RELIABILITY OF SOLAR ENERGY IN SOUTH EAST ASIA

LINK:
HTTP

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Year and Semester:
2, Semester 4

Word Count:
2000+

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1 Introduction

1.1 Background and Motivation

Target Audience

The users who will benefit from this visualization are energy enthusiasts, climate scientists, climate activists and businesspeople from the energy sector.

Potential tasks

The audience of this visualization will want to observe which Southeast Asia country has a better prospect of utilizing and generating a healthy amount of energy from solar compared to other alternatives in the space of renewable energy.

Importance of the project

The importance of this visualization project is to give insight to whether solar energy is a viable source of energy and should remain as an option for renewable energy.

1.2 Visualisation Purpose

Questions users will be able to answer with your visualisation

The visualization project aims to answer the question whether solar energy is a reliable renewable energy source in south-eastern region of Asia. The data could originate from government websites and publicly available data published by energy corporations.

List of possible benefits of the completed visualisation:

1. Figure out which south-east Asian country has the best prospects in harnessing the potential of solar energy.
2. Figure out if solar energy is a viable renewable energy source.

1.3 Project Schedule

Make sure that you plan your work so that you can avoid a big rush right before the final project deadline. Write this in terms of weekly deadlines.

Project Start.	24 days	9/9/22, 8:00 AM	10/12/22, 5:00 PM	
Decide on topic.	12 days	9/9/22, 8:00 AM	9/26/22, 5:00 PM	
Search for data. Preferrably in CSV format.	12 days	9/27/22, 8:00 AM	10/12/22, 5:00 PM	1
First Standup	13.5 days	10/13/22, 8:00 AM	11/1/22, 1:00 PM	null
Find data.	3 days	10/13/22, 8:00 AM	10/17/22, 5:00 PM	
Design low fidelity designs.	5 days	10/18/22, 8:00 AM	10/24/22, 5:00 PM	4
Draft first website design.	5 days	10/25/22, 8:00 AM	10/31/22, 5:00 PM	5
First draft process book.	0.5 days	11/1/22, 8:00 AM	11/1/22, 1:00 PM	6
Second Standup	4.5 days	11/1/22, 1:00 PM	11/7/22, 5:00 PM	3
Research other countries.	1 day	11/1/22, 1:00 PM	11/2/22, 1:00 PM	
Implement new charts.	3 days	11/2/22, 1:00 PM	11/7/22, 1:00 PM	9
Make progress on process book.	0.5 days	11/7/22, 1:00 PM	11/7/22, 5:00 PM	10
Third Standup	5 days	11/8/22, 8:00 AM	11/14/22, 5:00 PM	8
Finalize data visualization.	5 days	11/8/22, 8:00 AM	11/14/22, 5:00 PM	
Last Standup	1 day	11/22/22, 8:00 AM	11/22/22, 5:00 PM	12

Deliverables:

- **Project Start**
  - Decide on project title.
- **Standup Meeting 1**
  - Finalize project title.
  - Research on data relating to title.
  - Research on D3 template samples.
  - First draft of low fidelity design.
  - First draft process book/report.
- **Standup Meeting 2**
  - Complete at least 50% of process book/report.
  - Implement at least 1 chart.
  - Further research on data.
- **Standup Meeting 3**
  - Finalize website visualization.
  - Finalize process book/report.
  - Zip all data involved.
  - Ensure all relevant documents and codes are available on GitHub.
- **Final Standup Meeting**

2 Data

2.1 Data Source

From where and how are you collecting your data?

Data collected for the visualization project are from publicly available government websites and published research data published by energy corporations.

The data used originate from the following sources:

1. data.gov.my
2. data.gov.sg
3. data.world
4. https://www.aiddata.org/
5. https://worldpopulationreview.com/

What type of data set is it (e.g., table, network, field)?

The data used are in the form of CSV (Comma Separated Values) format. Although, the data available online are mainly in Excel formats with styled headers and body to describe the purpose of the research and data, therefore, some data cleaning and understanding were necessary.

Attributes in data set and type of data are the values (i.e., categorial, ordinal, interval, ratio/quantitative)

Chart 1: Year, Interval Data

Chart 2: Year, Interval Data

Chart 3: Countries, Categorical Data

Chart 4: Region, Qualitative/Nominal Data

Data in the set that will not be included in your visualisation

NOTE: Make sure that the data can be used to answer the questions outlined in Section 1.2.

