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Aim: To design interactive dashboards and create visual storytelling using D3.js on a dataset related to Environment/Forest cover, covering basic and advanced charts

Objectives:

- To understand how to use D3.js for data visualization.
- To implement basic charts like Bar chart, Pie chart, Histogram, Timeline chart, Scatter plot, and Bubble plot.
- To implement advanced charts like Word chart, Box and whisker plot, Violin plot, Regression plot (linear and nonlinear), 3D chart, and Jitter.
- To draw observations and insights from each chart.
- To create an interactive storytelling dashboard using the above visualizations.

Description:

Link:
https://data.opencity.in/dataset/national-compilation-on-dynamic-ground-water-resources-of-india-2020

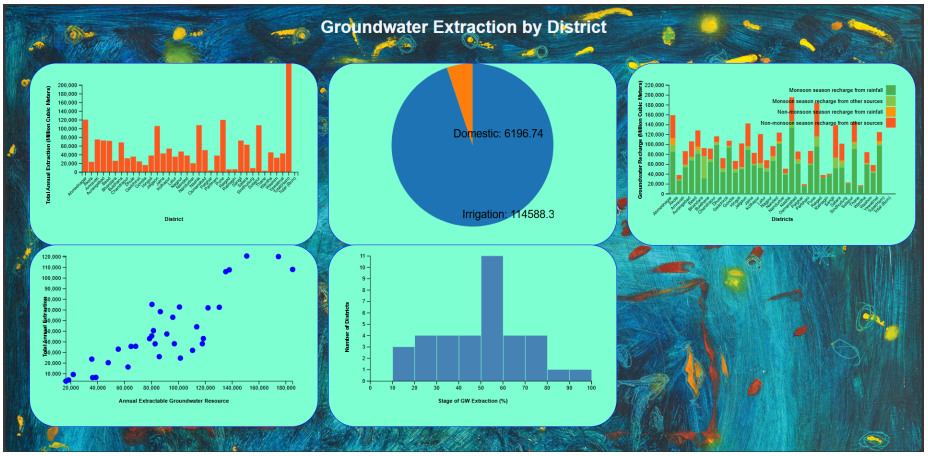
The "National Compilation on Dynamic Ground Water Resources of India 2020" dataset provides detailed information on groundwater resources and usage across various districts in India. Each row in the dataset corresponds to a district, with columns that represent various groundwater recharge, extraction, and allocation metrics. Here's a breakdown of each column:

- Sl. No: Serial number of the district entry.
- Name of District: Name of the district for which the groundwater data is reported.
- Monsoon Season Recharge from Rainfall: Amount of groundwater recharge (in million cubic meters) during the monsoon season, sourced specifically from rainfall.
- Monsoon Season Recharge from Other Sources: Amount of groundwater recharge (in million cubic meters) during the monsoon season, sourced from other inputs like rivers or lakes.
- Non-Monsoon Season Recharge from Rainfall: Amount of groundwater recharge (in million cubic meters) during the non-monsoon season, sourced specifically from rainfall.
- Non-Monsoon Season Recharge from Other Sources: Amount of groundwater recharge (in million cubic meters) during the non-monsoon season, sourced from other inputs.

- Total Annual Groundwater Recharge: The total amount of groundwater recharge (in million cubic meters) accumulated annually from both monsoon and non-monsoon seasons, aggregating all sources.
- Total Natural Discharges: Total groundwater discharge (in million cubic meters) that occurs naturally, without human extraction.
- Annual Extractable Groundwater Resource: The total groundwater available for extraction on an annual basis, after accounting for natural discharges (in million cubic meters).
- Irrigation - Annual Extraction: The amount of groundwater extracted annually for irrigation purposes (in million cubic meters).
- Industrial - Annual Extraction: The amount of groundwater extracted annually for industrial use (in million cubic meters).
- Domestic - Annual Extraction: The amount of groundwater extracted annually for domestic use (in million cubic meters).
- Total Annual Extraction: Total amount of groundwater extracted annually across all sectors (irrigation, industrial, and domestic) (in million cubic meters).
- Annual GW Allocation for Domestic Use (2025): Projected groundwater allocation for domestic use in the year 2025 (in million cubic meters).
- Net GW Availability for Future: Groundwater available for future use after accounting for current and projected extractions (in million cubic meters).
- Stage of GW Extraction (%): The ratio of total annual extraction to the annual extractable groundwater resource, expressed as a percentage. It provides an indicator of groundwater usage intensity, with higher values indicating higher levels of groundwater resource utilization.

