CAPSTONE PROJECT

IMPROVED SOURCE OF DRINKING WATER

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Access to safe and improved drinking water continues to be a major concern in many parts of India, especially in rural and underdeveloped regions. Despite national efforts and international goals under the Sustainable Development Goals (SDGs), significant disparities still exist across states, districts, and population groups.

These inequalities affect health, education, and overall well-being, highlighting the urgent need to better understand how water access varies regionally and socially.

PROPOSED SOLUTION

The proposed system aims to assess disparities and trends in access to improved drinking water across Indian states and sectors using data-driven insights. This involves leveraging data visualization and analytical tools available on IBM Watsonx.ai to identify key patterns, outliers, and gaps in water access. The solution consists of the following components:

Data Collection:

- Utilized the **78th Round of the Multiple Indicator Survey (MIS)** dataset.
- Focused on indicators such as:
- Access to improved sources of drinking water
- Sector-wise classification (Urban/Rural/All)
- Clean cooking fuel usage
- Migration-related trends

Data Preprocessing

- Uploaded the CSV dataset into **IBM Watsonx.ai Studio**.
- Cleaned and formatted the data for visualization.
- Converted categorical fields and normalized missing values to ensure accurate representation.

PROPOSED SOLUTION

Exploratory Data Analysis (EDA) & Visualization:

- Created multiple chart types (bar, pie, histogram, Pareto) to:
  - Compare Urban vs. Rural access by state
  - Identify states with lowest and highest water access
  - Analyze percentage distributions and data concentration
  - Understand sector-wise household data distribution

Deployment:

- Deployed and executed analysis on **IBM Cloud (Lite Plan)** using **Watsonx.ai no-code dashboard**.
- Visual outputs served as an interactive layer for decision-making and reporting.

Evaluation:

- Interpreted visual insights to identify key problem areas.
- Compared trends across sectors and states.
- Derived actionable insights for policy-level recommendations in achieving SDG goals.

SYSTEM APPROACH

The "System Approach" outlines the overall strategy and tools used for analyzing water accessibility in India. The project follows a data-driven and visualization-based methodology using IBM Cloud services.

System Requirements:

- **Platform**: IBM Cloud (Lite Plan)
- **Tool Used**: Watsonx.ai Studio
- **Data Format**: CSV file from NSS 78th Round – Multiple Indicator Survey (MIS)
- **Internet**: Required for cloud access and deployment
- **User Access**: IBM Cloud account and Watson Studio access

Libraries/Tools Used:

- Built-in **data visualization tools** (bar chart, pie chart, histogram, Pareto analysis)
- **Auto data summarization** and **column transformation** tools
- **Watsonx.ai dashboard components** for dragging and dropping analysis blocks
- **Chart building interface** for categorical and numerical fields

ALGORITHM & DEPLOYMENT

Algorithm:

Since the project focuses on **descriptive analytics**, no machine learning algorithm was applied. Instead, the project used:

- **Statistical visualization techniques** to identify patterns and disparities
- **Chart-based comparative analysis** between:
  - Urban vs. Rural access to improved drinking water
  - State-wise distribution of access
  - Sector-wise insights using pie, bar, histogram, and Pareto charts

Input Features:

- **State/UT** name
- **Sector** (Urban, Rural, All)
- **Percentage of population** with improved water access
- **Related indicators** like clean cooking fuel and migration status

ALGORITHM & DEPLOYMENT

Deployment Process:

- The entire solution was deployed and executed using **IBM Watsonx.ai on IBM Cloud Lite**.
- Key steps:
  - CSV Dataset uploaded into Watsonx.ai
  - Data prepared using Watsonx's transformation tools
  - Dashboards built with drag-and-drop visualization widgets
  - Charts exported as images and included in the project results

