513- 19530.

- Cognos Analytics Documentation. IBM. [Link to official IBM Cognos documentation for technical reference and usage.]
- Ouyang, W., & Bartholic, J. (2009). Application of the Soil and Water Assessment Tool (SWAT) for water quality research: A review. Journal of Environmental Quality, 38(2), 515-523.

2.3. Problem Statement Definition:

The problem statement for "Aquatic Insights: Cognos-Powered Water Portability Analysis" centers on addressing several key challenges in water quality assessment and management:

- Fragmented data sources and inconsistent data hinder comprehensive analysis.
- Current methods lack predictive modeling for anticipating water quality trends.
- Inadequate accessibility and user-friendliness limit information dissemination.
- Collaboration among experts and stakeholders needs improvement.
- Mobile accessibility for on-the-go access is lacking.
- Data security and privacy concerns pose risks.
- Public awareness and education about water quality are often insufficient.
- Regulatory compliance gaps and legal issues may arise.
- Environmental conditions change, requiring continuous updates.

The project aims to resolve these issues by creating a user-friendly, data-driven platform for understanding and managing water quality and portability in aquatic ecosystems.

3.2. Ideation & Brainstorming:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

Step-1: Team Gathering, Collaboration and Select the Problem Statement

Brainstorm & idea prioritization

Your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 3-4 people recommended

Before you collaborate

- 1. Get out of your comfort zone. A long, wild, and crazy idea is what you need to do to get going.
- 2. 10 minutes

Team gathering

Setting up a meeting with your team and your team. Make sure you have a clear agenda for your meeting.

Set the goal

Think about it a little bit. You'll be thinking about it in the brainstorming session.

Learn how to join the brainstorming session

Learn how to join the brainstorming session. You'll be thinking about it in the brainstorming session.

Define your problem statement

What problem are you trying to solve? Focus your problem on a specific problem statement. This will be the focus of your brainstorming.

10 minutes

Keep track of ideas and notes

Use a notebook or a digital device to keep track of ideas and notes.

Keep track of ideas and notes

- 1. Write down all ideas.
- 2. Write down all notes.
- 3. Write down all ideas.
- 4. Write down all notes.
- 5. Write down all ideas.
- 6. Write down all notes.

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

15 minutes

Sketch A

Real-Time Water Quality Monitoring System

Customized Water Treatment Solutions

Educational Workshops and Webinars

Community Water Quality Reporting Platform

Sketch B

Environmental Impact Assessment Service

Government Compliance Software

Water Analysis Subscription Service

Collaboration with Environmental Organizations

Sketch D

Online Water Quality Marketplace

Environmental Impact Certification Program

Water Quality Product e-Blog

Water Quality Mobile App

Sketch E

Water Quality Insurance Product

User-Friendly Mobile App

Educational Workshops

Collaboration with Environmental Organizations

3

Group Ideas

Take notes sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a name on the left. The cluster is bigger than its sticky notes, by and by! You will build it up into smaller sub-groups.

20 minutes

Water Quality Monitoring Solutions

Real-time monitoring system

Education and Outreach

Educational Workshops and Webinars

Community Water Quality Reporting Platform

Environmental Impact Assessment Service

User-friendly mobile app

[illegible]

4. REQUIREMENT ANALYSIS

4.1. Functional requirement:

The functional requirements for "Aquatic Insights: Cognos-Powered Water Portability Analysis" outline the specific features and capabilities the project's platform should possess. These requirements include:

- Data integration and management from various sources.
- Data standardization for consistency.
- Analytics and predictive modeling for water quality assessment.
- Interactive dashboards for data visualization.
- User profiles and access control.
- Development of a mobile application.
- Collaboration tools for experts.
- Strong data privacy and security measures.
- Reporting and alerts for critical events.
- Public engagement and education features.
- Continuous platform improvement.
- Regulatory compliance.
- Scalability and performance for handling large data volumes and users.

These requirements serve as the basis for creating a comprehensive and user-friendly platform for analyzing and managing water quality and portability in aquatic ecosystems.