This dataset is valuable for analyzing groundwater availability, recharge sources, extraction rates across different sectors, and identifying districts where groundwater resources may be stressed due to high extraction.

Dashboard:

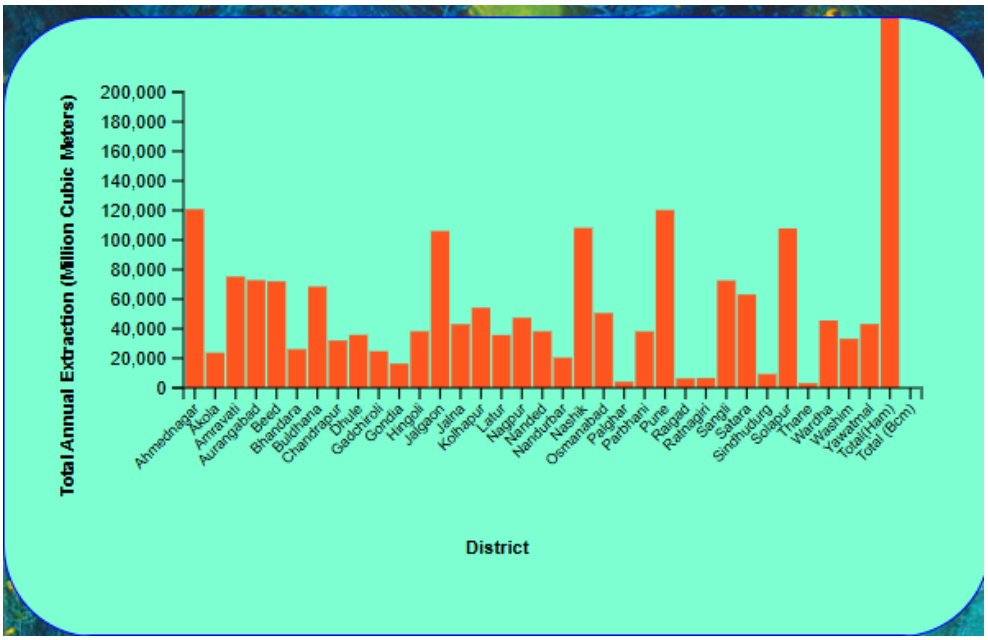


Story: The dashboard provides a comprehensive overview of groundwater extraction in different districts of Maharashtra. Overall, the dashboard highlights the uneven distribution

of groundwater extraction across districts, the dominance of irrigation as a major user, and the need for sustainable groundwater management practices to ensure long-term water security

Graphs and Observations:

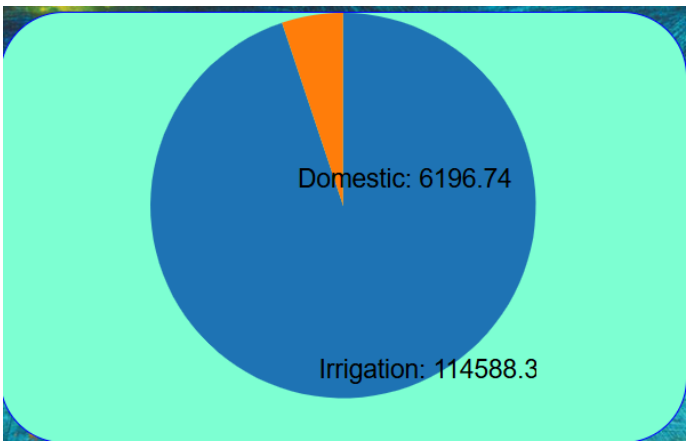
Bar chart:



Observation: The bar chart presents the total annual groundwater extraction in million cubic meters for various districts in Maharashtra. Here are some observations:

- There's a wide variation in groundwater extraction across different districts.
- Some districts extract significantly more groundwater than others.
- Ahmednagar has the highest total annual extraction, exceeding 120 million cubic meters.

