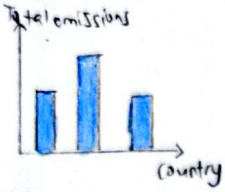
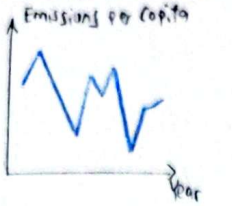
1. IDEAS

⇒ Attributes → Countries
→ Sources (coal, diesel etc)
→ Emissions (NH_3, CO, SO_2, NO_x ...)

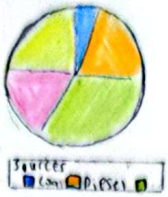
1. Bar Chart



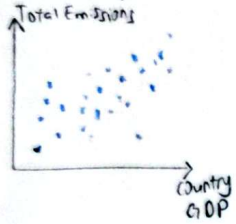
2. Multi Series Line Chart



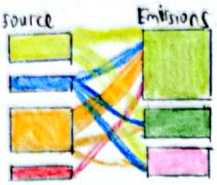
3. Pie Chart



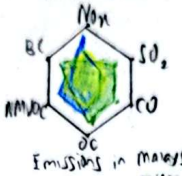
4. Scatter plot



5. Alluvial chart



6. Radar Chart

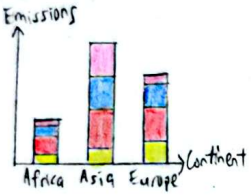


Emissions in Malaysia, India, China

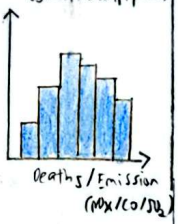
7. Ranking Table

Country	Emissions per capita
1. China	37ktC
2. India	28ktC
3. Russia	20ktC
4. U.S	15ktC

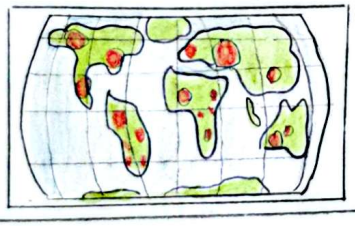
8. Stacked Bar Chart



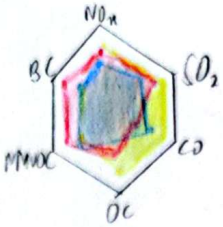
9. Histogram (small multiples)



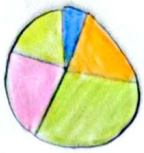
10. Proportional symbol map / Chloropleth map



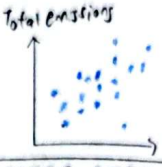
2. FILTER



- not suitable to represent different emissions
- values for each vary extremely widely



- too simple diagram
- only depicts proportions harder to see actual value
- bar chart more suitable



- not complex enough
- bubble chart would be better / complex option

3. CATEGORISE

→ Choropleth map → Global Overview

→ Bubble Chart (GDP, ...) → Economic factors

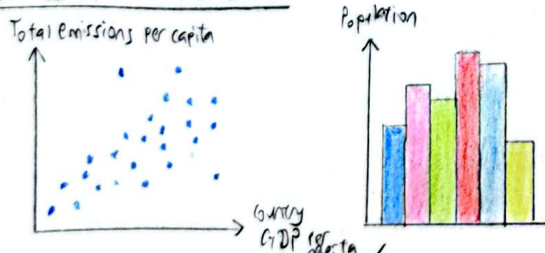
→ Waffle Chart / → Alluvial Chart → Emissions Breakdown

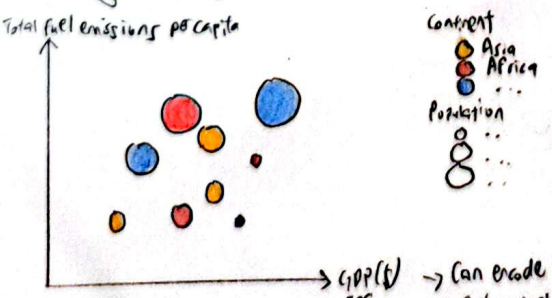
→ Line Chart / → Stacked area → Trends & Future

Country Attributes

Categorical	Quantitative
- Country	- Total emissions per capita
- Continent	- NO_x, BC, NMVOC, ... emissions
- Year	- Air Pollution deaths
- Type of emissions	
- Type of fuel sources	

4. COMBINE AND REFINE





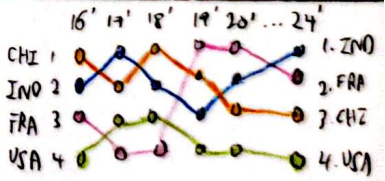
Bubble Chart

→ Can encode several categorical / quantitative attributes

→ Add year sliders to capture trends?

