# Ching’s Amazing Week-9 Webpage

Tang Ching Xian

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Week 9

```
(1) What is the topic that you have finalized? (Answer in 1 or 2 sentences)
    Food Waste Data Analysis

(2) What are the data sources that you have curated so far? (Answer 1 or 2 sentences).
    Recycling statistics per type of waste for 2018-2022
    Source: https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-over
all-recycling
```

(Continuation) Week 10

```
(1) What is the question that you are going to answer? (Answer: One sentence that ends wit
h a question mark that could act like the title of your data story)
```

Learn how much Singapore is saving energy per years by recycling plastics, paper, glass, ferrous and non-ferrous metal.

```
(2) Why is this an important question? (Answer: 3 sentences, each of which has some eviden
ce, e.g., “According to the United Nations...” to justify why the question you have chosen
is important)
```

In Singapore’s quest to achieve zero-waste status, the looming challenge of increased waste disposal.

Coupled with Semakau Landfill’s impending limit by 2035, necessitates urgent action.

The city-state, facing a shortage of land for waste facilities, responds with a unique strategy—inspiring citizens through the revelation of yearly energy savings from collective recycling efforts.

```
(3) Which rows and columns of the dataset will be used to answer this question? (Answer: A
ctual names of the variables in the dataset that you plan to use).
```

I will be using Recycling statistics to calculate energy saved every year from 2003 to 2022 based on 6 waste types: plastics, paper, glass, ferrous, non-ferrous metal and food.

```
# Libraries
library (tidyverse)
```

```
## Warning: package 'tidyverse' was built under R version 4.3.2
```

```
## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──
## ✓ dplyr     1.1.3     ✓ readr     2.1.4
## ✓ forcats   1.0.0     ✓ stringr   1.5.0
## ✓ ggplot2   3.4.3     ✓ tibble    3.2.1
## ✓ lubridate 1.9.2     ✓ tidyr     1.3.0
## ✓ purrr     1.0.2
## ── Conflicts ────────────────────────────────────────── tidyverse_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to
become errors
```

```
library (plotly)
```

```
##
## Attaching package: 'plotly'
##
## The following object is masked from 'package:ggplot2':
##
##     last_plot
##
## The following object is masked from 'package:stats':
##
##     filter
##
## The following object is masked from 'package:graphics':
##
##     layout
```

