FIT3179 Data Visualisation

Final Visualisation Report

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Visualisation link:
https://public.tableau.com/profile/shuyu5746#!/vizhome/vizProj/Global?publish=yes

*The layout and font side of the visualisation posted on Tableau public is different from the one I had in Tableau desktop. Please download it as "Tableau workbook" and open it in Tableau desktop to see the original visualisation as screenshotted in this report.

- This is due to the fact that all the element on my dashboard is floating.
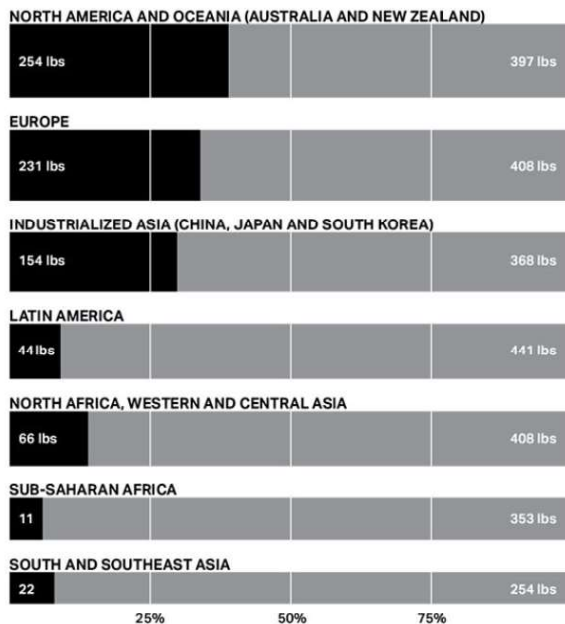
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1. Introduction

The Food and Agriculture Organization of the United Nation estimated that each year, approximately one-third of all food produced for human consumption in the world is either wasted or loss [2]. This reflects the misuse of resources and it's an emerging global issue that continues to raise concern in many parties. There are still many people around the world that are facing hunger, yet so much of the global food supply is wasted between the farm and table.

The final visualisation presented in this report aims to visualise the following questions:

(a) What's the ratio of food waste to food production for each continent in the world.
(b) Among all the food wasted, what type of food is discarded the most?

This visualisation is targeted for environment caring individuals or organisations like FAO and global government.

2. Review on related visualisations

This section will be looking into 3 different infographics on food waste. Each infographic consists of several visualizations.

2.1. Too Good to Waste

Source: http://arcadenw.org/images/uploads/content-media/food-waste-infographic-3500.jpg

Figure 1

The genre used in this narrative visualization is partitioned poster, whereby it uses proximity to group similar graphs together as we can see that there's distinctly 3 main partitions in this visualisation – left, middle and right. And for the right partition, it is separated into 2 partition as well – top and bottom.

Now let's take a look at the first part.

GLOBAL FOOD WASTE PER PERSON

Waste in Pounds per Person, 2011

■ Food Wasted by Consumers After Purchase
■ Food Wasted by Producers and Retailers (Pre-Consumer)

NORTH AMERICA AND OCEANIA (AUSTRALIA AND NEW ZEALAND)

| 254 lbs | 397 lbs |

EUROPE

| 231 lbs | 408 lbs |

INDUSTRIALIZED ASIA (CHINA, JAPAN AND SOUTH KOREA)

| 154 lbs | 368 lbs |

LATIN AMERICA

| 44 lbs | 441 lbs |

NORTH AFRICA, WESTERN AND CENTRAL ASIA

| 66 lbs | 408 lbs |

SUB-SAHARAN AFRICA

| 11 | 353 lbs |

SOUTH AND SOUTHEAST ASIA

| 22 | 254 lbs |

25%   50%   75%

In developing countries, consumers waste very little food; most food is lost during harvesting and processing. In industrialized countries like the US, consumers are significantly more wasteful— 31% of food is wasted after purchase.

This is a horizontal 100% stacked bar chart on the percentage of global food waste per person.

The data is already normalised given that the waste is recorded in units of pounds per person. We can also notice that the sum of each bar is different. This does not matter because the visualization is trying to show the proportion of food wasted by consumer with respect to the food wasted by pre-consumers within the same group of countries. Therefore, the raw value of the data does not matter, the proportion is the main point here.

The percentage of food waste visualised are quantitative data while the countries involved is a **categorical** attribute. The text provided under is also very helpful for viewers to understand the visualisation.

Figure 2

This is a vertical bar chart showing the percentage of food wasted at 5 different stages before getting to the consumer.

Serif is mainly used for the description text placed next to the bar graph. San serif is used for the main and subtitles of the infographic in addition to being heavy weighted (bold and larger font). The description under the main title also uses san serif font. This is well done because it creates a hierarchy.

The chart junk in this visualisation is also very relevant in helping viewers to distinguish the five stages of food waste.

Figure 3

HOW FOOD WASTE HAPPENS

The Five Stages of Food Waste for Fruits and Vegetables in the US, 2011

More than half of all the fruit and vegetables we produce are wasted.
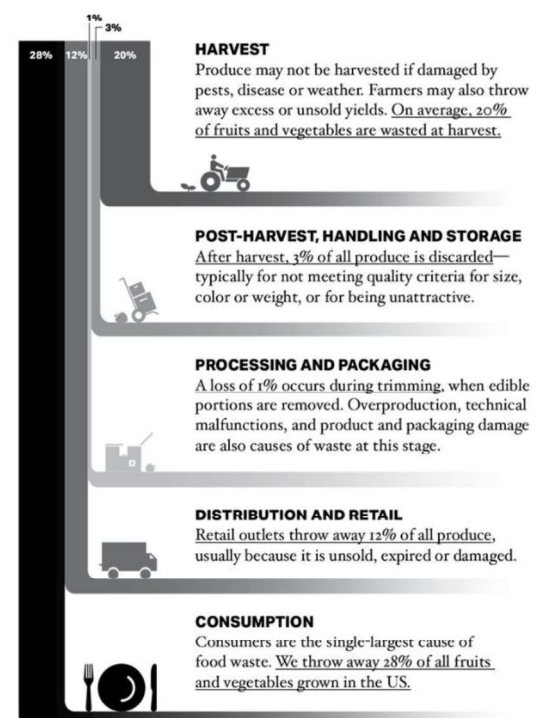The waste happens at:

1%
3%
28% 12% 20%

HARVEST
Produce may not be harvested if damaged by pests, disease or weather. Farmers may also throw away excess or unsold yields. On average, 20% of fruits and vegetables are wasted at harvest.

POST-HARVEST, HANDLING AND STORAGE
After harvest, 3% of all produce is discarded— typically for not meeting quality criteria for size, color or weight, or for being unattractive.

PROCESSING AND PACKAGING
A loss of 1% occurs during trimming, when edible portions are removed. Overproduction, technical malfunctions, and product and packaging damage are also causes of waste at this stage.

DISTRIBUTION AND RETAIL
Retail outlets throw away 12% of all produce, usually because it is unsold, expired or damaged.