Country	Emission per capita
1. China	37ktC
2. India	28ktC
3. Russia	20ktC
4. U.S.	15ktC

Ranking Table →



Bump chart

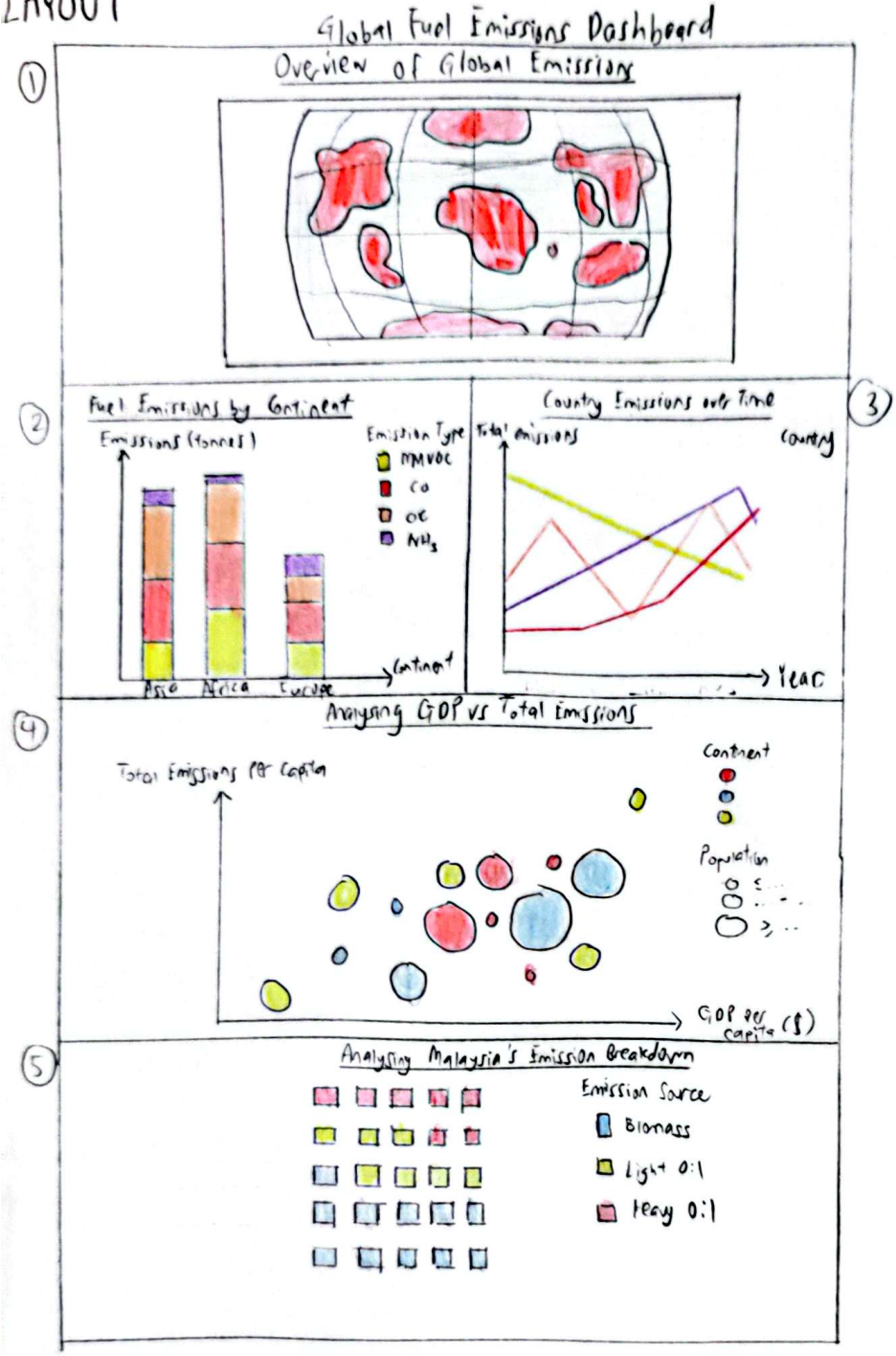
- show ranking over time

5. QUESTIONS

- Do the visualisations / graphs provide valuable insights?
- Are there more complex and suitable charts to better capture trends and patterns within data?
- Are the charts complex enough / feasible to recreate in Vegalite?