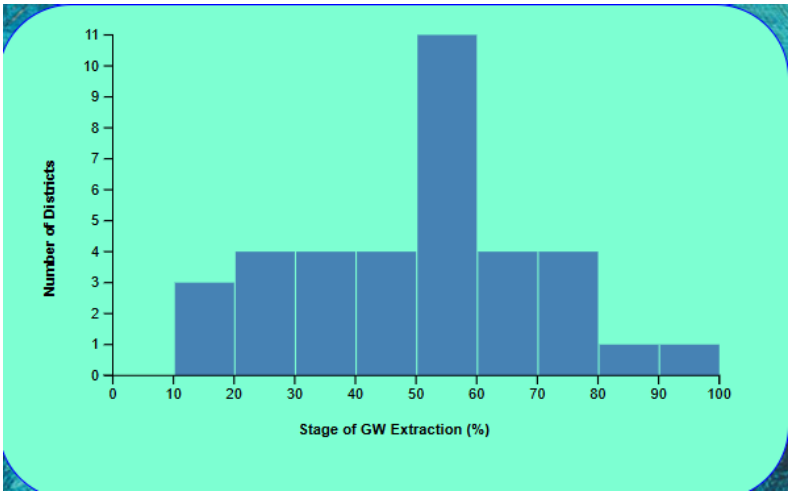
Pie Chart:



Observation: The pie chart illustrates the distribution of groundwater extraction between domestic and irrigation uses. Here are some observations:

- Irrigation Dominance: The chart clearly shows that irrigation accounts for the vast majority of groundwater extraction.
- Minor Domestic Use: Domestic use of groundwater constitutes a relatively small portion compared to irrigation.

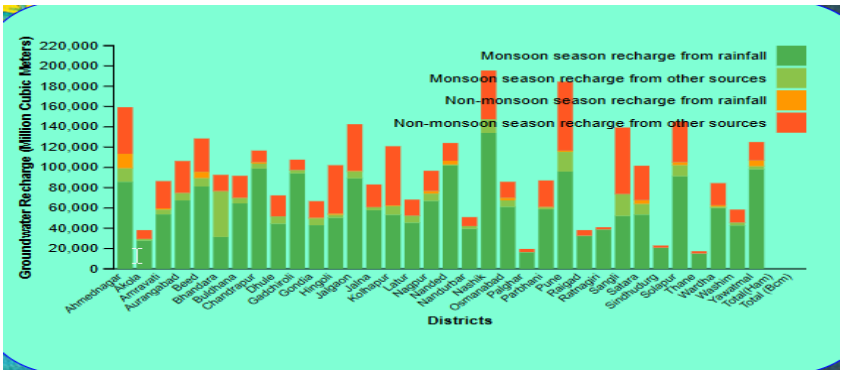
Histogram:



Observation: The histogram displays the distribution of districts across different stages of groundwater extraction in Maharashtra. Here are some observations:

- The distribution is skewed to the right, with a majority of districts falling in the lower stages of extraction.
- A significant number of districts are clustered around the 50-60% stage of extraction.
- A smaller number of districts are in the higher stages of extraction (80% and above).

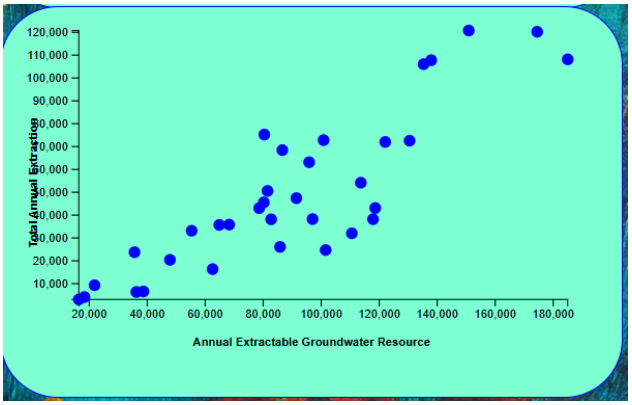
Stacked bar Chart:



Observation: The stacked bar chart provides a visual representation of groundwater recharge across different districts in Maharashtra, categorized by season and source. Here are some observations:

- Monsoon Season Dominance: The majority of recharge occurs during the monsoon season, with both rainfall and other sources contributing significantly.
- District-wise Variation: There's a considerable variation in recharge levels across different districts. Some districts receive significantly higher recharge than others.
- Ahmednagar and Yavatmal: These districts exhibit high levels of recharge, particularly from monsoon rainfall and other sources.

Scatter Plot:



Observation: The scatter plot illustrates the relationship between Annual Extractable Groundwater Resource and Total Annual Extraction for various districts in Maharashtra. Here are some observations:

- There appears to be a weak positive correlation between the two variables.

- As the annual extractable groundwater resource increases, the total annual extraction also tends to increase, but not in a perfectly linear manner.
- There is a cluster of points in the lower left corner, indicating districts with both low extractable resources and low extraction rates.

Conclusion:

Through this experiment, we gained valuable insights into D3.js and its powerful capabilities for data visualization. We explored how to effectively plot various types of graphs, including bar charts, line plots, histograms, and more. We learned how the various plots can be arranged into a dashboard in D3.js.