CONSUMPTION
Consumers are the single-largest cause of food waste. We throw away 28% of all fruits and vegetables grown in the US.
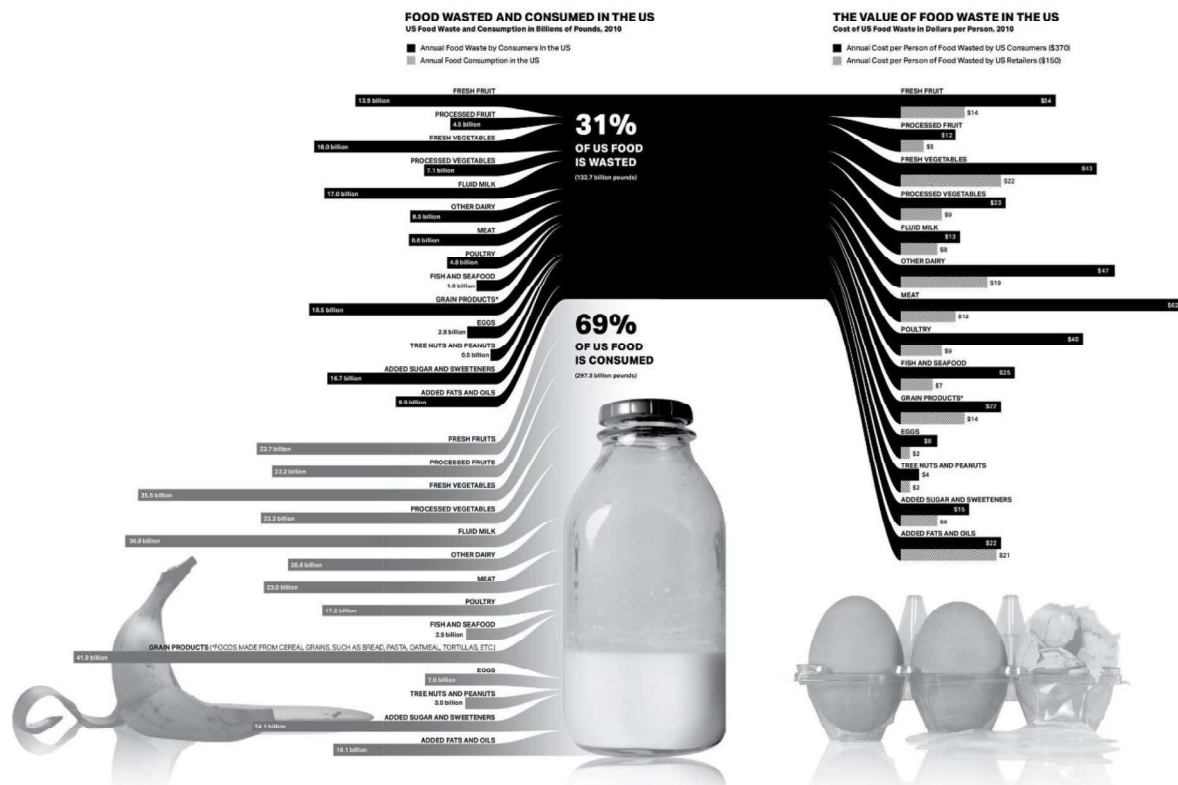
4

Figure 4

This is a horizontal bar chart showing the breakdown of the types of food wasted and consumed in the United State. I find the legends unnecessary since everything is already labelled on the bar chart. The information about the data being an annual data could be placed on the title of the chart.

The data don't have to be normalised since it is only comparing statistics within US. The amount of chart junk is also relevant.

2.2. Impacts of Food Waste Solutions

Source: https://public.tableau.com/profile/lauren5963#!/vizhome/FoodWaste_2/Sheet1

Figure 5

The data ink ratio for this bar chart is quite low. The designer could have removed the background horizontal lines of the bar chart along with the vertical axis title as neither of them provide any useful information. The labels on the horizontal axis could also be removed as all the information is labelled in the legend. The solution labels are also not readable as they are too long. The only readable ones are "Animal Feed" and "Trayless Dining".

Colour scheme choice for the visualisation is poor and not friendly towards colour vision impaired users. Using bright blue as the text label colour is also a poor choice.

2.3.   Two sides of the food crisis

This is a very long infographic with 2 main parts – food demand and food waste. Blue and red is used as the main colour scheme. I personally think it is not a good choice as both colours are too bright and contrasting. Contrasting colours are needed to distinguish between the two parts of the visualization but I would avoid using such bright colour as it is too striking for the eyes. However, the story flow of this visualisation is good.
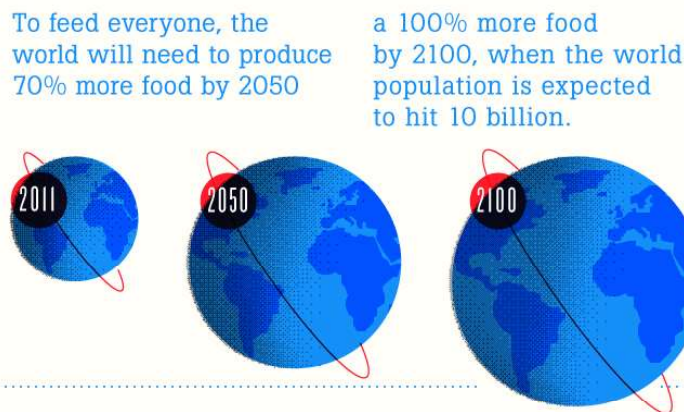
Figure 6

Figure 6 is a poor choice to visualise the change in percentage of food production. For instance, the second globe seems to be twice as large as the first globe but in fact it's only representing 70%. Circles is a bad choice for size comparison. Would use a bar chart instead.
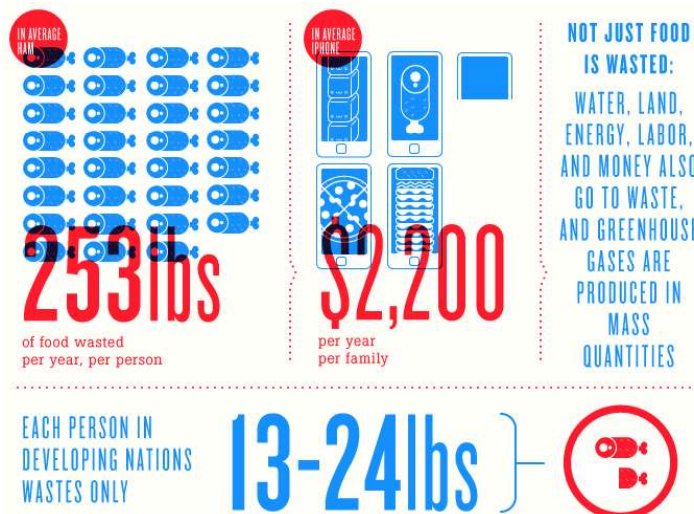
Figure 7

There're too many chart junks in Figure 7 which is misleading for viewers. The placement of labels is poor as it's overlapping with the isotype visualisation.