Author: Benjamin Lim Chin Yeong
Date: 13/9/2024
Sheet: 1
Task: 5 Design Sheet Visualisation Planning (Brainstorm)

LAYOUT



Title: Global Fuel Emissions Dashboard

Author: Benjamin Lim Chin Yeong

Date: 14/9/2024

Sheet: 2

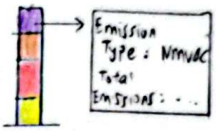
Task: 5 Design Sheet Visualisation Planning (Initial Ideas)

OPERATIONS

Panel

① Year slide for analysing emission across years

② On hover for each sub-bar



Tooltips for specific emission info

③ Make line-chart animated?

↳ Animated Vegalite
↳ feasible?
↳ Idea: Line chart is animated to progress over the years

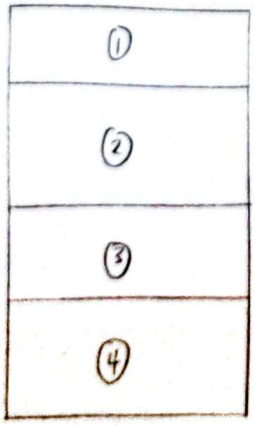
④ Continent Filter

(•) Show All
( ) Asia
( ) Africa
( ) Europe

→ To focus on certain countries and their distribution

FOCUS

- Main focus on comparison between countries / continents in fuel emissions
  ↳ and correlation between other factors



→ main focus point
→ serves as foundation for understanding general distribution of global fuel emissions

→ a more in depth comparison / breakdown of emissions between countries
→ explore leading causes of high emissions

→ explore factors / correlations between emissions and other factors

→ Deep dive into Malaysia's emission breakdown
→ understand what is Malaysia's greatest emission source is