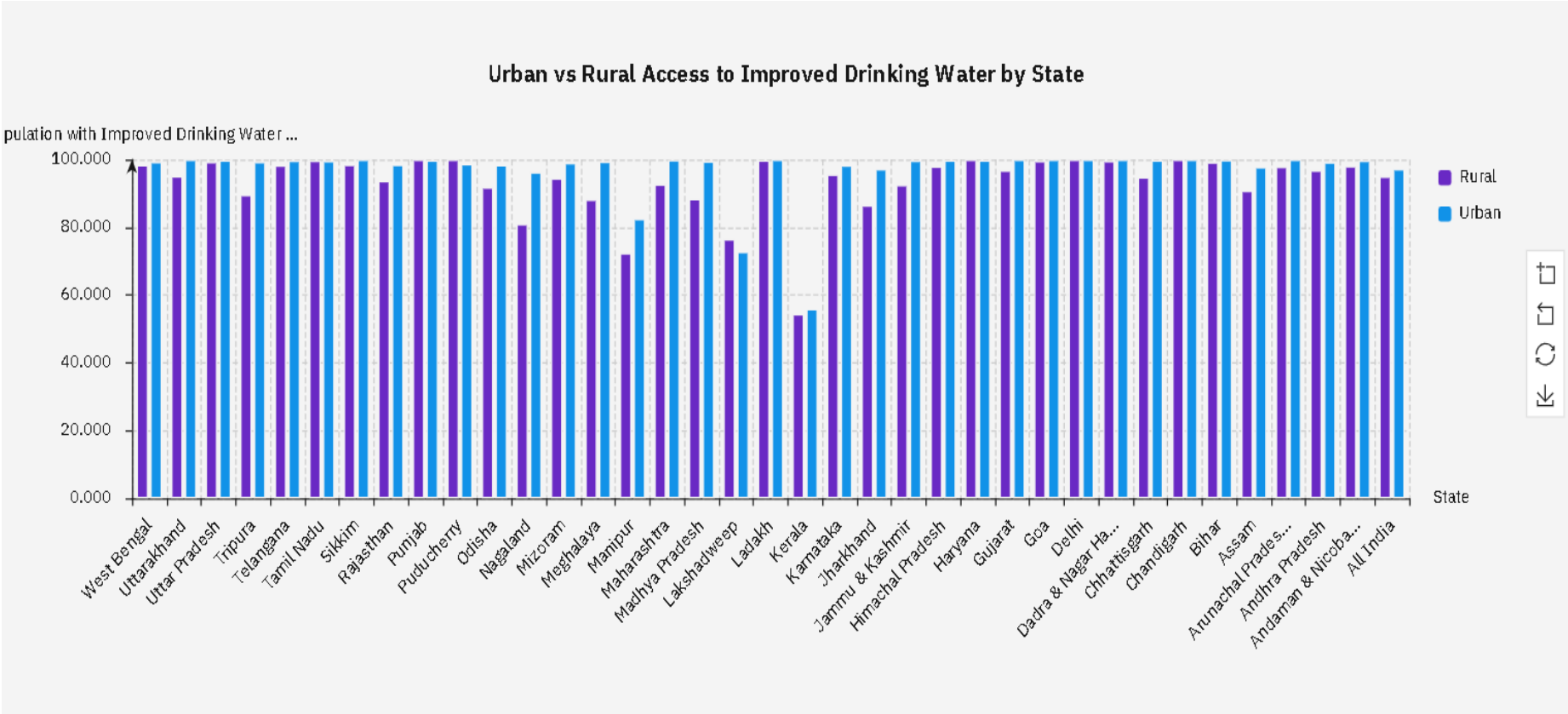
Outcome:

- A fully interactive, visual representation of disparities in water access
- No-code solution enabled rapid, accurate insight generation without writing any ML code
- Charts used as direct outputs for evidence-based understanding

RESULT

Key Findings:

1. Urban areas showed significantly higher access to improved drinking water sources compared to **rural regions**.



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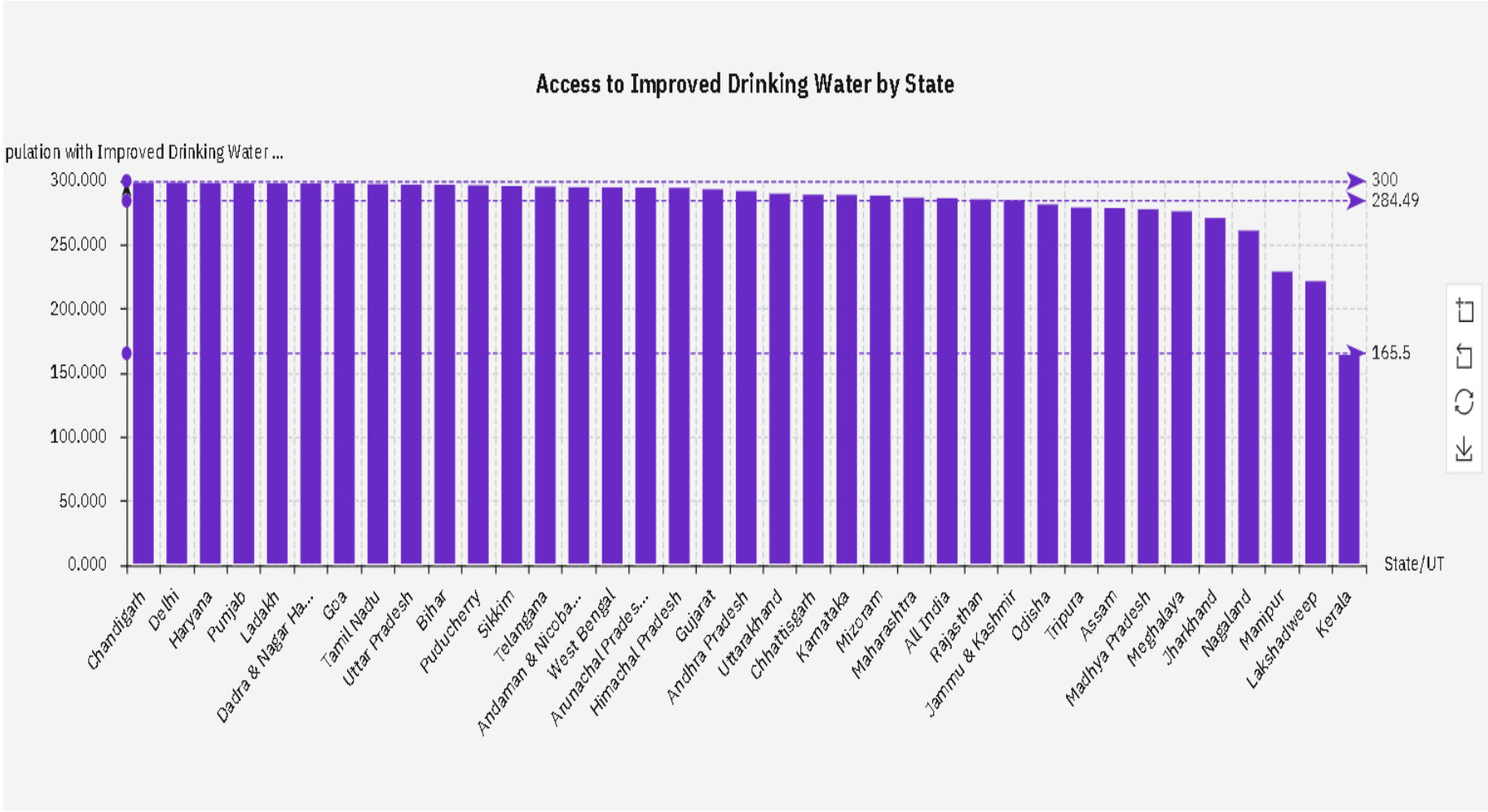
RESULT

2. Certain **states and union territories** had noticeably lower access levels, indicating the need for targeted interventions.



