# Project 10: Water Quality Analysis (DAC_Phase1)

# Phase 1: Problem Definition and Design Thinking

## Introduction

The objective of this project is to analyse water quality data to assess the suitability of water for specific purposes, particularly for drinking. The project encompasses a series of tasks, including defining analysis objectives, collecting relevant data, designing visualizations, and building a predictive model. In this initial phase, we will focus on understanding the problem statement and outlining our approach to solving it.

## Problem Statement

The primary problem we aim to address is the assessment of water quality for drinking purposes. This involves evaluating water samples against regulatory standards and identifying any potential issues or deviations. The key components of the problem statement include:

## Define Analysis Objectives:

- Clearly define the specific objectives of the analysis.
- These objectives should guide our data collection and analysis efforts.
- In this case, our primary objective is to determine if the water is potable for drinking.

## Collect Water Quality Data:

- Gather relevant water quality data, which may include various parameters such as pH levels, turbidity, microbial content, chemical composition, and more.
- This data can come from different sources, including government agencies, environmental organizations, or water treatment facilities.

## Design Visualizations:

- Create informative and actionable visualizations to represent the collected data.
- These visualizations will aid in identifying trends, outliers, and deviations from regulatory standards.

- They will also help in communicating findings effectively.

## Build a Predictive Model:

- Develop a predictive model that can assess water potability based on the collected data.
- This model should consider the multiple parameters and provide a reliable prediction of whether the water is safe to drink.

## Design Thinking Approach

To effectively address the problem, we will employ a design thinking approach, which involves the following stages:

## Empathize:

- In this stage, we will seek to understand the needs and concerns of the end-users, which in this case are individuals relying on the water for drinking.
- We will also consider the perspectives of regulatory bodies and environmental experts who set water quality standards.

## Define:

- We will clearly define the problem, objectives, and constraints.
- This includes specifying the parameters we need to measure and the regulatory standards that must be met.

## Ideate:

- Generate ideas for data collection methods, visualizations, and potential modelling techniques.
- Brainstorm various ways to make the assessment process efficient and reliable.

## Prototype:

- Create initial prototypes of visualizations and data collection methods.
- This may involve designing sample charts or dashboards to visualize water quality data.

### Test:

- Test the prototypes with a small sample of data and gather feedback from relevant stakeholders.
- This feedback will help refine the prototypes and improve their effectiveness.

### Iterate:

Based on feedback and testing results, refine, and iterate on the prototypes until they meet the project's objectives effectively.

## Proposed Approach

Our proposed approach for solving the problem involves the following steps:

### Data Collection:

- Gather water quality data from authoritative sources, ensuring that it covers a wide range of parameters such as pH, turbidity, chemical composition, and microbiological content.
- Organize and preprocess the data to make it suitable for analysis.

### Data Visualization:

- Design a variety of visualizations, including scatter plots, histograms, and time series graphs, to explore and represent the data.
- Create a dashboard that provides a comprehensive view of water quality metrics and their trends over time.

### Model Development:

- Build a predictive model using machine learning techniques that consider the various water quality parameters.
- Train and validate the model using historical data and evaluate its accuracy.

### Assessment and Reporting:

- ❖ Use the predictive model to assess the potability of water samples based on the input parameters.
- ❖ Generate reports and visualizations that communicate the findings effectively to both technical and non-technical stakeholders.

## Iterative Improvement:

- ❖ Continuously collect new data to keep the model up-to-date and enhance its accuracy.
- ❖ Gather feedback from end-users and experts to improve the analysis process and visualizations.

## Conclusion

In this initial phase of the project, we have defined the problem statement, outlined our objectives, and proposed a design thinking approach to address the water quality assessment challenge. Our focus is on understanding the needs of end-users, collecting relevant data, designing effective visualizations, and building a predictive model to assess water potability accurately. This document serves as a roadmap for the subsequent phases of the project.