3. Design choices and process

The final visualisation is primarily based on the "Too Good to Waste" visualisation given that it's overall a good example. The other two infographic is used as guidelines for improvement. For example, lesson learnt from the "Impact of Food Waste Solution" is to increase the data-ink ratio by removing graph background lines along with redundant axis label that could be represented by a legend.

The next few pages are the five design sheet methodology sketches.

compare between
countries
(maybe have a few
visualisations? Each
for one country)
choose 3 country.

Global food waste.

choropleth map

- comparing the amount of
  food waste across each
  country

- normalise the data by
  dividing raw food waste
  value by population.
  * title: food waste per capita

bar chart

- comparing the types of food
  wasted within one country.

rice
wheat
yogurt
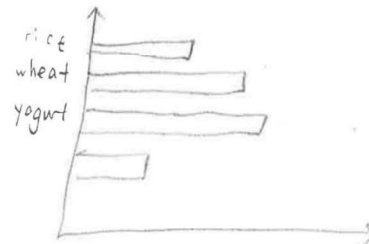
comparing food waste between producer and consumer.

producer   consumer

Diverging bar chart

rice
yogurt
wheat

producer   consumer
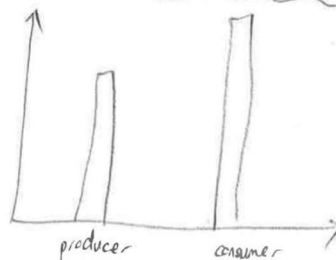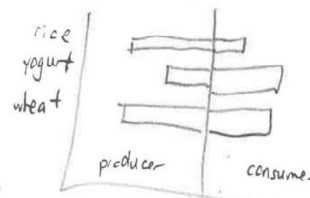
combine + refine ⟶ the values can
be labelled on top of
the bar chart.
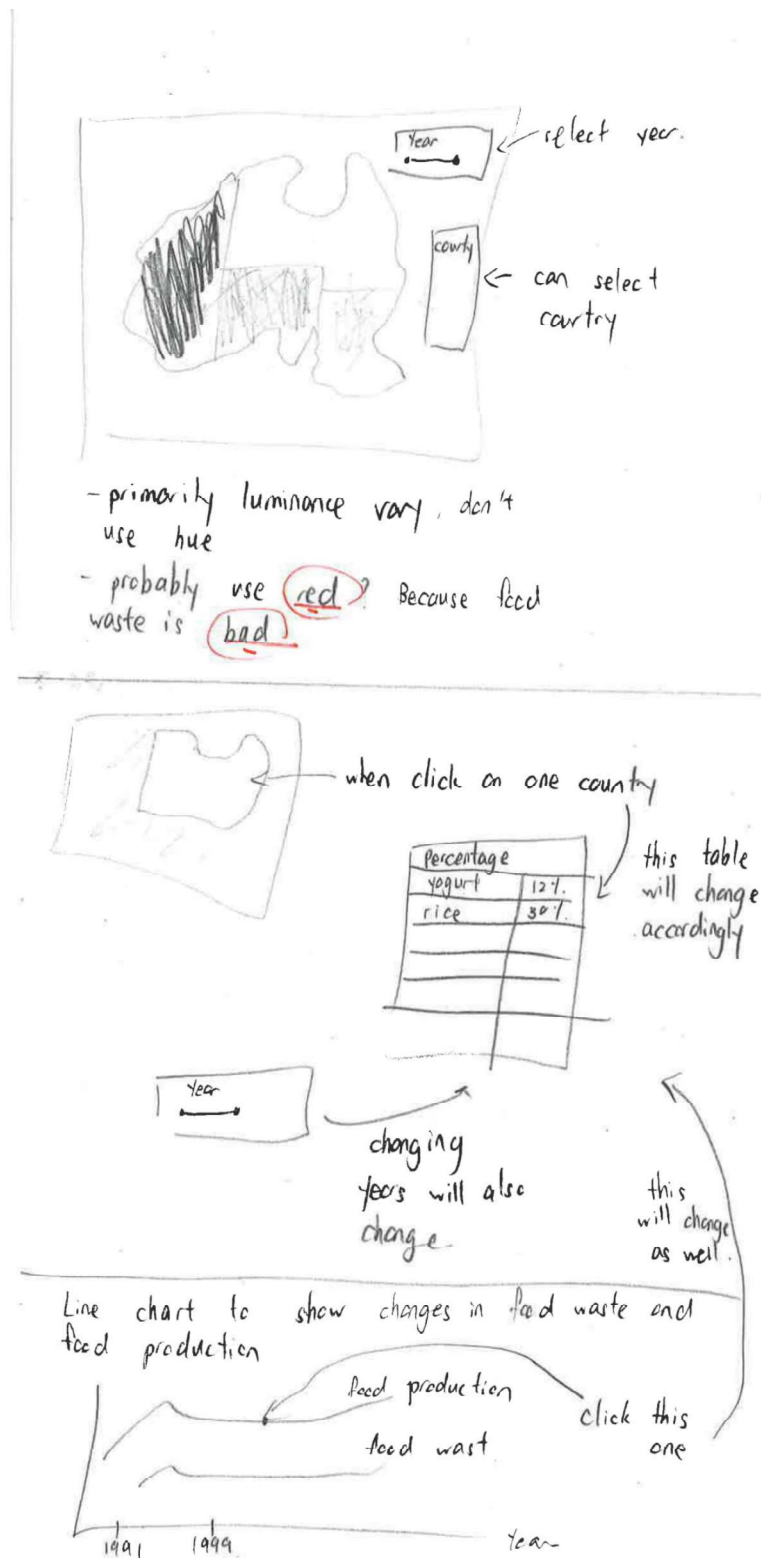
Figure 8

Figure 9

Title : Interactive Map
Author : Shu Yu Tew
Date : 11 October 2018.
Sheet : 2
Task : Visualize the food
waste of each
countries.

- create interaction
between a few visualization

- try to reduce the
interaction within map
(maybe turn off
tooltip ?) if no
extra information is
needed to be
convey.