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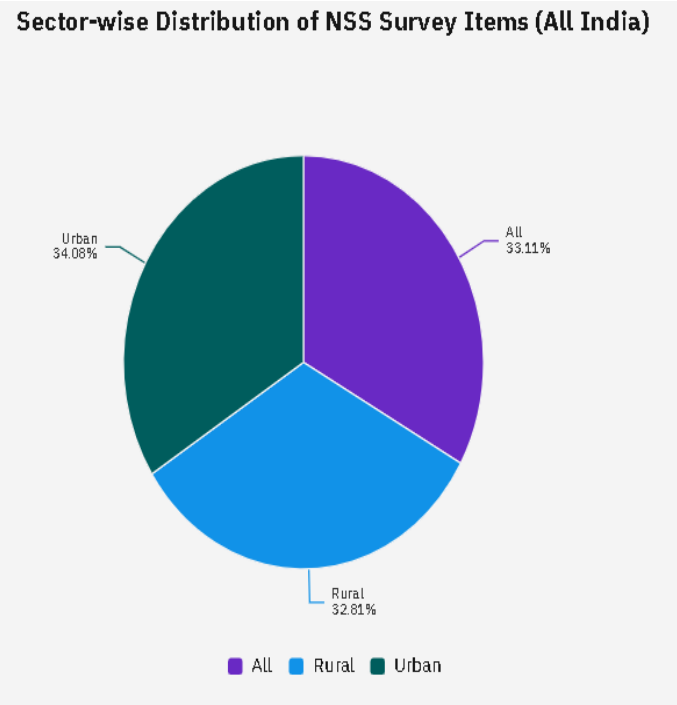
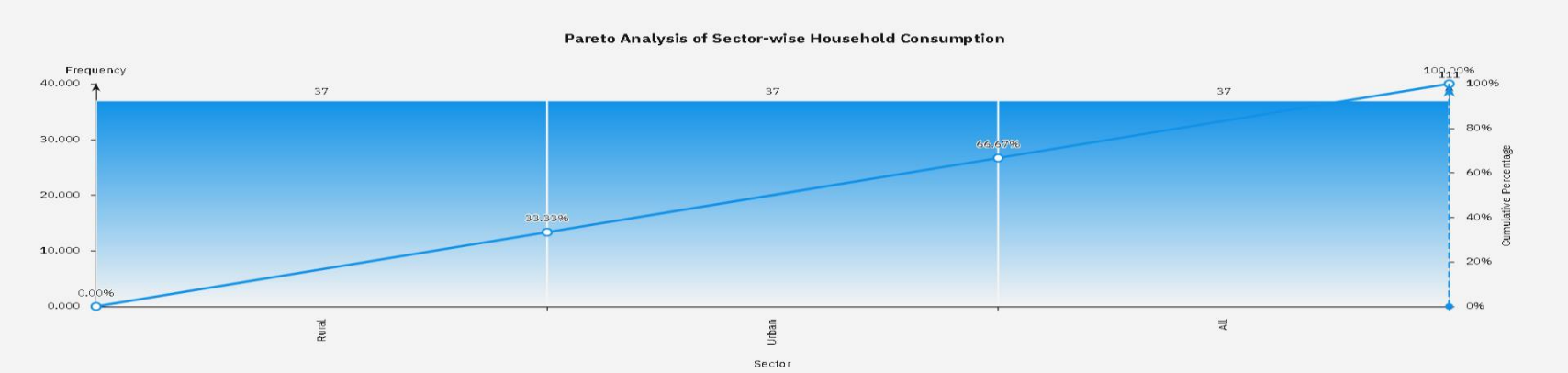
RESULT