DISCUSSION

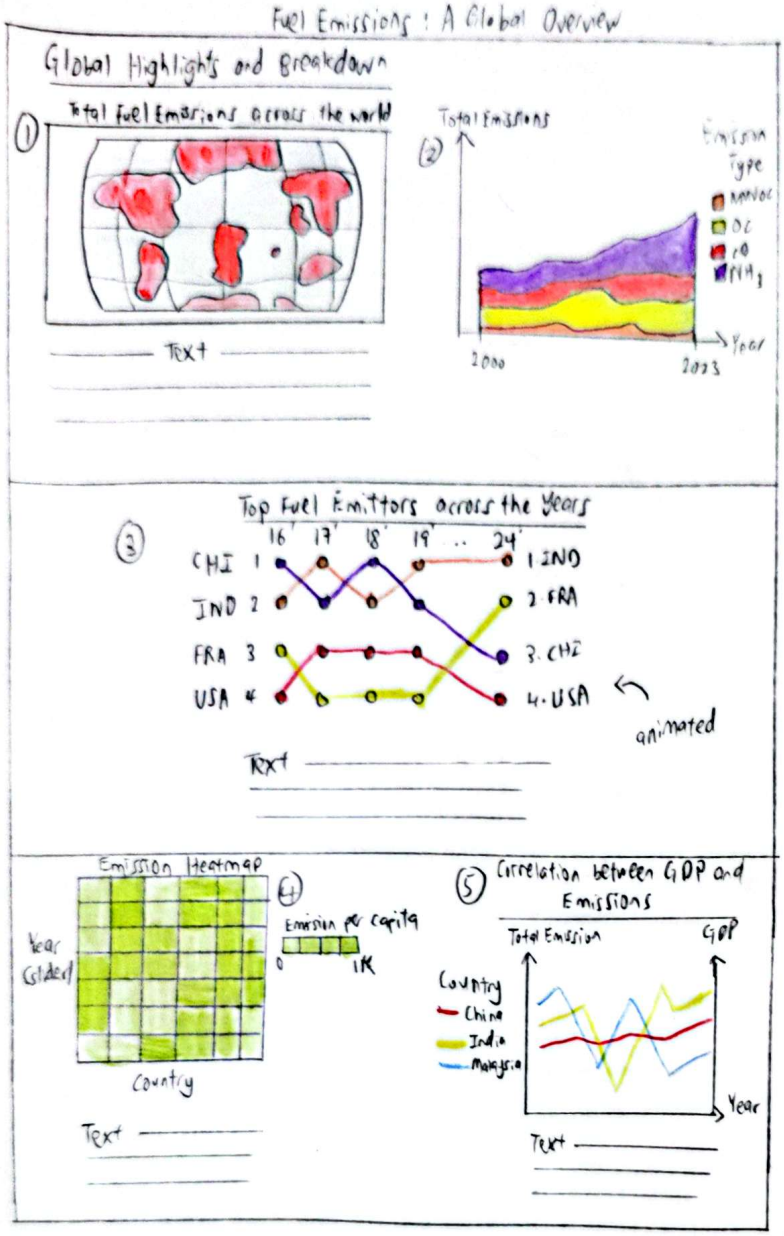
Pros

* Comprehensive exploration of multiple aspects of fuel emissions globally and nationally.
* Useful for a global overview and understanding of common fuel sources and emissions
* Interactive and appealing

Cons

* Minimal filters, could use more complexity for certain charts such as panel ⑤

LAYOUT



Title: Fuel Emissions: A Global Overview

Author: Benjamin Lim Chin Yeong
Date: 15/9/2024
Sheet: 3
Task: 5 Design Sheet Visualisation Planning (Initial Ideas)

OPERATIONS

Chart ①

On click of country in map → Modify stacked area chart to show breakdown for country

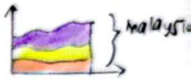


Chart ②

Add animated vega-lite
↳ use "time" encoding to show progress of bump chart

Chart ④ & ⑤

Year filter

Start year :
to
End year :

Range of years (x-axis)

Continent Filter

Continent : Asia
Africa
Oceania
Europe

→ To narrow down to certain countri

FOCUS

→ Main focus is animated bump chart on ③

↳ Highlights the top contributors (countries) of fuel emissions
↳ Shows the reduce / increase of country emissions over time

①	→ Global overview of fuel emissions ↳ Stacked area chart shows breakdown of emissions of specific country / worldwide
②	→ Bump chart show emission trends over time
③	→ left - heatmap shows which years and countries has highest / lowest emissions → Right -