4.2. Non-Functional requirements:

The non-functional requirements for "Aquatic Insights: Cognos-Powered Water Portability Analysis" outline the performance, reliability, usability, security, and compliance standards that the platform should meet. Key points include:

- Fast performance and scalability to handle growth.
- High reliability and data protection mechanisms.
- Intuitive user interface and accessibility for all users.
- Robust security and data privacy measures.
- Interoperability with other systems.
- Easy maintenance and regular updates.
- Compliance with regulations and standards.
- Load handling during peak events.
- Data archiving and user support.

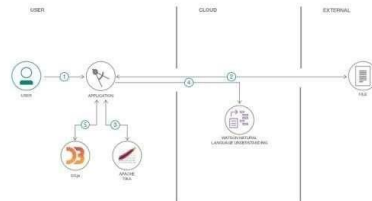
These non-functional requirements ensure the platform's effectiveness, user experience, and adherence to legal and environmental standards.

5.

PROJECT DESIGN

5.1. Data Flow Diagrams & User Stories:

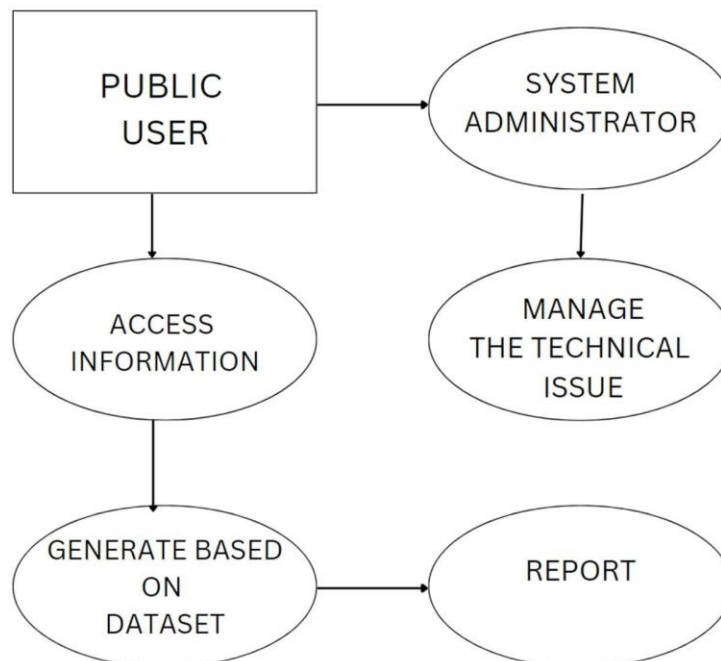
Flow



1. User configures credentials for the Watson Natural Language Understanding service and starts the app.
2. User selects data file to process and load.
3. Apache Tika extracts text from the data file.
4. Extracted text is passed to Watson NLU for enrichment.
5. Enriched data is visualized in the UI using the D3.js library.

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Flow diagram:



User Stories:

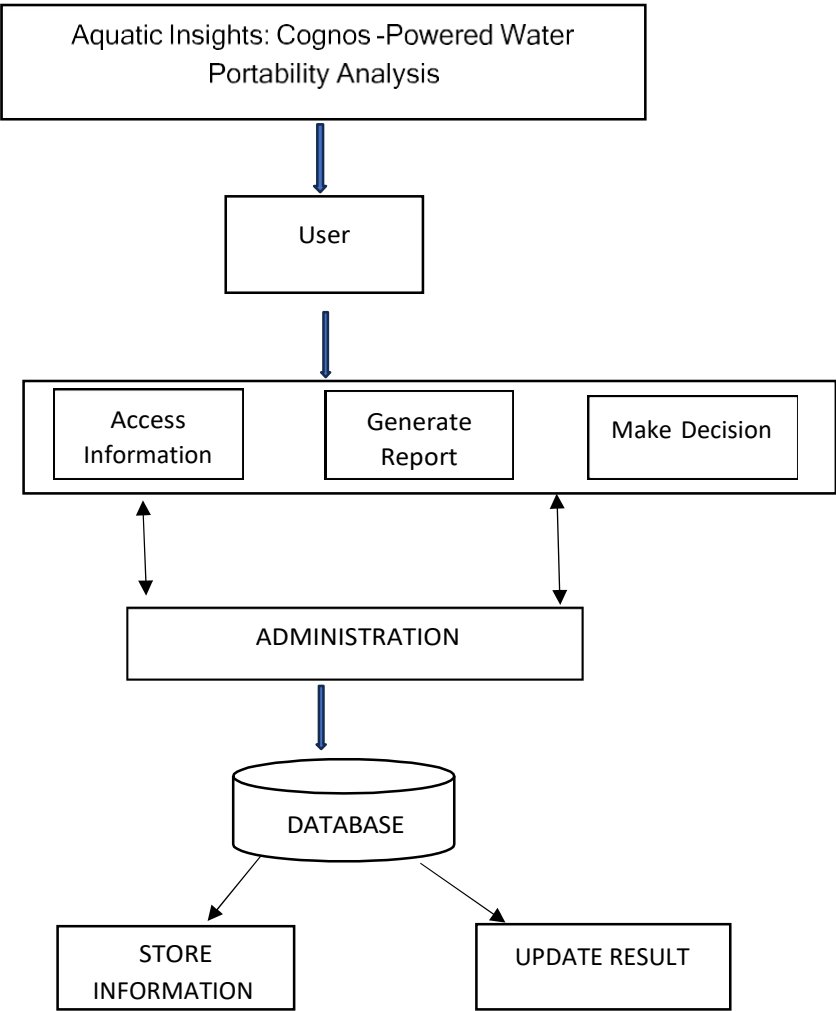
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
PUBLIC	check water quality information for their area	USN-1	Public users can access the system to check the quality of water in their area. They can view real-time water quality information, including potability status.	I can access my account / dashboard	0/1	
		USN-2	Public users may set preferences to receive real-time alerts and notifications about water quality issues, such as water contamination or safety concerns.		0/1	
		USN-3	They can access historical water quality data to track changes and trends in water quality over time		0/1	
	Dashboard					
System Administrator			Infrastructure Management: System administrators are responsible for managing the technical infrastructure, including servers, databases, and software updates. They ensure that the system is running smoothly and efficiently.			

5.2. Solution Architecture:

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Example - Solution Architecture Diagram:

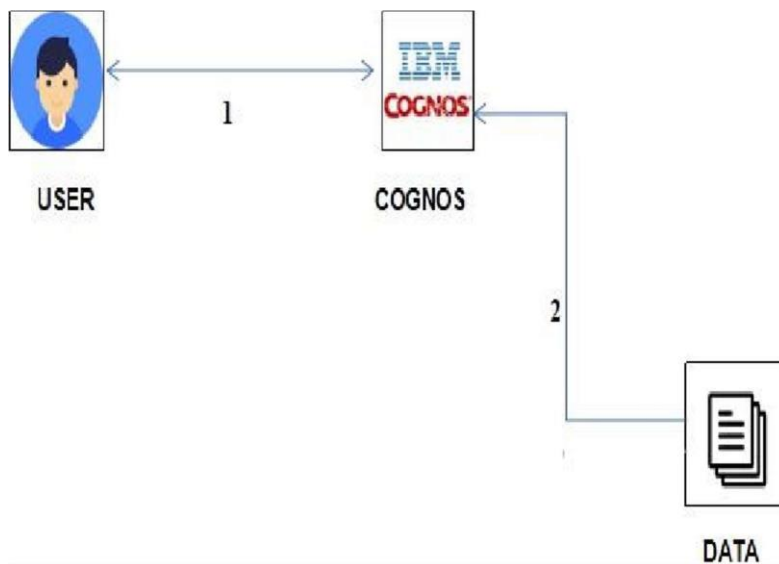


6.PROJECT PLANNING & SCHEDULING

1. Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Reference: <https://www.kaggle.com/code/khsamaha/potable-water-prediction-0-798- with- caret-rf-r/input>



□ Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Mobile App, Chatbotetc.	HTML, CSS, JavaScript / Angular Js / ReactJs etc.
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Cognos Analytics
4.	Application Logic-3	Logic for a process in the application	IBM Cognos Analytics
5.	Database	Data Type, Configurations etc.	Excel

6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Purpose of External API used in the application	IBM Weather API, etc.
9.	External API-2	Purpose of External API used in the application	Aadhar API, etc.
10.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model, etc.
11.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: Cloud Server Configuration :	Local, Cloud Foundry, Kubernetes, etc.