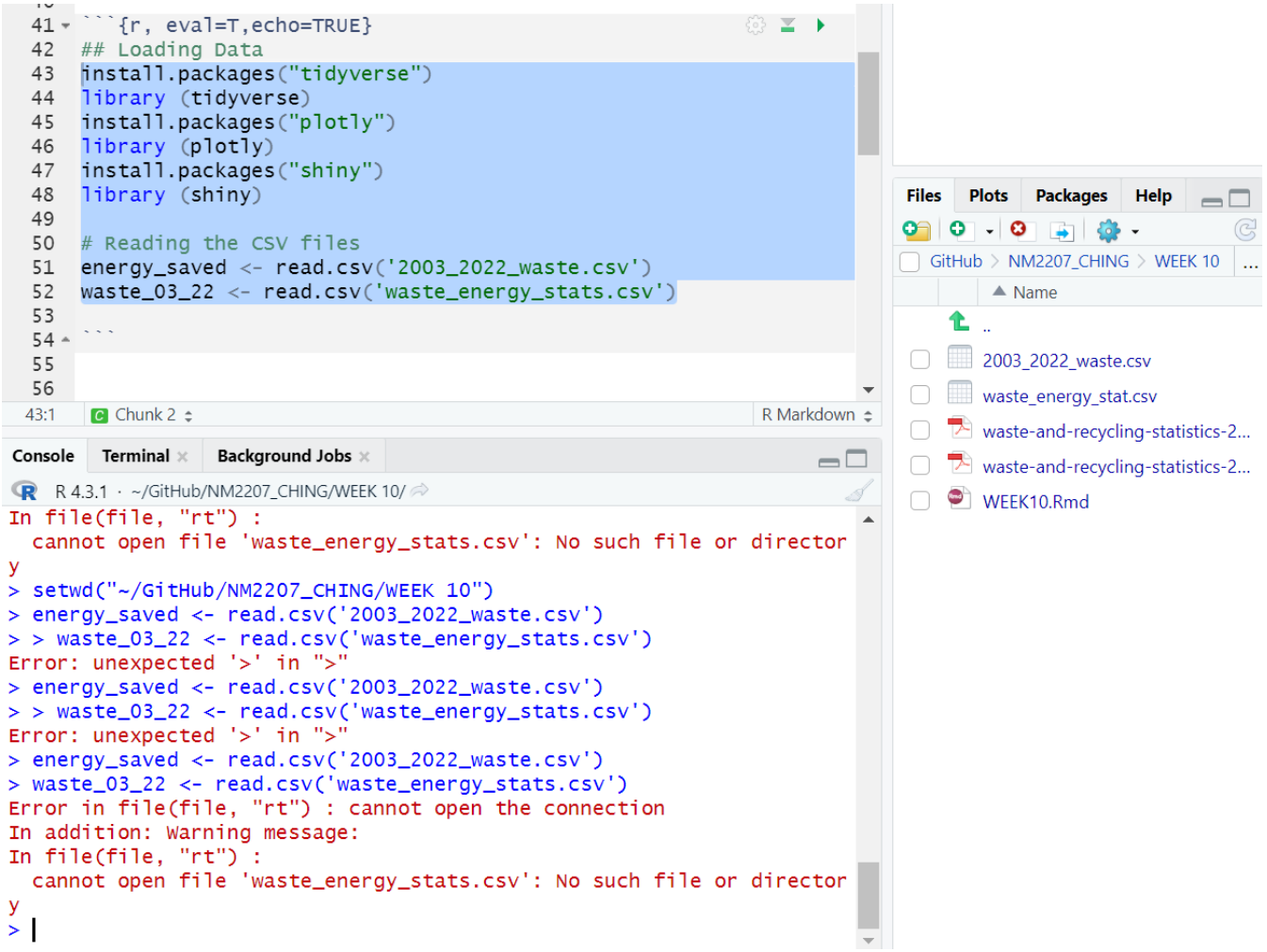
```
library (shiny)
library(dplyr)

# Reading the CSV files
waste_03_22 <- read.csv('2003_2022_waste.csv')

energy_stat <- read.csv('waste_energy_stat.csv')


# Renaming columns and mutating the data to convert values from kilo-tonnes to tonnes
clean_waste_03_22 <- waste_03_22 %>%
  rename(
    waste_type = "waste_type",
    total_waste_generated_tonne = "total_generate_1k_tonnes",
    total_waste_recycled_tonne = "total_recycled_1k_tonnes",
    year = "year"
  ) %>%
  mutate(
    total_waste_generated_tonne = total_waste_generated_tonne * 1000,
    total_waste_recycled_tonne = total_waste_recycled_tonne * 1000
  )
```

```
# Filtering waste_03_22 dataset for specific years and waste types
wasteselected <- clean_waste_03_22 %>%
  filter(year %in% 2003:2022,
         waste_type %in% c("Plastics", "Ferrous Metals", "Non-Ferrous Metals", "Glass", "F
ood"))%>%
  arrange(waste_type)

          #problem encountered: missing data for Food and Non-Ferrous Metals


### Calculating and adding recycling rate into DataFrame for analysis.

# Calculate recycling_rate and round to 2 decimal places
clean_waste_03_22$recycling_rate <- round(
  clean_waste_03_22$total_waste_recycled_tonne / clean_waste_03_22$total_waste_generated_t
onne,
  2
)

# Display the cleaned data
head(clean_waste_03_22)
```

```
##                  waste_type total_waste_generated_tonne
## 1 Construction & Demolition                     1624000
## 2            Ferrous Metals                     1269000
## 3           Paper/Cardboard                     1054000
## 4                 Plastics                      949000
## 5                     Food                      763000
## 6               Wood/Timber                      521000
##   total_waste_recycled_tonne year total_not_recycled_1k_tonnes recycling_rate
## 1                    1618000 2018                           6           1.00
## 2                     126000 2018                        1143           0.10
## 3                     586000 2018                         468           0.56
## 4                      41000 2018                         908           0.04
## 5                     126000 2018                         637           0.17
## 6                     428000 2018                          93           0.82
```