< insert comments >

2.2 Data Processing

Do you expect to do substantial data cleanup?

Data cleaning is expected due to the heavily formatted Excel sheet available online. Although, with data sets available in CSV format out of the box, then this step is unnecessary.

What quantities do you plan to derive from your data?

The whole entry available within a dataset will be used for processing. If not, a data cleaning process will be carried out to narrow down the dataset for easy data processing.

How will data processing be implemented?

With invalid data, those entries will be filtered out in JavaScript when reading data. Null or missing values will also be filtered out rather than giving them average or ignored.

Will you be deriving any variables?

No variables will be derived through the process of developing the visualization.

Describe clean-up process that was implemented.

Clean up was done using Microsoft Excel to copy over important data from the source data since majority of the data is in Excel Workbook format into a separate CSV file.

JavaScript was also used to process incoming data read into appropriate data structure that can be processed by the D3 templates.

Explanation and calculation of derived variables (if used).

There are no additional calculations required since all measurements arein metric measurements and not imperial measurements since the data gathered do not originate from the west.

3 Requirements

3.1 Must-Have Features

These are features without which you would consider your project to be a failure. Were you able to deliver all the promised features? If not, explain why.

- A fully hosted and functioning website is a must-have features in this project.
- Each visualisation charts must contain at least one interactive element.

3.2 Optional Features

Those features which you consider would be nice to have, but not critical.

- Account Management Feature
  - login and sign-out function nice to have to but not required.
  - Account management.
- Live data fetching from 3rd Party API.
- Other language support
  - Support other languages like Malay and Chinese for Malaysian audiences.

Were you able to deliver any of these extra features?

No. Due to time constraint and scope of the project, the above-mentioned features were not implemented. The account management feature is nice to have, but not necessary to achieve the key outcome of the visualization project. The implementation of real time 3rd party APIs is also nice to have which would make the charts update more dynamically but is not necessary. Other language support is nice to have but necessary, which can cater the visualization to a wider range of audiences.

4 Visualisation Design

How will you display your data?

A set of low fidelity design will be prepared before implement any coding development. The low fidelity design of website user interface and individual chart are sketched using draw.io; a web-based drawing tool and paint software from Microsoft. Each chart will be created from different dataset and included at least one interactive element such as mouse-over effect and interactive legend to filter and manipulate the data of the chart.

Provide some general ideas that you have for the visualisation design. Include sketches of your design. Include at least 2-3 alternative ideas for your visualisation. Describe and justify your choice of visual encoding and idioms.

Sketches Screenshots (Website):

First sketch is the interface design for the website. The content will be display only in one page. Project Title will be display on top area of the website as it showed a clear objective of the project to the users.

For content section, card view will be implemented to manage the content in more effective way. First card view consists of brief description regarding history of solar energy. Second card view will focus on displaying several charts in neat and clean position.