DISCUSSION

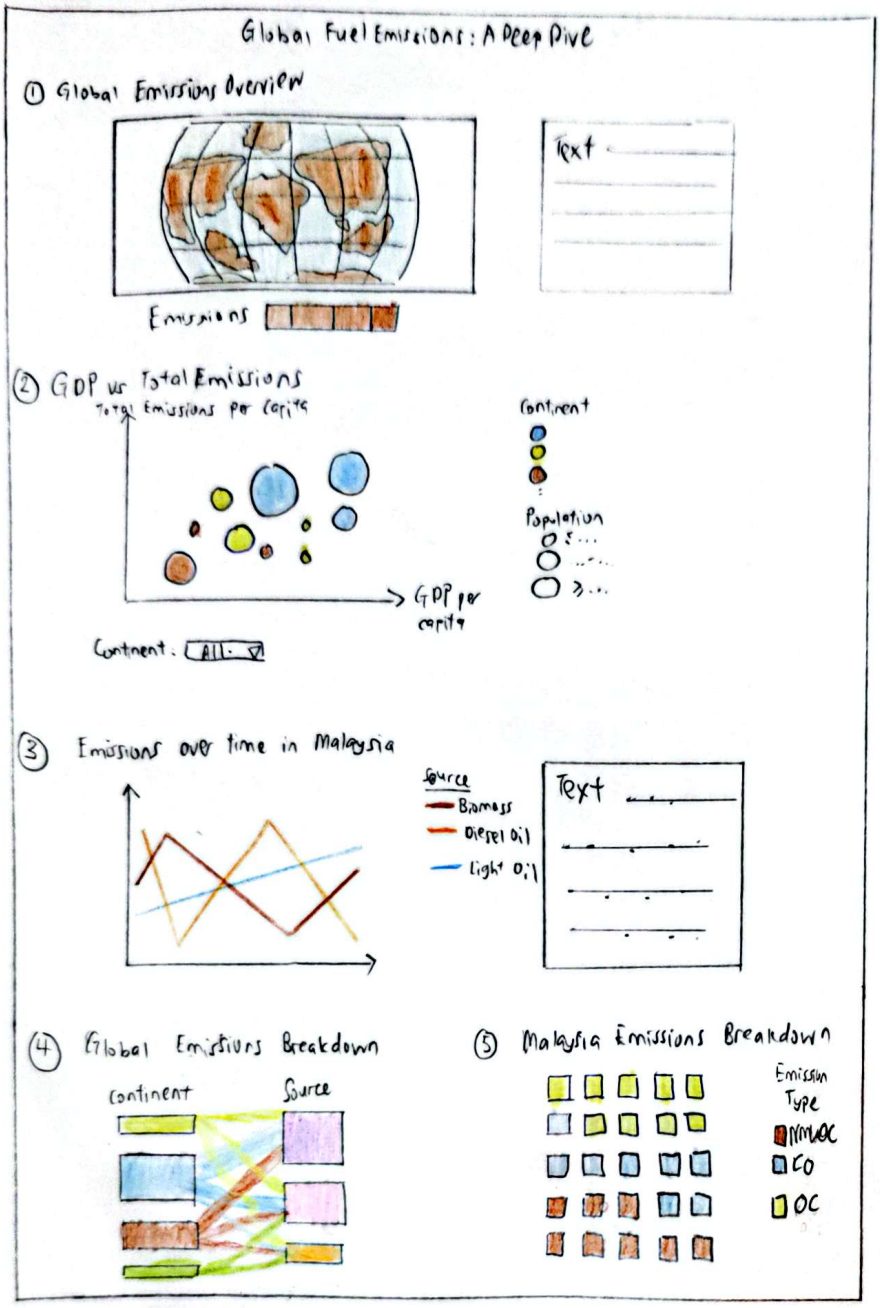
Pros

* Visualisation is simple and easy to understand and follow
* Animation of bump chart attracts viewer / keep user attention

Cons

* Not enough interactivity
* Chart ③ and ④ possibly repetitive / redundant
* Is animation too complex / feasible?

LAYOUT



Title: Global Fuel Emissions: A Deep Dive

Author: Benjamin Lim Chin Yeang

Date: 16/9/2024

Sheet: 4

Task: 3 Design Sheet visualisation Planning (Initial Ideas)

OPERATIONS

① Year Filter

Year: 2021

- applies to section ① and ②

② Continent selection

Continent: Show All

Asia
Africa
Europe

- applies to section ②
- aims to highlight certain countries to avoid clutter

③ Tooltips (on hover over data points)

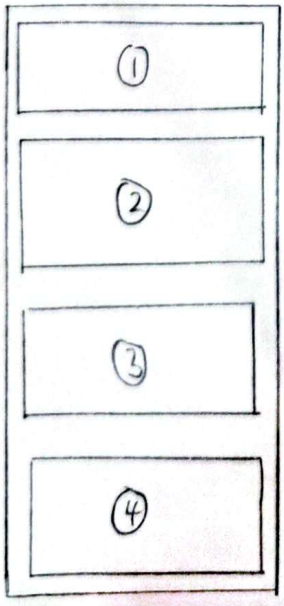
Eg: Country: ...
Continent: ...
GDP(G): ...
Emissions: ...

- Show concise info about relevant country data

④ - Text beside each chart that are informative and concise

- highlight important text and colour code

FOCUS



→ no main focus, visualisation viewed as a narrative covering global and Malaysia emissions