2. Sprint Planning & Estimation:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	
Sprint-2		USN-3	As a user, I can register for the application through SmartInternz	2	Low	
Sprint-1		USN-4	As a user, I can register for the application through smartInternz provided email id.	2	Medium	
Sprint-1	Login	USN-5	As a user, I can log into the application by entering email & password	1	High	
	Dashboard					

3. Sprint Delivery Schedule:

Sprint	Total StoryPoints	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	1 Days	16 Oct 2023	16 Oct 2023	16 Oct 2023	16 Oct 2023
Sprint-2	20	1 Days	17 Oct 2023	17 Oct 2023	17 Oct 2023	17 Oct 2023
Sprint-3	20	1 Days	18 Oct 2023	18 Oct 2023	18 Oct 2023	18 Oct 2023
Sprint-4	20	1 Days	19 Oct 2023	19 Oct 2023	19 Oct 2023	19 Oct 2023

7.CODING & SOLUTIONING

7.1. Feature 1:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=<device-width>, initial-scale=1.0">
  <title> Water Portable </title>
  <style
>body{
  background-color: rgb(0, 0, 0);
}
h1{
  text-align: center;
  font-size:50px;
}
p{
  font-size: 25px;
  font-style: italic;
  font-weight: 100;
  margin-left: 20px;
}
</style>
</head>
<body>
  <h1 style="font-size: 40px;color: rgb(255, 255, 255);"><b>Aquatic Insights</b></h1>  <h1
style="font-size: 40px;color: rgb(255, 255, 255);"><b>COGNOS POWERED</b></h1> <h1 style="font-
size: 40px;color: rgb(255, 255, 255);"><b>WATER PORTABILITY ANALYSIS</b></h1>
  <h2 style="font-size: 25px;color: rgb(255, 255, 255);">Here is the data analyst regarding the
water analysis. We are analysed with the different datas like ph values , Hardness , TDS , Chloramines
, Sulfate , Conductivity , Organic carbon , Trihalomethanes , Turbidity , Potability of the water
samples.</h2>
  <iframe src="https://us3.ca.analytics.ibm.com/bi/
perspective=dashboard&amp;pathRef=.public_folders%2FProject
2FDashboard_water&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=fal
se&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model00
00018b452f8bbd_00000000" width="800" height="800" frameborder="0" gesture="media"
allow="encrypted-media" allowfullscreen=""></iframe>
  <h1 style="font-size: 40px;color: rgb(255, 255, 255);">STORY BOARD</h1>
  <p style="font-size: 29px;color: rgb(255, 255, 255);"><!--stry goes here-->Our Analysis are
Seperate the Samples as Portable and Non Portable , Average Sulphate content of portable and non
portable , Summerizing cloramines taking their average , Summerizing Organic - Carbon content
taking their average , Average Organic- Corbon content of portable and non-portable water ,
Chloramines by Conductivity (Group) colored by Potability and ph by Hardness (Group) colored by
Potability. </p>
```