- instead of just
listing the country
name and value
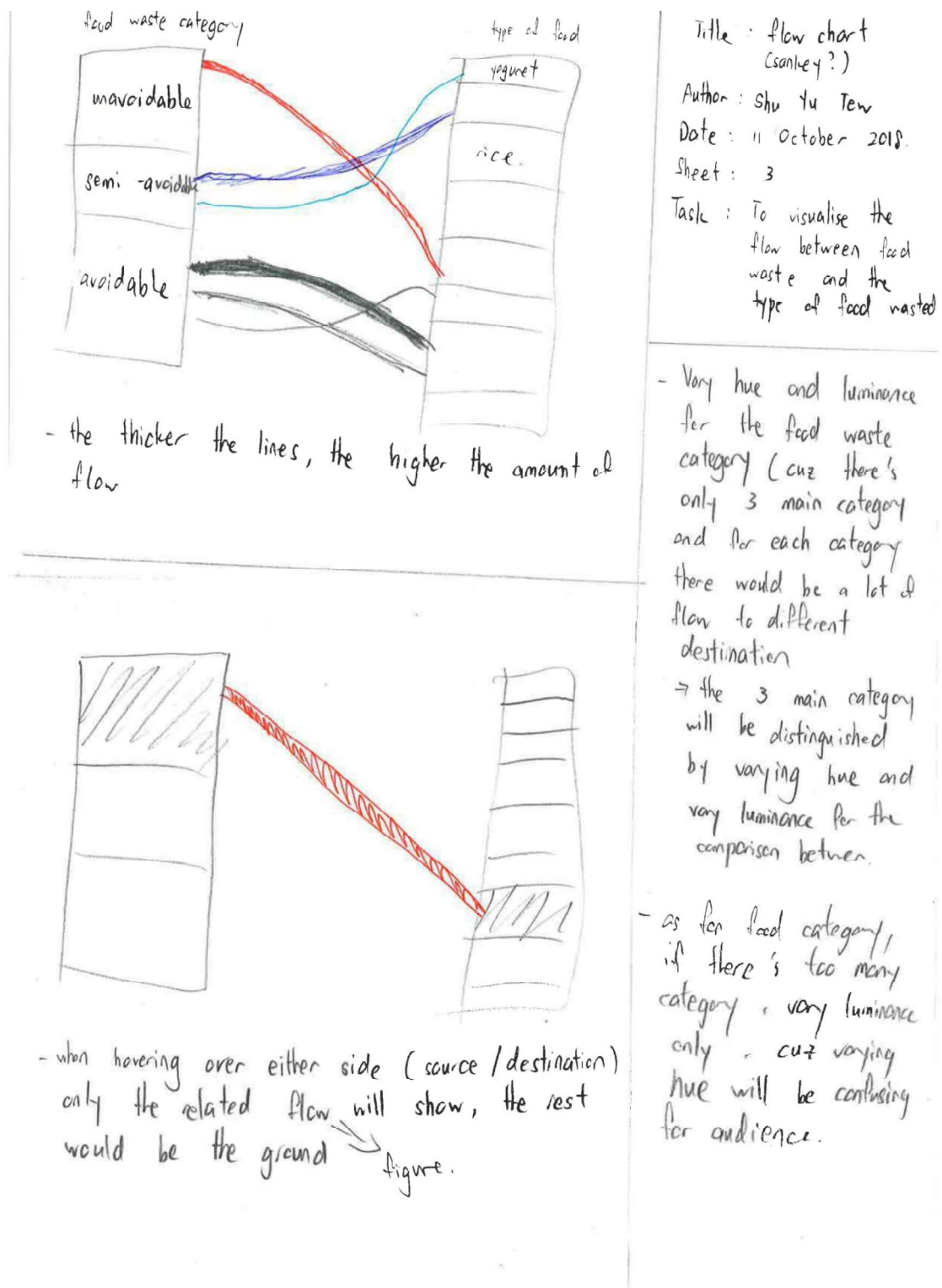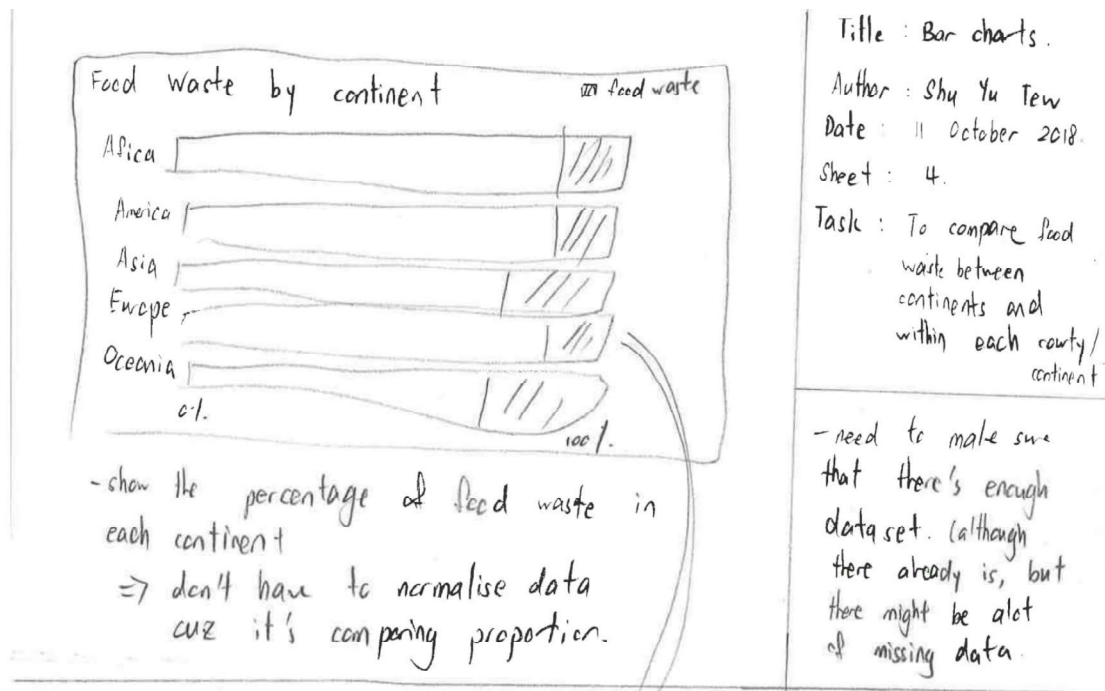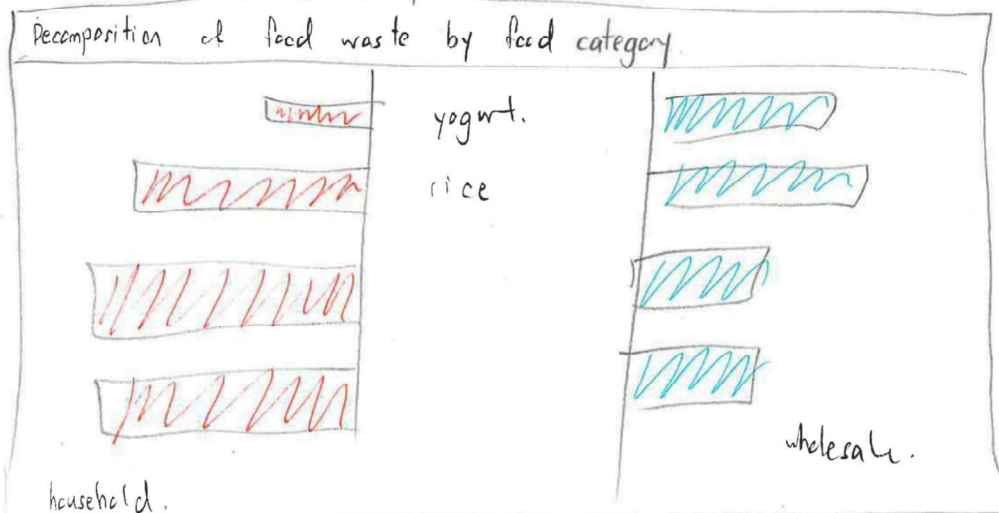for tooltip ......
maybe add some
meaningful descriptions?

select year.

can select
country

- primarily luminance vary, don't
use hue
- probably use red? Because food
waste is bad.

when click on one country

Percentage
yogurt   12%.
rice   30%.

this table
will change
accordingly

Year

changing
years will also
change.

this
will change
as well.