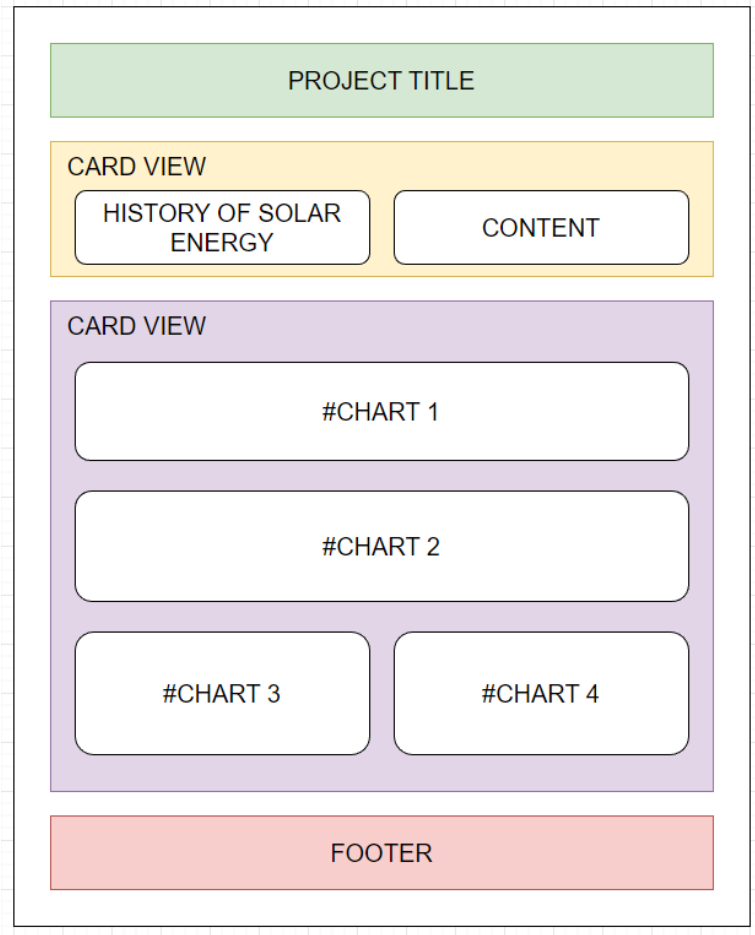

Figure 1

Sketches Screenshots (Charts):

First chart will show user about the consumption of renewable energy in Southeast Asia. The dataset used are continuous data across multiple year, line chart will be suitable to handle the data.

Sketch below showing data displaying in line chart format. X axis is renewable energy consumption in year and Y axis is percentage of total consumption in each country. The chart will arrange a set of interactive legends (Southeast Asia countries) for user to click and filter the countries whether to display or not display in the line chart.

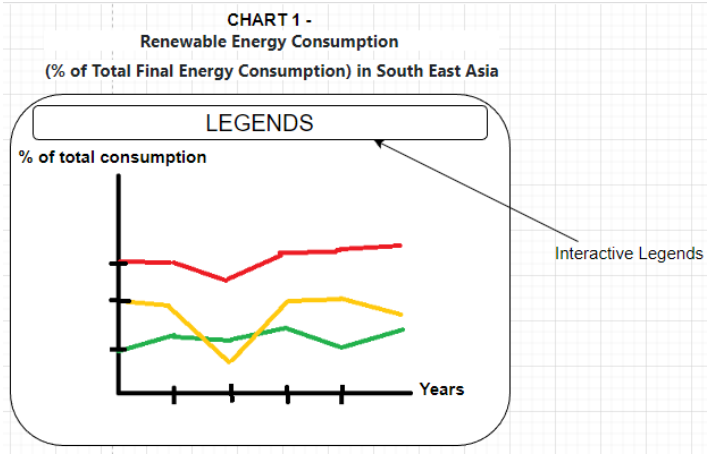

Figure 2

Second chart will show user about the percentage of total solar capacity in Southeast Asia. The dataset also provided continuous data across multiple year and line chart will be suitable to handle the data.

Sketch below showing data displaying in line chart. X axis is total solar capacity in year and Y axis is percentage of total capacity in each country. Unlike first chart, this line chart will equip with mouse-over effect to display detail information. On hover, the closest data point to the mouse cursor and its associated line series will be display the detail information.

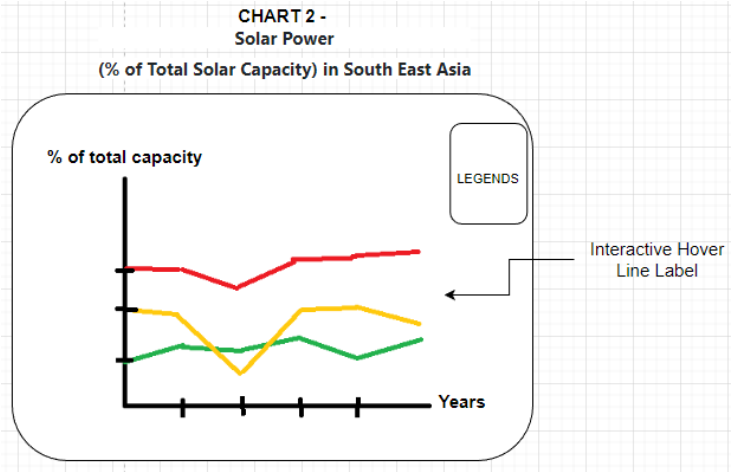

Figure 3

Third chart will show user about the renewable energy production in Singapore. The dataset found is categorical dataset across multiple year. Stacked bar chart is suitable in displaying the data.