```
<iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.public_folders%2FProject%2FStory%2Bof%2BWater%2Bpotability&closeWindowOnLastView=true&ui_appbar=false&ui_navbar=false&shareMode=embedded&action=view&sceneId=model0000018b4795eed0_00000000&sceneTime=3350" width="800" height="800" frameborder="0"
gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</body>
</html>
```

8. PERFORMANCE TESTING

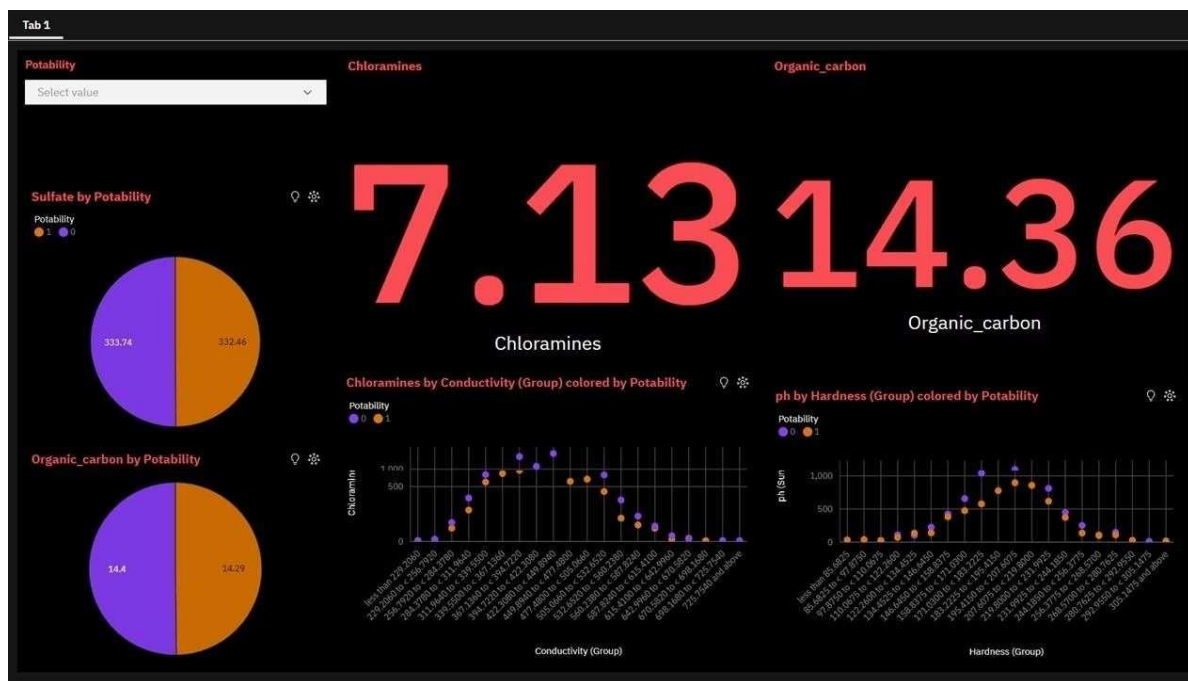
8.1. Performace Metrics:

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	No of Visualizations / Graphs – We have include 4 tabs
2.	Data Responsiveness	The system's ability to efficiently analyze these indicators and provide real-time predictions, ensuring the availability of safe drinking water in regions facing a crisis
3.	Amount Data to Rendered (DB2 Metrics)	The global drinking water crisis by ensuring the availability of safe and potable water in regions facing water quality concerns
4.	Utilization of Data Filters	Employed to narrow down the dataset and focus the analysis such as assess water quality
5.	Effective User Story	No of Scene Added - 4
6.	Descriptive Reports	No of list / Graphs – 1

9.

RESULTS

9.1. Output Screenshots:



10.ADVANTAGES & DISADVANTAGES

□ **Advantages:**

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" offers a range of advantages:

- Comprehensive water quality assessment with predictive capabilities.
- User-friendly interface accessible to experts and the public.
- Data integration for a complete view of water quality.
- Facilitation of collaboration and knowledge sharing.
- Promotion of public awareness and regulatory compliance.
- Robust data security and continuous improvements.
- Resource efficiency and environmental sustainability.
- Data-driven decision-making for policymakers and researchers.
- Customization and scalability for future growth.
- Real-time monitoring and international collaboration.

These advantages collectively contribute to improved water quality management and sustainable ecosystems.

□ **Disadvantages:**

The project "Aquatic Insights: Cognos-Powered Water Portability Analysis" comes with several potential disadvantages and challenges:

- Handling complex and diverse data sources.
- Data availability limitations in remote or less-studied areas.
- Technical barriers for some users with limited skills.
- Ongoing maintenance and software update costs.
- Stringent data privacy and security requirements.
- Regulatory compliance complexities.
- Resource-intensive computational and human requirements.
- High initial implementation costs.
- Sustaining user engagement and public awareness.
- Ensuring data consistency across various sources.
- Adaptation to changing environmental conditions.
- Potential public resistance to sharing data.
- Mobile application compatibility challenges.
- Scalability concerns as the project grows.
- Effective communication with diverse stakeholders.

Mitigating these challenges will be vital for the project's success and its ability to deliver comprehensive water quality insights.

11.CONCLUSION

In conclusion, "Aquatic Insights: Cognos-Powered Water Portability Analysis" represents a promising solution for addressing challenges in water quality assessment and management. The project leverages advanced data analytics,user-friendly interfaces, and collaboration tools to provide valuable insights into aquatic ecosystems. It offers advantages such as improved water quality assessment and informed decision-making, contributing to environmental sustainability.