Line chart to show changes in food waste and
food production

food production
food wast

Click this
one

1991   1999   Year

food waste category   type of food

unavoidable   yogurt

semi -avoidable   rice.

avoidable

- the thicker the lines, the higher the amount of flow

- when hovering over either side (source /destination) only the related flow will show, the rest would be the ground figure.

Title : flow chart (sankey?)
Author : Shu Yu Tew
Date : 11 October 2018.
Sheet : 3
Task : To visualise the flow between food waste and the type of food wasted

- Vary hue and luminance for the food waste category (cuz there's only 3 main category and for each category there would be a lot of flow to different destination
⇒ the 3 main category will be distinguished by varying hue and vary luminance for the comparison between.

- as for food category, if there's too many category, vary luminance only. cuz varying hue will be confusing for audience.

Figure 10

Food Waste by continent
☒ food waste

Africa

America

Asia

Europe

Oceania

0%   100%

- show the percentage of food waste in each continent
  ⇒ don't have to normalise data cuz it's comparing proportion.

- need to make sure that there's enough data set. (although there already is, but there might be alot of missing data.

food waste in Europe

Decomposition of food waste by food category

yogurt.

rice

household.

wholesale.

⇒ to see where does the food waste often occur instead of only the type of food waste

Figure 11

12

4. Final visualisation

The final visualisation is a partitioned poster with 5 different partitions

San serif is used for all the text in the visualisation. Reason being is that san serif is easier to read especially on maps and diagram. To create hierarchy, I used varying type weight. The main title of the visualization has the largest weight and both main – sub titles are in bold. The title of diagrams and charts are also in bold however they are in a lighter shade of grey while the more important titles are in black.

For every partition of visualization, there would be a small box either on the most right or the most left which guide audience through the interactivity of the visualisation.

The arrangement of the elements is such that if the current partition is heavy towards the left side, the following partition would be heavier towards the right side. This is to balance out the arrangement of the visuals.

Pastel colour scheme is chosen for this visualisation.

Figure 12

By clicking at any point of year on the timeline, the chart and table of "Percentage of food category" would change accordingly to display the relevant information for any chosen year.

An icon of is added beside of the main title to give audience a first impression that this visualisation is about food.
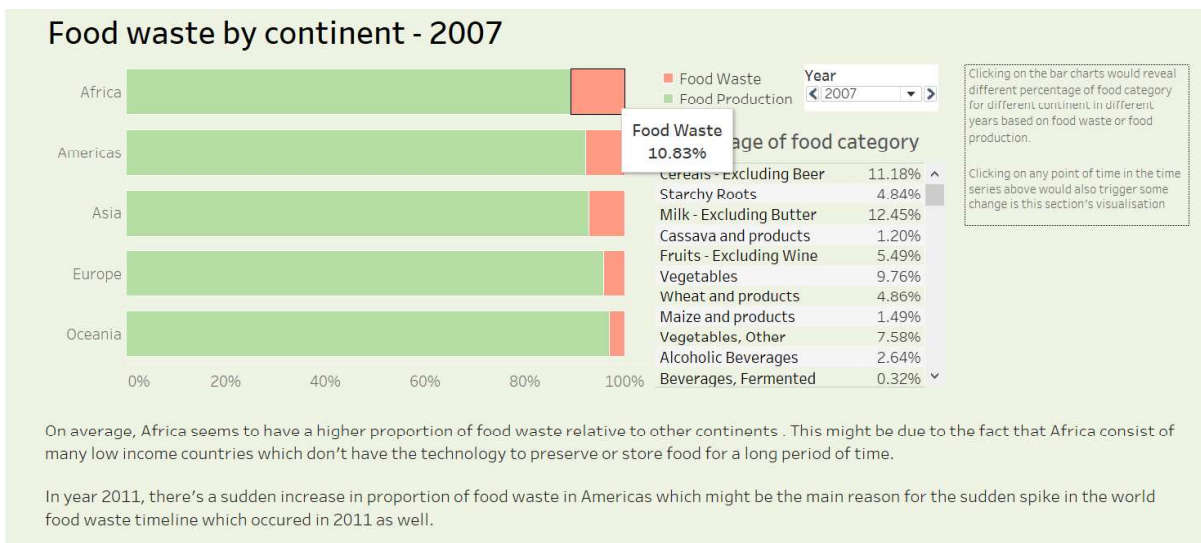

Figure 13

Figure 13 is a horizontal 100% stacked bar chart on the percentage of food waste and food production for each continent. The data is not normalised, and normalisation is not needed because we are comparing the food waste to food production ratio between continents and not the raw value. The colour choice is such that red represents food waste because it's a negative event while green represents food production which is more towards neutral or positive event.

When hovering over the bar chart, the percentage of food waste/food production will be shown (Figure 13). Clicking on the bar chart would reveal more information on the percentage of food category on the table beside the bar chart.

14

Food Waste in Australia

Australia seems to be struggling to reduce household food waste as we can see that across the years, the amount of food waste per capita fluctuates a lot for each state. With the exception of Western Australia which constantly had relatively low food waste per capita as compared to other states.

Hover over each of the states in Australia to get the approximate amount of food waste in a particular year.

Household Waste by States

Food waste per capita
0.27 — 15.18

Year of Time
2006

Western Australia
South Australia
New South Wales
Victoria

Victoria wasted approximately 25,796 tonnes in 2006

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Figure 14

The third partition of the visualisation is a choropleth map on food waste in Australia. The colour scheme used is such that it matches the previous visualisation whereby food waste is represented by red. The colour components that vary is luminance. The darker the luminance, the higher the amount of food waste per capita.

The data is normalised by dividing the raw food waste data with the population of each state.
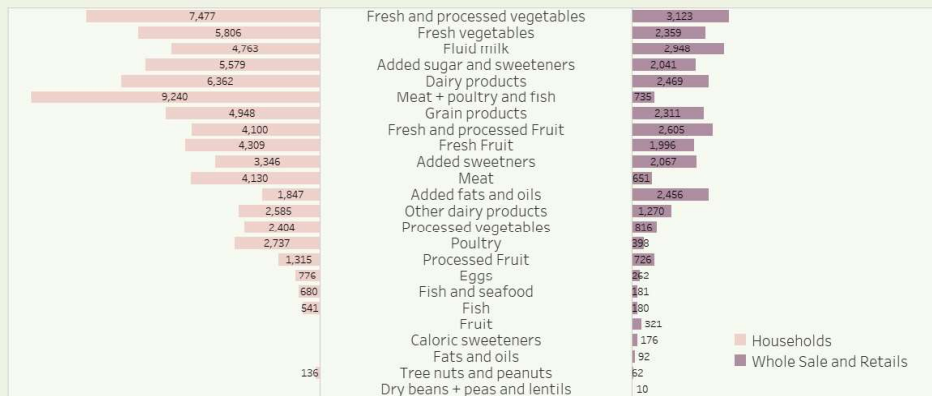
The figure for this map is the coloured countries with available data while the ground would be the desaturated, washed out grey land.

