**PRESENTATION CONTENT**

**Outline**

* Overview
* Understanding Water Network System
* EPANET Package
* Introducing the WNTR Package
* Problem Statement
* Amazing features of the WNTR Package
* Business Proposition

NOTE:

Every team member is expected to come up with content in line with the above outline. The outline is just a guide but you are expected to come up with a storyline from problem statement to what we are expected to do.

1. **JOHN**
2. **SANDILE**
3. **BUHARI**
4. **DARLINGTON**
5. **JOSEPH**
6. The uttermost goal for any urban or rural water utility is to provide water to residents at sufficient pressure and quality. With the increased urban development, the management of water distribution systems has encountered new and challenging problems due to the increased demand for drinking water; which also highly varies in time and volume. The reliability of these utilities’ water distribution systems is then pegged upon the various elements that are critical for the design and management of these systems, e.g., reservoir capacity, pipe size and maintenance, and the variability of water demand. While the inception of powerful simulation models enabled by new-era computing power enabled hydraulic engineers to visualize the behavior or distribution systems in almost any scenario, the accuracy of such models relies heavily on the quality of input data deployed. These data input points include nodal temporal (spatiotemporally varying nodal water demands) variations, nodal demands, pipe friction coefficients. The confidence in the resultant water distribution simulation model, its performance, and applicability are then reliant on the quality of these input metrics since they directly impact the differences between simulated and actual water flows and pressures. However, the primary challenge in calibrating these simulations to reflect real-time water pressures and flows is the absence or insufficiency of data to accurately map the numerous nodal demands.
7. **KENNEDY**

**Modeling Water Network Distribution System Resilience**

**Overview**

EPANET is the industry’s standard hydraulic solver used as the water Distribution simulator (WDS).

It can be used to track the flow of water in each pipe, the pressure at each node, the height of the water in each tank, a chemical concentration, the age of the water, and source tracing throughout the network during a simulation period.

On the other hand, The Water Network Tool for Resilience (WNTR) is a Python package designed to simulate and analyze resilience of water distribution networks.

While EPANET includes some features to model and analyze water distribution system resilience, WNTR was developed to greatly extend these capabilities.

WNTR provides a flexible platform for modeling a wide range of disruptive incidents and repair strategies, and includes an extensible hydraulic simulator.

**WNTR package capabilities**

* Simulate disaster scenarios and damage to a specific water distribution system over time
* Measure quantitative resilience indicators
* Evaluate the benefit of utility response actions
* Evaluate improvements in resilience due to changes in system operation or design

**Problem statement**

Real word water supply systems are exposed to a range of risks, due to both natural and man-made hazards.

Natural disasters like drought, earthquakes, floods, wildfire, winter storms, hurricanes and Tornados cause immense damage to water supply systems.

There are also risks to water supplies arising from operational practices, perhaps currently the most important being the water losses problem.

This project demonstrate the framework by “stress-testing” a synthetic water Distribution Network system with an ensemble of scenarios whose parameters are stochastically changing within the water system simulation timeframe and quantify the uncertainty in the estimation of the system’s resilience.

**Aim and Objectives**

**Aim**

The aim of this project is to support water utilities to improve evidence-based decision making for long-term infrastructure planning.

To bring an understanding of how resilience to various hazards (natural and man made) in water supply systems can be developed

To developed an integrated approach to identify and rank the risks and recommends methods of analysis and assessment to improve the resilience of water supply systems.

**Objectives**

Assessing the resilience of real word water supply systems through analysis and assessment of risks, including transmission pipelines and water distribution network, and to determine how these risks may be reduced through effective measures of mitigation.

**Specific objectives**

* Describe the behavior of groups of consumers at smaller scales, e.g., at a household level, to allow the generation of realistic water demand patterns for various types of consumers and/or uses;
* Simulate the hydraulic distribution of water to consumers in the temporal and spatial dimension, e.g., a model for the water distribution network (WDN), which simulates the behavior of pipes, tanks, valves, pumps, etc.;

**Important business Questions**

* What kind of infrastructure damage would be expected after a disruptive event?
* How long would the system continue to provide water to customers?
* Which customers are impacted the most?
* What kind of restoration actions would be helpful?
* How should restoration actions be prioritized and implemented?
* What can utilities do to prepare?