#Problem Encounter 1

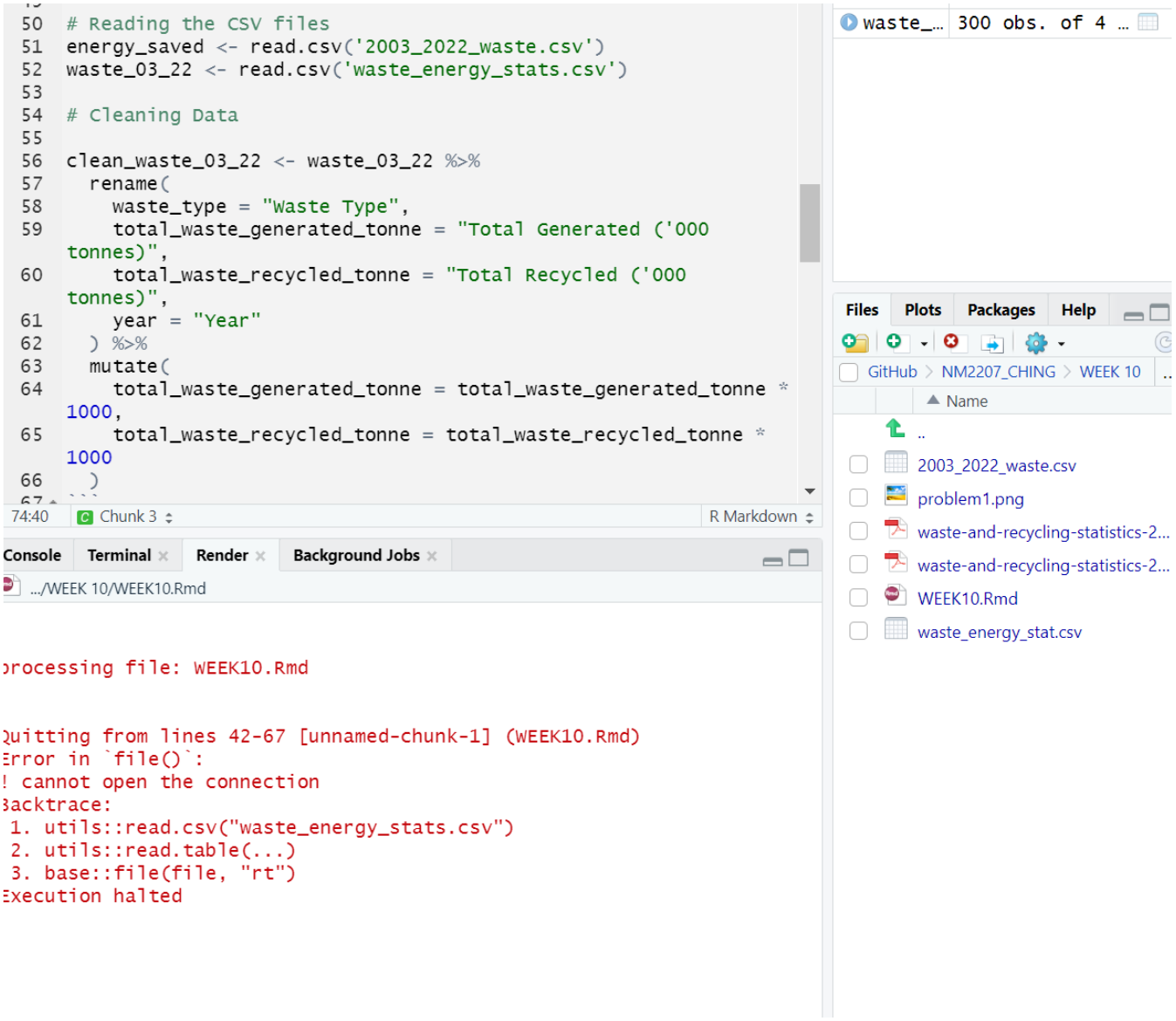
```
knitr::include_graphics("problem1.png")
```