Hovering over any state of the map would reveal a description on the amount of food waste in a particular year for that state (Figure 14).

Food waste in the United States

Decomposition of food waste

	Households	Wholesale and Retails
Fresh and processed vegetables	7,477	3,123
Fresh vegetables	5,806	2,359
Fluid milk	4,763	2,948
Added sugar and sweeteners	5,579	2,041
Dairy products	6,362	2,469
Meat + poultry and fish	9,240	735
Grain products	4,948	2,311
Fresh and processed Fruit	4,100	2,605
Fresh Fruit	4,309	1,996
Added sweetners	3,346	2,067
Meat	4,130	651
Added fats and oils	1,847	2,456
Other dairy products	2,585	1,270
Processed vegetables	2,404	816
Poultry	2,737	398
Processed Fruit	1,315	726
Eggs	776	262
Fish and seafood	680	181
Fish	541	180
Fruit		321
Caloric sweeteners		176
Fats and oils		92
Tree nuts and peanuts	136	62
Dry beans + peas and lentils		10

Clicking on any of the bar charts would highlight the bars on both side (houshold and wholesale) to allow clearer comparison for each variable.
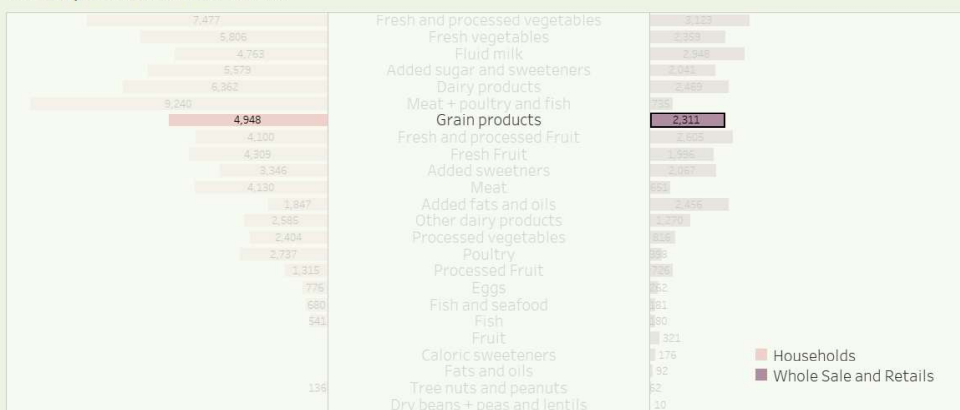
Food waste by households is twice as much as the food waste disposed by wholesale and retails with the exception of added fats and oil.

Figure 15

This is a diverging bar chart showing the decomposition of type of food waste in the United States. The variable names were placed in between to distinctly separate household and retail. To increase the data ink ratio, the background lines were removed along the horizontal and vertical axis label as they do not convey any additional information. The tooltip is also turned off to reduce unnecessary interactions, there won't be any information popping out as the values are already labelled on the bar chart itself.

Clicking on the bars would highlight the corresponding values for both household or retails so as to ease users to make comparison (Figure 16).

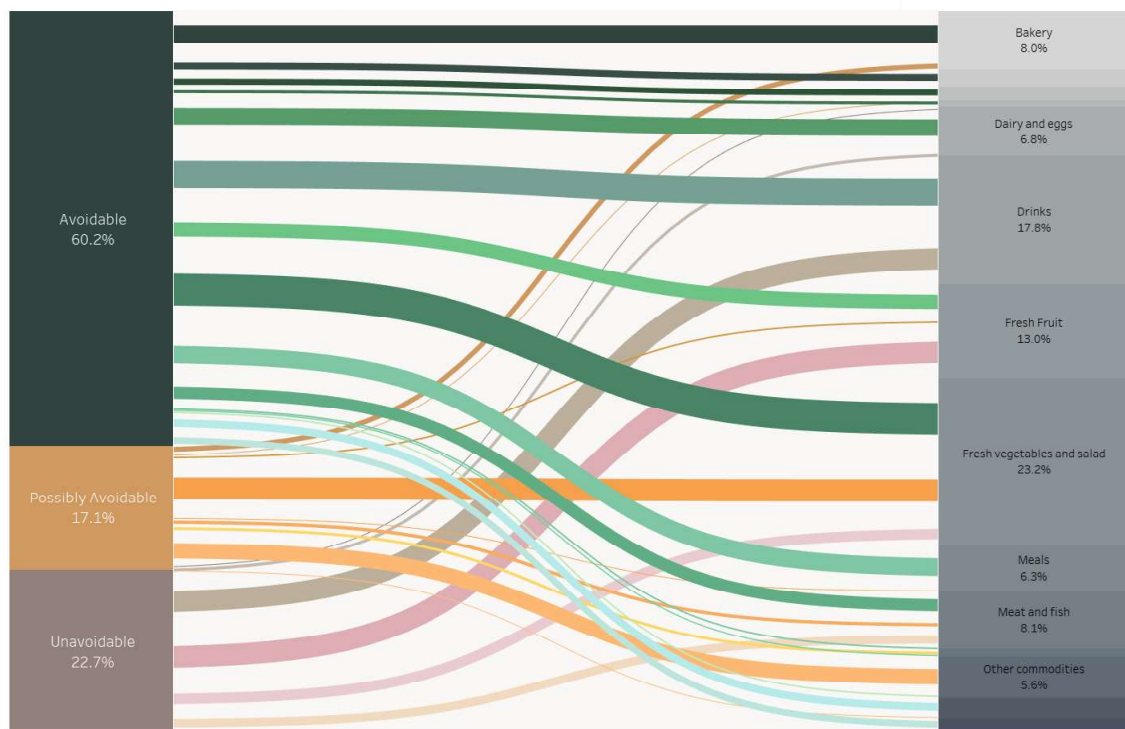*Figure 16*

Food Waste in the United Kingdom

Figure 17

The final partition of the visualisation is a Sankey diagram describing food waste in the United Kingdom. It links the three level of food waste avoidability to the type of food. The thicker the line, the higher the proportion of flow to food category.

Luminance is varied for food category because there are too many food categories, changing hue would make the visualisation messy.