Despite potential challenges such as data complexity and privacy concerns, the project's goals are attainable with careful planning and dedication. "Aquatic Insights" has the potential to be a valuable resource for various stakeholders, serving as a catalyst for positive change in aquatic ecosystem management. The project signifies a promising path toward sustainable water quality management and the preservation of natural water resources.

12.FUTURE SCOPE

The future scope for "Aquatic Insights: Cognos-Powered Water Portability Analysis" is expansive and promising. It includes:

- Incorporating advanced data sources, AI, and IoT for more comprehensive and real-time water quality analysis.
- Implementing blockchain for enhanced data security and transparency.
- Facilitating global collaboration and data sharing.
- Developing educational resources and influencing water quality policies.
- Addressing climate change and ecosystem health, and expanding the project's focus to include flood monitoring and environmental equity.⁷⁷
- Promoting sustainable practices and contributing to open data initiatives.

The project has the potential to become a comprehensive and collaborative platform, empowering stakeholders to better understand and manage aquatic ecosystems in an increasingly complex world.

13. APPENDIX

Source Code:

Index.html

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Water Portable</title>
  <style>
    body {
      background-color: rgb(0, 0, 0);
    }
    h1 {
      text-align: center;
      font-size: 50px;
      color: rgb(255, 255, 255);
    }
    h2 {
      font-size: 25px;
      color: rgb(255, 255, 255);
    }
    p {
      font-size: 29px;
      color: rgb(255, 255, 255);
    }
    .center-img {
      text-align: center;
    }
    .center-img img {
      display: block;
      margin: 0 auto;
      max-width: 100%; /* Ensure images don't exceed their container width */
    }
  </style>
</head>
<body>
  <h1><b>Aquatic Insights</b></h1>
  <h1><b>COGNOS POWERED</b></h1>
  <h1><b>WATER PORTABILITY ANALYSIS</b></h1>
  <h2>Here is the data analysis regarding water analysis. We have analyzed various data points such as pH
  values, hardness, TDS, chloramines, sulfate, conductivity, organic carbon, trihalomethanes, turbidity, and
  potability of the water samples.</h2>
  <div class="center-img">
    
  </div>
  <h1>STORY BOARD</h1>
  <p>Our analysis separates the samples as portable and non-portable, averages sulfate content for portable and
  non-portable water, summarizes chloramines taking their average, summarizes organic carbon content taking their
  average, and considers the average organic carbon content of portable and non-portable water. We also look at
  chloramines by conductivity (group) colored by potability and pH by hardness (group) colored by potability.</p>
  <div class="center-img">
    
```

```

        
    </div>
    <script>
        // Image transition timer (5 seconds)
        setInterval(function() {
            var image1 = document.getElementById("image1");
            var image2 = document.getElementById("image2");
            var image3 = document.getElementById("image3");

            if (image2.style.display === "none") {
                image2.style.display = "block";
                image3.style.display = "none";
            } else {
                image2.style.display = "none";
                image3.style.display = "block";
            }
        }, 10000);
    </script>
</body>
</html>

```

App.py

```

from flask import Flask, render_template
app = Flask(__name__)
@app.route("/")
def index():
    return render_template("index.html")
if __name__ == "__main__":
    app.run()

```

Github link:

<https://github.com/Sucharitha0905/Naan-Mudhalvan>

Project Demo Link:

[https://drive.google.com/file/d/1AmmSpJEO6i-iZnZ4SO3YIfRfPOLrYOHu/view?usp=drive link](https://drive.google.com/file/d/1AmmSpJEO6i-iZnZ4SO3YIfRfPOLrYOHu/view?usp=drive_link)