→ viewers read from top to bottom, with visual hierarchy and figure ground

→ use attractive features and headings to keep user's attention

① make filters for map (year, type) for interactivity

② another interactive chart (year, continent) filter

③ - make line chart animated?
- viewers can clearer understand temporal trends

④ viewers better understand the top most emissions and source of emissions

DISCUSSION

Pros

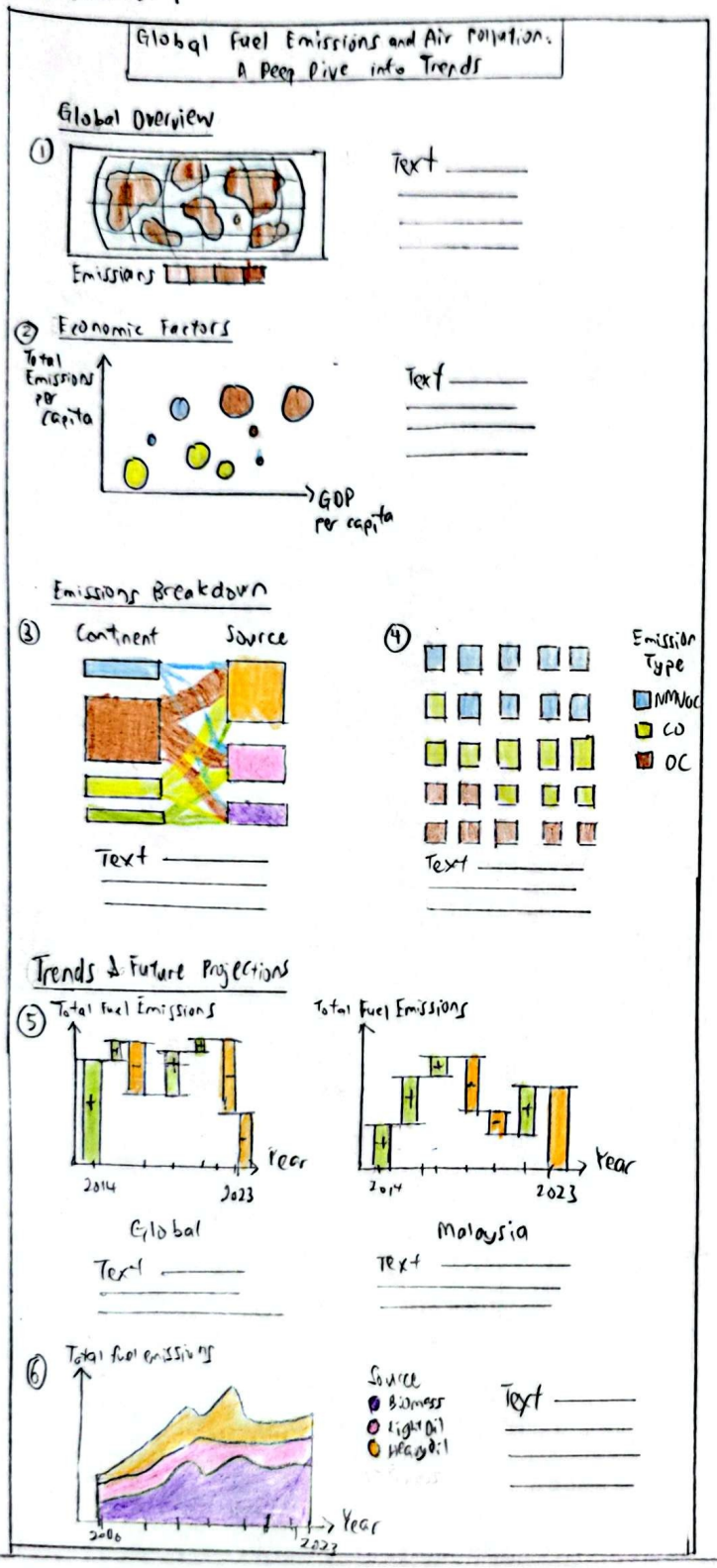
* Vertical organisation of panels provide storytelling flow, creates a natural narrative progression
* Diverse complex visualisation techniques bring variety and depth to analysis.
* Interactive filters and sliders

Cons

* Alluvial diagram might be hard to implement in Vegalite / not feasible
* Needs more explanation for each graph?
* potential info overload

LAYOUT

Based on Sheet 4



Title: Global Fuel Emissions and Air Pollution: A Deep Dive into Trends

Author: Benjamin Lim Chin Yeong

Date: 17/9/2024

Sheet: 5

Task: 5 Design Sheet (Realization)

OPERATIONS

① Year filter — For:
- ① Map
- ③ Bubble Chart

Year: ●

→ To visualise trends across years

② Continent Filter — For ② Bubble Chart

Continent: [Show All ▽]
Asia
Africa
Europe
Oceania ...

→ To highlight data points / identify clusters / patterns between continents

③ Tooltips

Country:
Emissions (Tonnes):
GDP($):

→ For more detailed relevant info for each data points when hovered

④ Text annotations inside & outside graph for guiding viewer

⑤ Hover effects (increase opacity)

⑥ Navigation bar to navigate between sections

DETAIL

A. Algorithms used
- Sigmoid functions for alluvial
- Data pivoting (wide → long) using Python
- Data Cleaning using Python

B. Dependencies
- Vega-Lite for designing, building charts cleaning and formatting data
- Dashboard must be built using HTML, CSS, and JavaScript

C. Estimated time
- Charts: 3-4 days
- Dashboard: 3 days

D. Requirements
- No specific requirements needed

FOCUS

→ No main focus, each chart explores different areas / trends of fuel emissions

→ concise / succinct explanation / annotations to guide viewer throughout visualization

→ Main interactivity in ① and ②
- ① - let viewers see global emissions over time
- ② - let viewers view trends / factors over time

→ Areas of focus - Global emission ① ② ③ ⑤
- Malaysia emission ④ ⑥