Hovering over any variables on the right or left would display only the flow from pointed source to its destination (Figure 18 and Figure 19). The labels for food category with small proportion are not displayed as there's not enough space to fit the label. Therefore, when user hover over selected food category, the category title and percentage would appear (Figure 19).
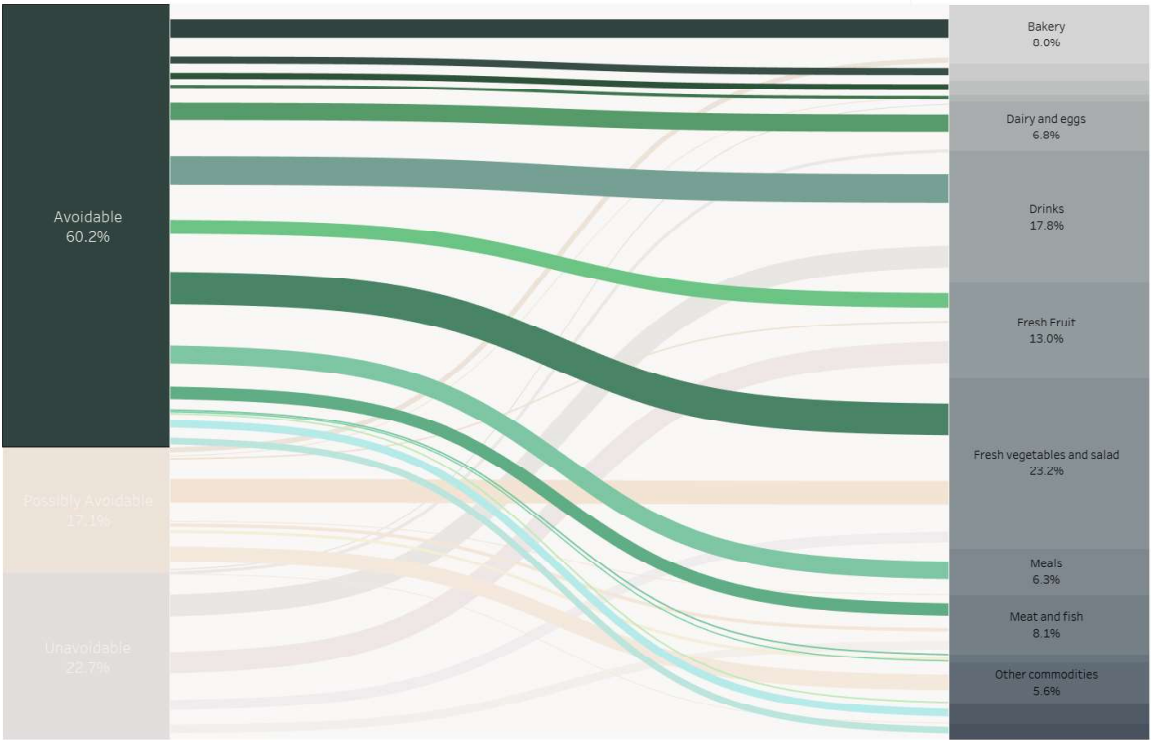
17

Food Waste in the United Kingdom

Bakery
0.0%

Dairy and eggs
6.8%

Drinks
17.8%

Fresh Fruit
13.0%

Fresh vegetables and salad
23.2%

Meals
6.3%

Meat and fish
8.1%

Other commodities
5.6%

Avoidable
60.2%

Possibly Avoidable
17.1%

Unavoidable
22.7%

Figure 18

Food Waste in the United Kingdom

Bakery
8.0%

Cake and desserts
2.3%

Dairy and eggs
6.8%

Drinks
17.8%

Fresh Fruit
13.0%

Fresh vegetables and salad
23.2%

Meals
6.3%

Meat and fish
8.1%

Other commodities
5.6%

Avoidable
60.2%

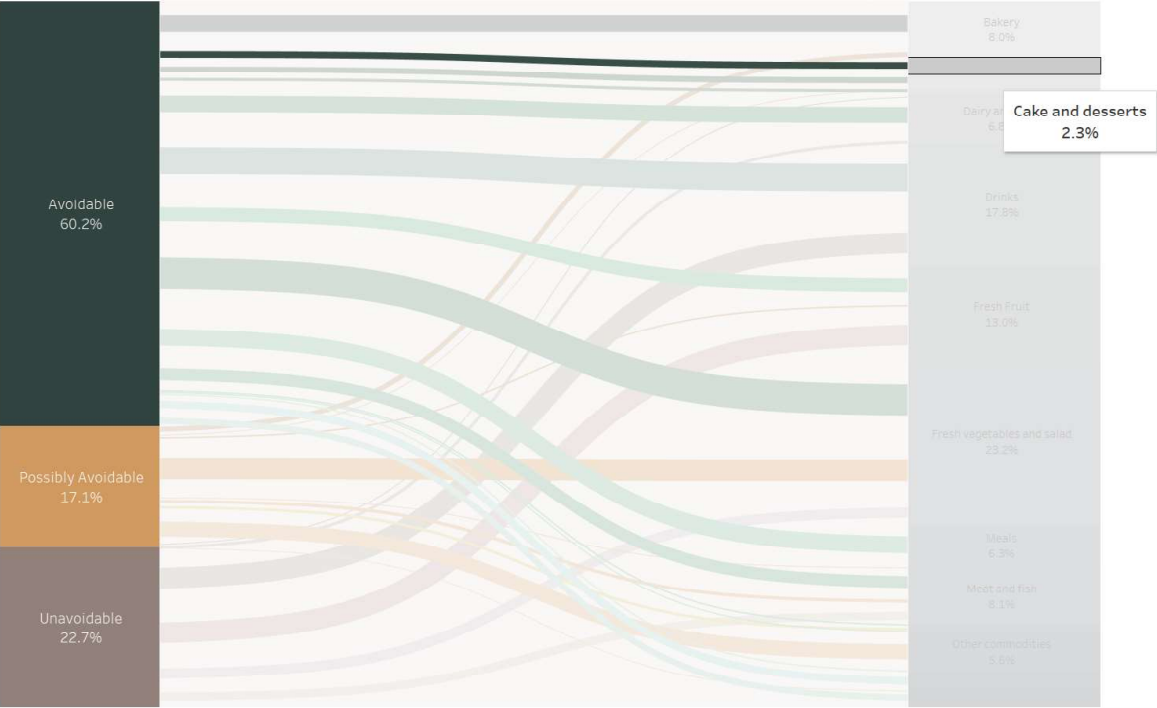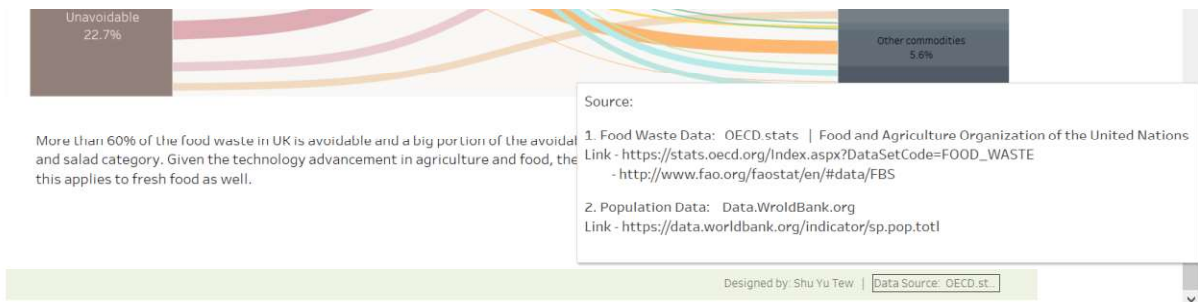Possibly Avoidable
17.1%