Overcome: by typing separate lines instead of just throwing both at the same time.

#Problem Encounter 2

```
knitr::include_graphics("problem2.png")
```




Overcome: by typing “waste_energy_stat.csv” instead of “waste_energy_stat(s).csv” –> careless typing

#Problem Encounter 3

```
knitr::include_graphics("problem3.png")
```

```
# Reading the CSV files
energy_saved <- read.csv('2003_2022_waste.csv')

waste_03_22 <- read.csv('waste_energy_stat.csv')

# Cleaning Data

clean_waste_03_22 <- waste_03_22 %>%
  rename(
    waste_type = "Waste Type",
    total_waste_generated_tonne = "Total Generated ('000 tonnes)",
    total_waste_recycled_tonne = "Total Recycled ('000 tonnes)",
    year = "Year"
  ) %>%
  mutate(
    total_waste_generated_tonne = total_waste_generated_tonne * 1000,
    total_waste_recycled_tonne = total_waste_recycled_tonne * 1000
  )
```

53:39 Chunk 2 R Markdown

Console Terminal Render Background Jobs

.../WEEK 10/WEEK10.Rmd

```
processing file: WEEK10.Rmd
  |.............................                        |  57% [unnamed
-chunk-1]
Quitting from lines 42-68 [unnamed-chunk-1] (WEEK10.Rmd)
Error in `rename()`:
! Can't rename columns that don't exist.
✖ Column `Waste Type` doesn't exist.
Backtrace:
 1. ... %>% ...
 4. dplyr:::rename.data.frame(...)

Execution halted
```

waste_... 300 obs. of 4 ...