Sketch below showing data in stacked bar chart. X axis is production of each renewable energy category in year and Y axis is total energy generation of stacked categories in percentage. This

stacked bar chart will equip with mouse-over effect to display detail information. On hover, different total percentage of energy production will display when mouse cursor pointed to the specific colour sector.

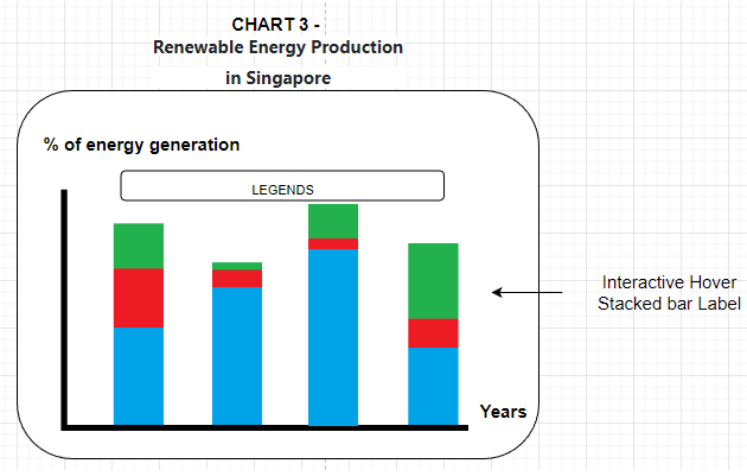

Figure 4

Fourth chart will show user about the Singapore solar PV installation in region. The dataset used contain the information of PV installation in region of Singapore. So, geo map graph will be suitable to display the data.

Sketch below showing geo map group with hover effect. Detail information will show in bottom right corner when mouse cursor pointed to specific region.

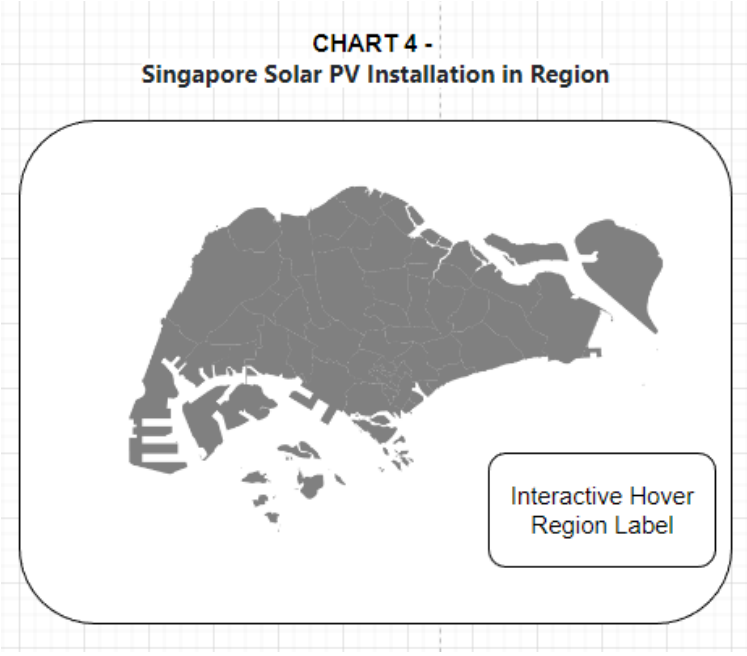

Figure 5

Show the evolution of your design. How has it progressed? Justify the visualisation idioms you have chosen to represent your data.

Description (including screen shots) and explanation of final design.

After the website and visualization chart created, the outputs served well and the objective of reliability of solar energy in Southeast Asia is clearly showed to the user. Hence, the first sketches of the website and contents will be the final design for the project.