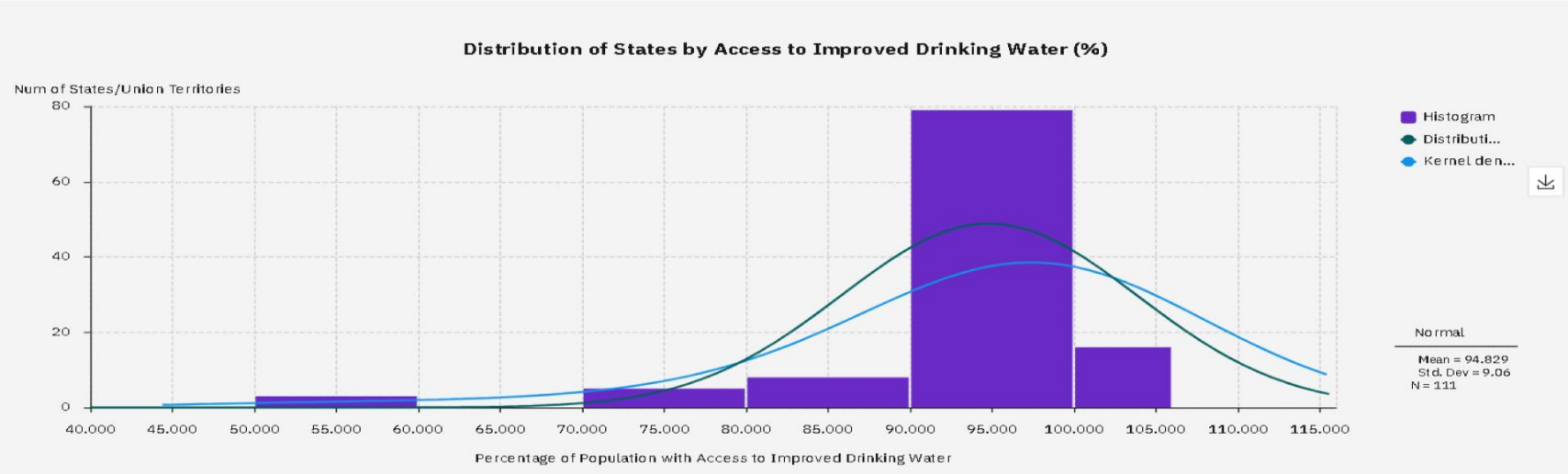
3. Pie and bar charts revealed the proportion of households by sector with and without improved water sources.

4. The **Pareto chart** helped identify the top contributing states to water access inequalities.

5. The **histogram** displayed the frequency distribution of access percentages across all states.







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CONCLUSION

The project successfully analyzed data from the 78th Round of the Multiple Indicator Survey to understand the state-wise and sector-wise access to improved drinking water in India. Using IBM Watsonx.ai's no-code platform, we identified significant disparities in water access between urban and rural areas, as well as among different states.

The visualizations provided clear evidence of inequality, which can help guide future government policies and resource allocation. The project also demonstrated how cloud-based data tools can empower non-programmers to extract meaningful insights from public datasets.

This analysis contributes directly to supporting India's progress toward Sustainable Development Goals (SDG 6 – Clean Water and Sanitation) by enabling **data-driven decision-making** and identifying **priority areas for intervention**.

FUTURE SCOPE

- **Incorporate real-time water quality data** (e.g., contamination levels, pH) to assess not just access but safety.
- **Integrate with sanitation and health datasets** to explore the broader impact of water access on public health.
- **Use machine learning models** in future to predict water-stressed regions and seasonal shortages.
- **Develop a public dashboard** for policymakers to monitor progress on SDG 6 at the district level.
- **Extend the analysis** to include rainfall, groundwater levels, and climate impact on drinking water availability.

REFERENCES

- National Sample Survey Office (NSSO) – **78th Round: Multiple Indicator Survey (MIS)**
- Ministry of Statistics and Programme Implementation (MoSPI), Government of India
- United Nations Sustainable Development Goals – **Goal 6: Clean Water and Sanitation**
- IBM Cloud and Watsonx.ai Studio Documentation – https://cloud.ibm.com
- Edunet Foundation – AICTE Internship Support Material
- Research articles and public datasets related to rural water access and migration trends

IBM CERTIFICATIONS

In recognition of the commitment to achieve professional excellence

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