CS7DS4 / CSU44065 Data Visualization 2019-20

Assignment 3

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1   Introduction

Our daily lives are highly dependent on the consumption of electricity. It is essential to think about the resources from where electricity is generated, which sources contribute in the world's electricity mix from various countries, what is the consumption to generation gap of electricity. This visualization comprises all these parameters assessing energy systems of humankind. The metric used here to measure the energy produced is Daily Mega-Watt Hour (DMh) which means the energy produced by any source in a day. [1]

2   Description

- **Data**

The energy dataset obtained consists of Daily Mega-Watt Hour scale, potential energy gap, percentage of electricity mix in the world as well as countries and different energy sources such as biomass, coal, oil, gas, hydro, nuclear, solar, wind and others. These sources contribute in the generation of electricity further resulting in the overall electricity mix percentage continuous feature. Another important feature of the dataset is the country. Name of countries is provided and the amount of energy generated in Daily Mega-Watt Hour is shown from various sources for these countries. The metric Daily MWh is used to measure power produced in a day which is a continuous variable here. It is calculated by multiplying the operational hours, capacity and the Mega-Watt energy. [2]

Daily MWh = MW*Capacity*Operational Hours per day

 Country names are nominal variables. The data also has the energy mix percentage which entails the contribution of the energy sources in generating electricity for every country. The amount of energy generated and consumed is also present in the data showing the potential energy gap.

- **Tasks**

The task is to visualise the energy sources of electricity across the world. It depicts the amount of energy generated by the sources in a day in different countries. It shows an estimate of the world electricity mix indicating the level of generation from the sources. The visualization also attempts to showcase the gap between the amount of energy that is generated and the amount consumed. An interactive map is provided to the user which can be zoomed in and out. The map shows the countries in data with different colours. On hovering the countries the detail of the energy source type and Daily MWh energy generation is shown. A drop down menu is provided to the user to change the energy source type. This shows that not every source type generates electricity in every country and the highest generation of electricity is obtained from which data source in a particular country. Colour as an encoding channel plays an essential role here as the each source type is indicated by a different colour and so is the country. The Daily MW Scale is shown by plotting the amount of energy that is MW per day on the Y-axis and the countries on the X-axis. Size, colour, shape and motion are the encoding channels in action here. The size of the colours represents the Daily MWh and changes accordingly to that amount. The lesser the energy generation the smallest the size of the circle and vice-versa. The distance between the circle indicates the gap in generation from the energy sources in a country. As mentioned the colour indicates different energy source types. It helps in drawing correlation such as which country generates the highest amount of coal energy or does this country generates electricity from coal or not. The graph can also be played and paused to see the entire history of the graph at different speed levels for every country. Interactive correlation between the map and the Daily MWh scale graph has been established such that on hovering the country location on the map the circle for that particular country and energy source type is indicated in the graph. The World Electricity Mix Bar Graph shows the share percentage on the Y-axis and the energy source on the X-axis. Maintaining the colour encoding channel here also for every source type different colour has been used. This is a simple graph to just give user the idea about the heterogeneous nature of the electricity generation exists in the humankind. It helps in querying that the electricity generation is highest from which energy source in the entire world. The potential gap between the energy

generated and consumed is shown through the dual axis graph with both on X-axis for energy source types. The colour of circle tells if the energy is generated or consumed. The distance between the circle shows the potential gap. The graph of the history can be seen with the play and pause history click button. A single mouse click button is given on the Daily MWh scale graph that navigates user to another visualization indicating the energy mix percentage for every country. The size of squares indicates the level of contribution in the energy mix. A drop down menu is provided to the user to select the country of their choice as shown in Figure 1.
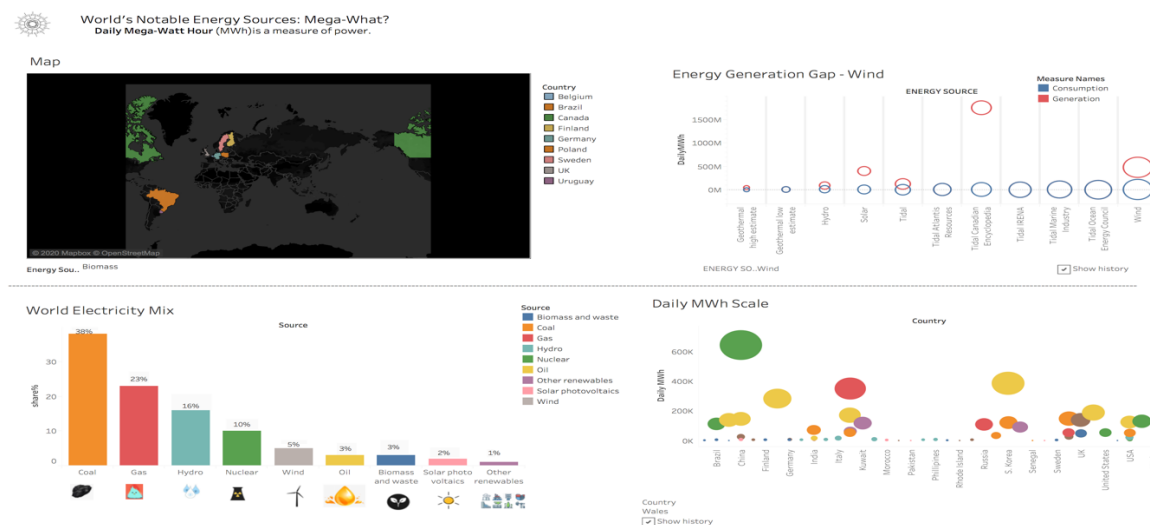

Fig. 1 Drop down menu for user.

Fig. 2 Visualization of World's Notable Energy Sources

- **Approach**

The approach is to visualise the world's energy sources as shown in Figure 2. The size of the shapes, in this case squares and circles determine the daily energy generation measured in Daily MWh. The distance between the shapes is use to show the gap between electricity mix from different sources and the gap between the amount of energy consumed versus the amount of energy generated. A common colour scale is used to indicate the different types of energy sources. The user can manipulate the visualizations by selecting their choice of energy source type complemented with the zoom in and out feature. The user can play and pause the history of the graphs.

- **Conclusions**

The visualization for world's notable energy sources in terms of Daily Mega-Watt Hour is created. The goal is to provide the user with the information regarding the contribution of different sources for electricity and show the gap when it comes to the utilization of energy. Common colour scale is used to indicate the different source types. The user can manipulate the visualization by making their own choices. The aim to make the visualization interactive and the narration of humankind energy sources is been accomplished. The visualization can be further improved by providing the information of the power plants. This information can be indicated in the map. Story-telling can be improved by showing trends of the sources through various years using the appropriate chart.

3 Resources

The data for this visualization was obtained from https://informationisbeautiful.net/ and https://www.eia.gov/opendata/

Tool Used: Tableau Desktop 2019.4, **Link to Visualization:** https://youtu.be/pGn_tXtGx5g

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References

[1] D. G. D. S. S. O. K. F. B. David McCandless, "Mega-What? World's Largest and Notable Energy Sources," Information is Beautiful, 15 July 2019. [Online]. Available: https://informationisbeautiful.net/visualizations/mega-what-the-worlds-biggest-and-most-notable-power-plants/. [Accessed 25 March 2020].

[2] M. R. Hannah Ritchie, "A sense of units and scale for electrical energy production and consumption," Our World in Data, 22 November 2017. [Online]. Available: https://ourworldindata.org/scale-for-electricity. [Accessed 2020 March 25].