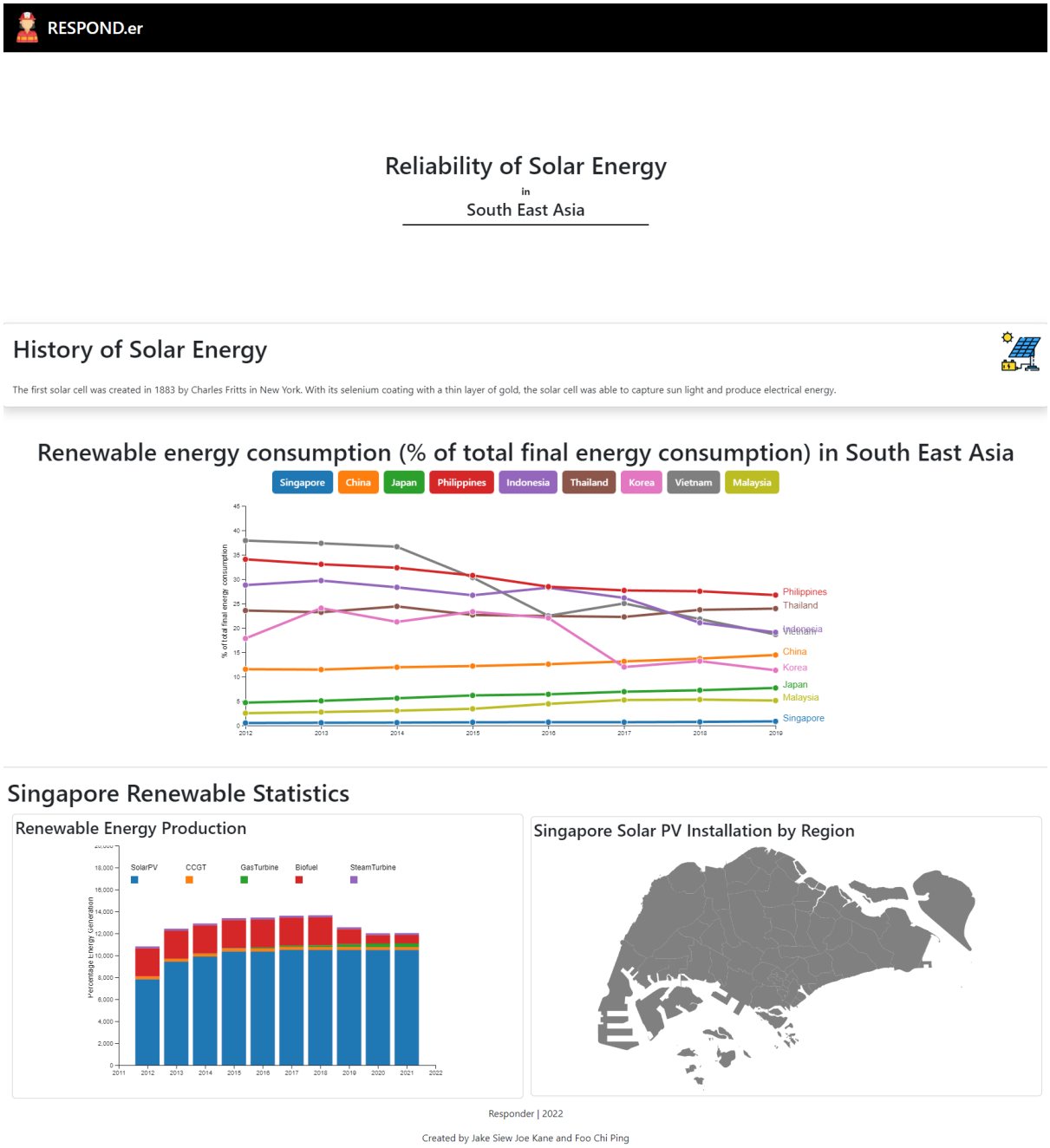

Figure 6

Renewable Energy Consumption:

The following line graph can be filtered by clicking on each of the respective buttons. Click on each Country button will hide that country in the line graph to focus on other countries.

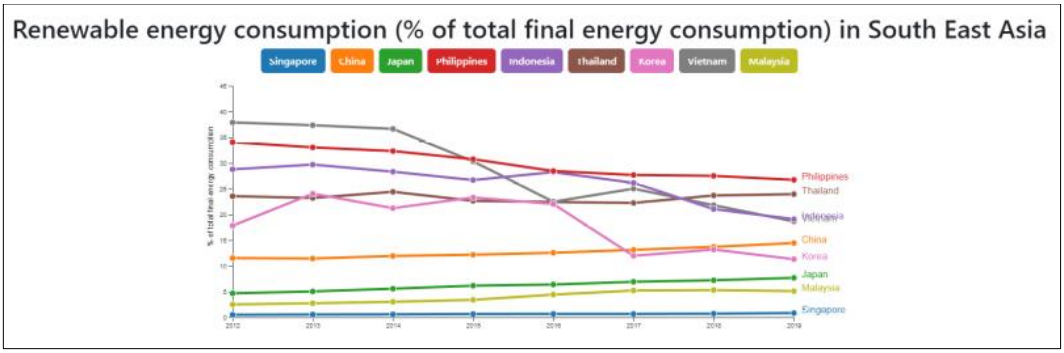

Figure 7

Renewable energy viability Stacked bar chart:

The following is an interactive stacked bar chart where if the user hovers on one of the bar chart, the corresponding value associated with that bar chart will be displayed above.

