



Northeastern University
College of Professional Studies

Module 3 Assignment — Individual RShiny Application

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ALY6070 - Communication and Visualization for Data

Analytics

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Introduction

Water is a vital resource sustaining life as well as industry and agriculture, but there is a huge difference in their availability and use across regions. Understanding the water consumption patterns and levels of scarcity and their relationship to precipitation and usage is crucial for sustainable management of the resource. This report presents an interactive R Shiny dashboard visualizing key insights derived from the water consumption database at the global level. The dashboard will incorporate time series, sectoral trends accompanied by time comparisons, and geospatial mapping, enabling a comprehensive exploration of water issues. Such interactive visualization will make policymakers, environmentalists, and researchers savvy in making data-informed decisions about water sustainability.

Analysis

Research/Business Question

Primary Research Question: How do global water consumption patterns and scarcity levels vary across regions, and what are the key factors influencing these trends?

-> These questions guide the dashboard's design, allowing stakeholders—policymakers, environmentalists, and researchers—to investigate trends, hazards, and actionable insights for sustainable water management.

Dashboard Overview

This R Shiny dashboard basically comprises three main sections:

1. Water Consumption Trends – A time series visualization showing trends in global and country-specific water usage.

2. Water Scarcity & Sectoral Usage – A stacked area chart and geospatial map to explore water scarcity levels and sector-based consumption patterns.
3. Sustainability Insights – A boxplot analysis that reveals consumption variability across different years and highlights groundwater depletion risks.

The dashboard contains several interactive features for a better experience for the users:

- Dropdowns for country and year selection.
- Hover-over tooltips for deeper data points.
- Click to focus on specific insight.

These design features allow a simple and immediate approach toward making sense of the dataset, as it is effortless to use and access.

Data Preparation

Data Cleaning and Transformation:

- The dataset (global_water_consumption.csv) was imported into the environment, cleaned up, and structured for consistency.
- Having standardized the column names, the risk of utilization errors in visualization was limited.
- Missing and inconsistent values were detected and treated suitably.
- Computed variables were produced, including water scarcity classifications and sectoral breakdown.

Key Data Transformations:

- Yearly Aggregation: The dataset was structured to allow for time-series analysis.
- Sector-Based Categorization: Water use was grouped into agriculture, industry, and household sectors.

- Geospatial Data Mapping: Countries with unlocated data were assigned latitude and longitude using geocoding.

With these transformations, the dashboard accurately reflects the trends and relationships present in the data.

Visualization Design & Storytelling

A. Water Consumption Trends

- Visualization: Time Series Line Chart
- Purpose: Analyzes global and country-specific water consumption trends over time.
- Key Insights: Water usage trends vary significantly across regions, with certain countries exhibiting increasing consumption rates due to population growth and industrial expansion.