Unavoidable
22.7%

Figure 19

Figure 20

The data sources are listed in the visualization by hovering over the "Data Source" text.
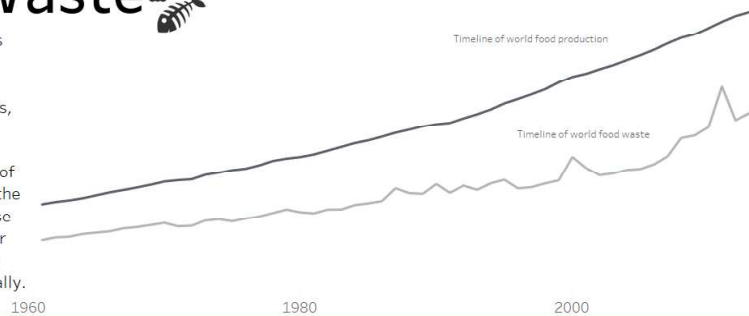
Layout

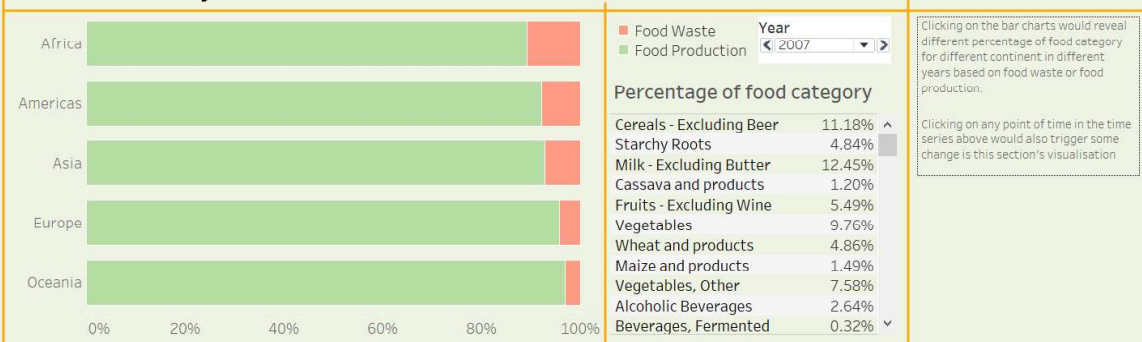The sightlines of this final visualisation are minimized to reduce disjointedness of the layout.

Global Food Waste

Over the years, the world production of food has been increasing exponentially. Food demand increases with the growing world population. However, as the world food production increases, the amount of food waste rises as well.

Although we can observe the deacreasing value of food waste for some years, the overall trend of the time series is still upward. If we were to decrease the amount of food waste, would the demand for food decreases as well? Therefore, we would be looking deeper into the type of food waste globally.

Timeline of world food production

Timeline of world food waste

1960   1980   2000

Food waste by continent - 2007

■ Food Waste
■ Food Production

Year
◀ 2007 ▼ ▶

Percentage of food category

Cereals - Excluding Beer	11.18%
Starchy Roots	4.84%
Milk - Excluding Butter	12.45%
Cassava and products	1.20%
Fruits - Excluding Wine	5.49%
Vegetables	9.76%
Wheat and products	4.86%
Maize and products	1.49%
Vegetables, Other	7.58%
Alcoholic Beverages	2.64%
Beverages, Fermented	0.32%

Clicking on the bar charts would reveal different percentage of food category for different continent in different years based on food waste or food production.

Clicking on any point of time in the time series above would also trigger some change is this section's visualisation

Africa, Americas, Asia, Europe, Oceania

0%   20%   40%   60%   80%   100%

On average, Africa seems to have a higher proportion of food waste relative to other continents . This might be due to the fact that Africa consist of many low income countries which don't have the technology to preserve or store food for a long period of time.

On average, Africa seems to have a higher proportion of food waste relative to other continents . This might be due to the fact that Africa consist of many low income countries which don't have the technology to preserve or store food for a long period of time.
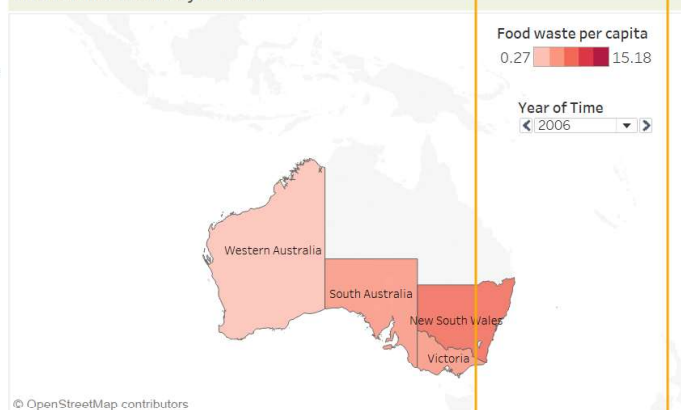
In year 2011, there's a sudden increase in proportion of food waste in Americas which might be the main reason for the sudden spike in the world food waste timeline which occured in 2011 as well.

Food Waste in Australia

Australia seems to be struggling to reduce household food waste as we can see that across the years, the amount of food waste per capita fluctuates a lot for each state. With the exception of Western Australia which constantly had relatively low food waste per capita as compared to other states.
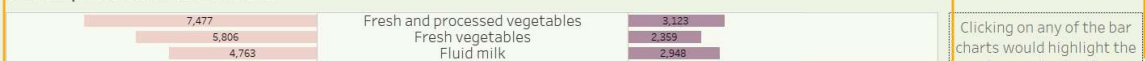
Hover over each of the states in Australia to get the approximate amount of food waste in a particular year.

Household Waste by States

Food waste per capita
0.27 ▮▮▮▮ 15.18

Year of Time
◀ 2006 ▼ ▶

Western Australia

South Australia

New South Wales

Victoria

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Food waste in the United States

Decomposition of food waste

7,477	Fresh and processed vegetables	3,123	
5,806	Fresh vegetables	2,359	
4,763	Fluid milk	2,948	

Clicking on any of the bar charts would highlight the

20

5. Data source

<u>Bibliography</u>

1) Australia state population Data:

Australian Statistic Indicator. (n.d.). Retrieved from Australian Bureau of Statistic:
http://www.abs.gov.au/ausstats/abs@.nsf/Products/9FC129DDC38D89CACA25781D000D68
F3?opendocument

2) Food Waste by Continent Data:

FOASTAT. (2017, December 12). Retrieved from Food and Agriculture Organization of the United
Nation: http://www.fao.org/faostat/en/#data/FBS

3) Food Waste in Australia, UK, US data:

Food Waste. (2014, June). Retrieved from OECD.Stat:
https://stats.oecd.org/Index.aspx?DataSetCode=FOOD_WASTE

4) World population Data:

Population, total | Data. (n.d.). Retrieved from The World Bank:
https://data.worldbank.org/indicator/sp.pop.totl

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[1] *Coolors*. (n.d.). Retrieved from Generate: https://coolors.co/a4243b-32443f-d8c99b-cf995f-d8973c

[2] (2013). *Food wastage footprint: Impacts on natural resources - Summary report.* FAO.