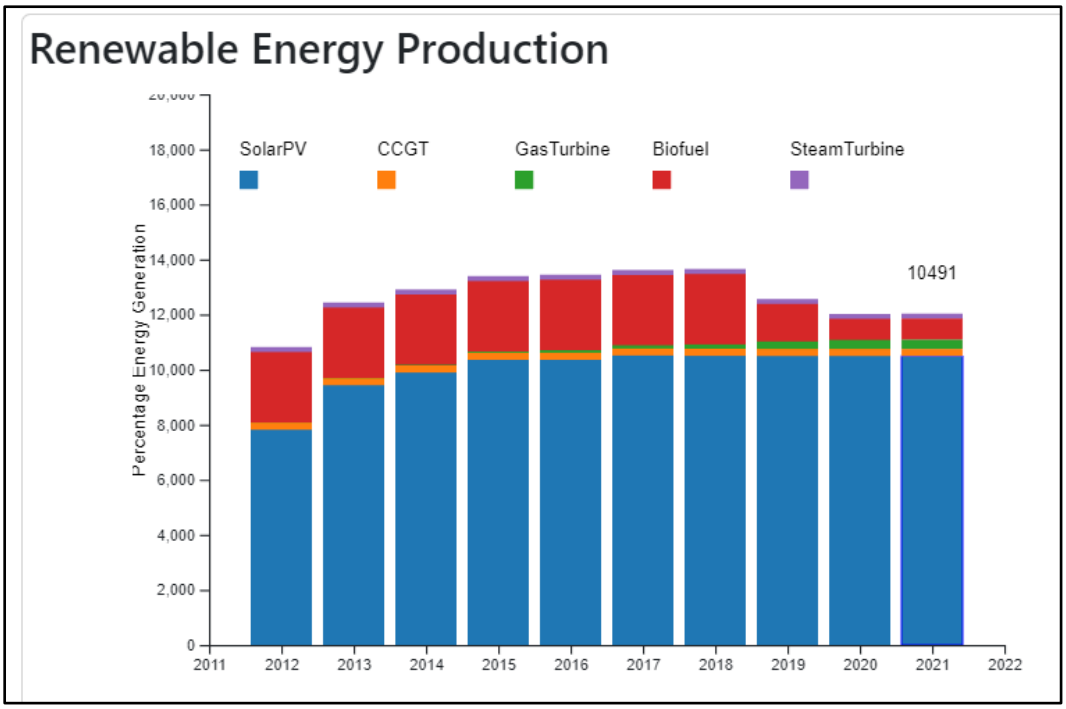

Figure 8

Singapore Solar Panel Installations per Planning Regions (state):

The following is an interactive map chart of Singapore to show solar panel installations per planning region or state. Upon hovering on each of the state will show the region/state name, total solar panel installations, and total energy generated using the solar panel.