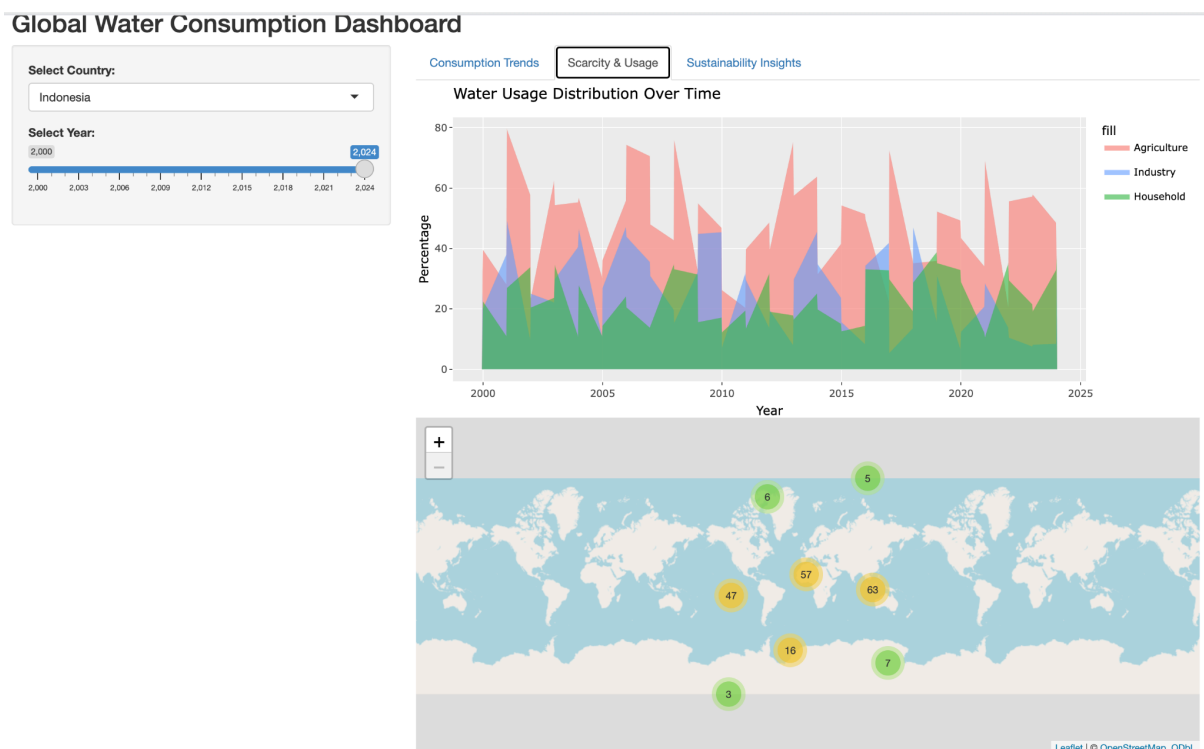
Global Water Consumption Dashboard



B. Water Scarcity & Sectoral Usage

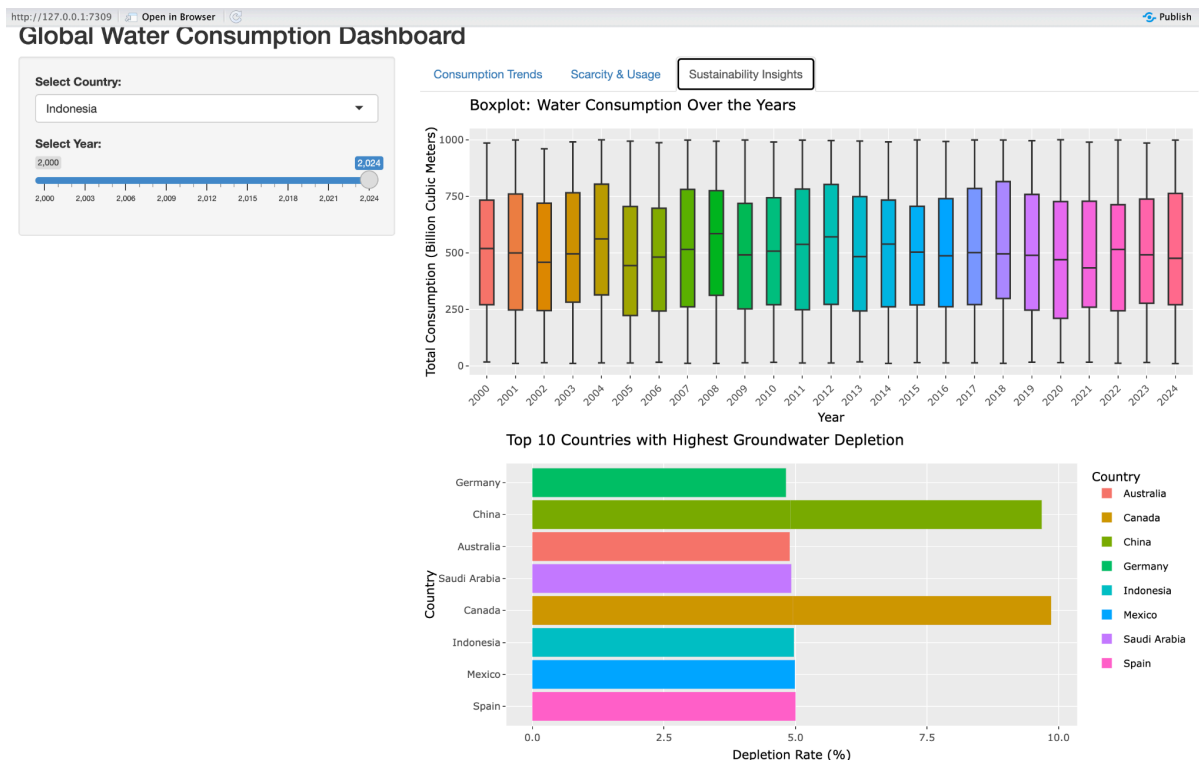
- Visualization: Stacked Area Chart & Interactive Geospatial Map

- Purpose:
 - The stacked area chart breaks down water usage across agriculture, industry, and household sectors.
 - The geospatial map highlights global water scarcity levels.
- Key Insights: Agriculture remains the dominant water-consuming sector, and regions with low precipitation levels tend to experience severe water stress.



C. Sustainability Insights

- Visualization: Boxplot Analysis of Yearly Water Consumption
- Purpose: Identifies variability and trends in water usage across different years.
- Key Insights: Some countries show high fluctuation in water consumption, likely due to seasonal changes, policy shifts, or drought conditions.



Conclusion & Recommendations

The R Shiny dashboard is easy to use, interactive, and most importantly, based on data. It provides information about how much water is used, how scarce it is, and how sustainable it is around the world. It also shows different visualizations that show how water is used in different sectors, how it has changed over time, and how it is different in different places. Such information would help policymakers, environmentalists, and researchers develop much more effective strategies for water conservation.

Recommendations for the future:

- Enhancing Interactivity: Establishing more dynamic filters to compare regions is possible.
- Real-Time Data Integration: Introducing live water usage recordings for even more up-to-the-minute insights.

- Sector-Specific Analysis: Expand household, industry, and agricultural categories for a more intricate breakdown.

By improving the dashboard, it can provide utility for managing sustainable water resources.

References

Global Water Consumption Dataset (2000-2024) 🌍💧. (2025, March 13). Kaggle.

<https://www.kaggle.com/datasets/atharvasoundankar/global-water-consumption-dataset-2000-2024>