Files Plots Packages Help

GitHub > NM2207_CHING > WEEK 10

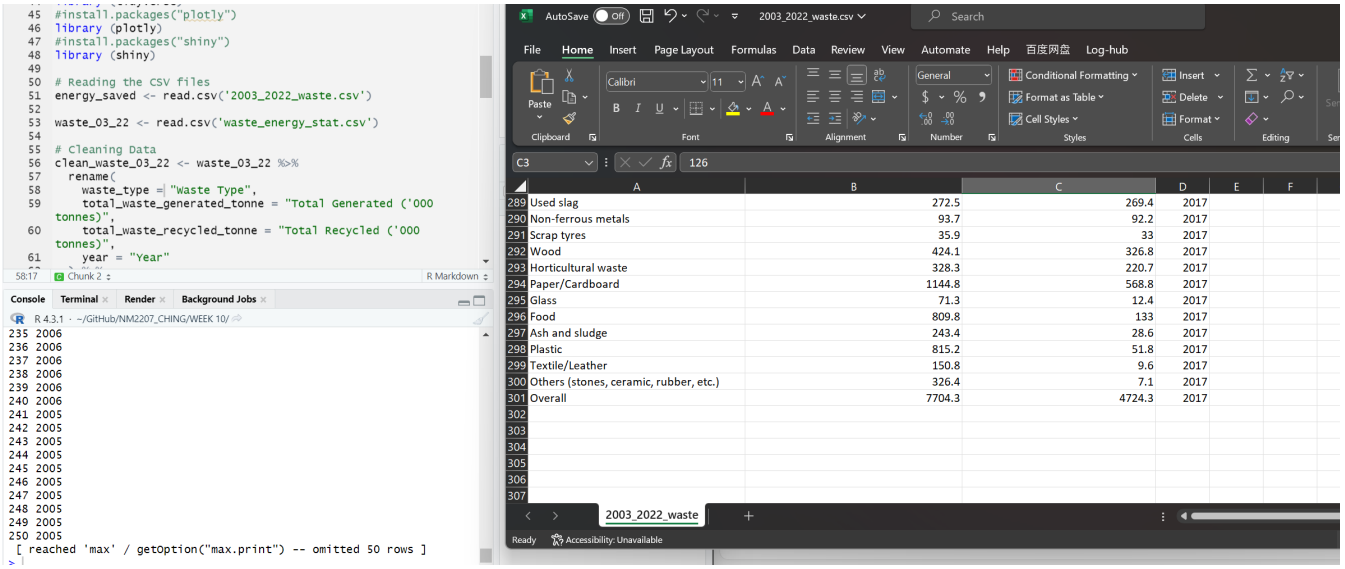
Name

- ..
- 2003_2022_waste.csv
- problem1.png
- waste-and-recycling-statistics-2...
- waste-and-recycling-statistics-2...
- WEEK10.Rmd
- waste_energy_stat.csv
- problem2.png

Overcome: Confirm column names mentioned in the ‘rename’ and ‘mutate’ function exist in the CSV. They are also case-sensitive, so make sure there are no typos.

#Problem Encounter 4

```
knitr::include_graphics("problem4.png")
```




Overcome: Rearrange the data?

Overview of the Introduction of the webpage: Learn how much Singapore is saving energy per years by

recycling plastics, paper, glass, ferrous and non-ferrous metal.

# Introduction of Narrative

In the heart of Singapore’s bustling landscape, a groundbreaking initiative aims to turn the tide on the nation’s mounting waste crisis. With the looming threat of Semakau Landfill reaching its limit by 2035 and a scarcity of land for new waste facilities, the urgency to address this issue has never been more apparent.

As the nation confronts this pressing challenge, a unique strategy unfolds—one that seeks to inspire citizens by revealing the potential energy savings derived from combined recycling efforts. The journey begins with a meticulous project of data cleansing and preparation, focusing on the Singapore NEA Energy Savings dataset, which sheds light on total garbage collection and recycling rates. However, the complexity deepens with the diversity in material names from various sources.

To bring the narrative up-to-date, the latest developments are seamlessly integrated, incorporating the 2022 data from waste statistics and overall recycling provided by the National Environment Agency. This ensures a comprehensive and current statistical analysis as the nation strives for a zero-waste future.

The quest for understanding extends beyond borders, drawing insights from Greentumble to gauge the energy production potential of recycling efforts. The spotlight narrows onto five key waste types—plastics, paper, glass, ferrous, and non-ferrous metals—forming the cornerstone for calculating annual energy savings from 2003 to 2022. The hope is to propel Singapore toward a future where waste becomes not a problem but a source of renewed energy.

Amidst this environmental pursuit, the narrative weaves in elements of Singapore’s unique relationship with food—a nation touted as a food paradise. The complexities of food security and waste management come to the forefront, challenging the conventional notion of waste. The thesis proposes a transformative approach to food waste management by harnessing it as a resource, exploring alternative architectural typologies for decentralized food waste-to-energy production in local neighborhoods.

This proposition not only aims to support closed-loop food systems but also challenges societal perceptions of “waste”. This project reflects a holistic inquiry into the intricate relationships between food waste, technology, environment, culture, and society. It calls for a rethink of current waste management practices, emphasizing the potential of waste as a resource that can be repurposed, recycled, and given a second life.

In a city where waste is often out of sight, this narrative brings it to the forefront, proclaiming that not recycling waste is a missed opportunity. With an insatiable appetite for consumption, Singapore must take action to transform waste into a valuable resource, creating a sustainable future where the city’s vibrancy is not overshadowed by the looming shadow of excess waste.