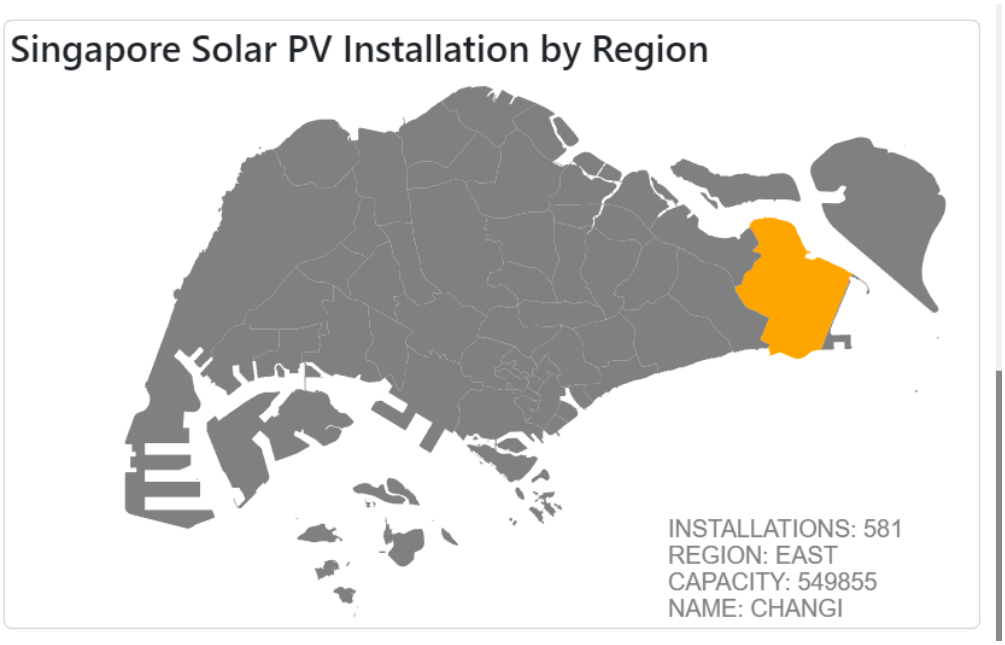

Figure 9

Solar Power (total solar capacity, MW) in South East Asia:

The following interactive Line chart displays the total solar power capacity generated per country in Southeast Asia. Upon hovering on one of the lines, it will focus on that particular country on that particular year highlighted with a distinct colour.

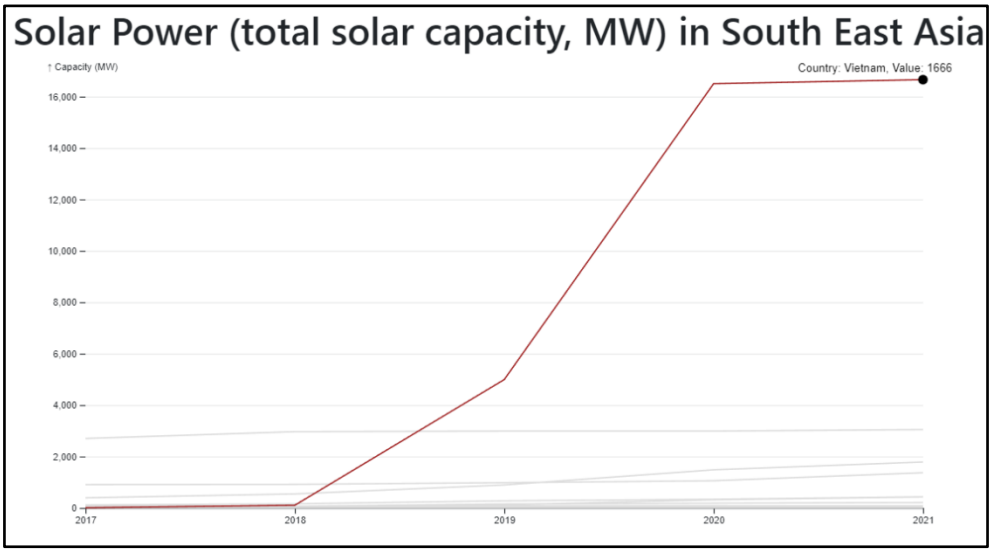

Figure 9

5 Validation [optional - Bonus Points]

Test your visualisation with users and report the results.

< insert comments >

6 Conclusion

Provide a summary of the project and what you learnt from doing it.

This project helps us builds the understanding of human perception, cognition and data visualisation design principles because we have to research real life dataset and analyse most suitable chart to display the data based on the project title and objective.

By creating an effective visualisation, we learnt conceptualise the visualisation design by sketching low fidelity come in place to assist prototyping regarding how the chart going to be and what are the dataset being handle by the chart. After the prototyping completed, we start code development on website as the platform to display all the charts and contents to the audience. Lastly, we learned on creating an interactive data visualisation using real-world data set. We learned to create interactive data visualisation using D3 library which consist plenty of free interactive chart templates.

In summary, we learned to visualise data related to energy production from research, prototype and code development throughout this project. Other than that, communication and project planning between team member are very significant to ensure the project progress keep on track and end result produced meet the standard and objective.

References

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D3 Template References:

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