# Ching’s Amazing Week-9 Webpage

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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
```

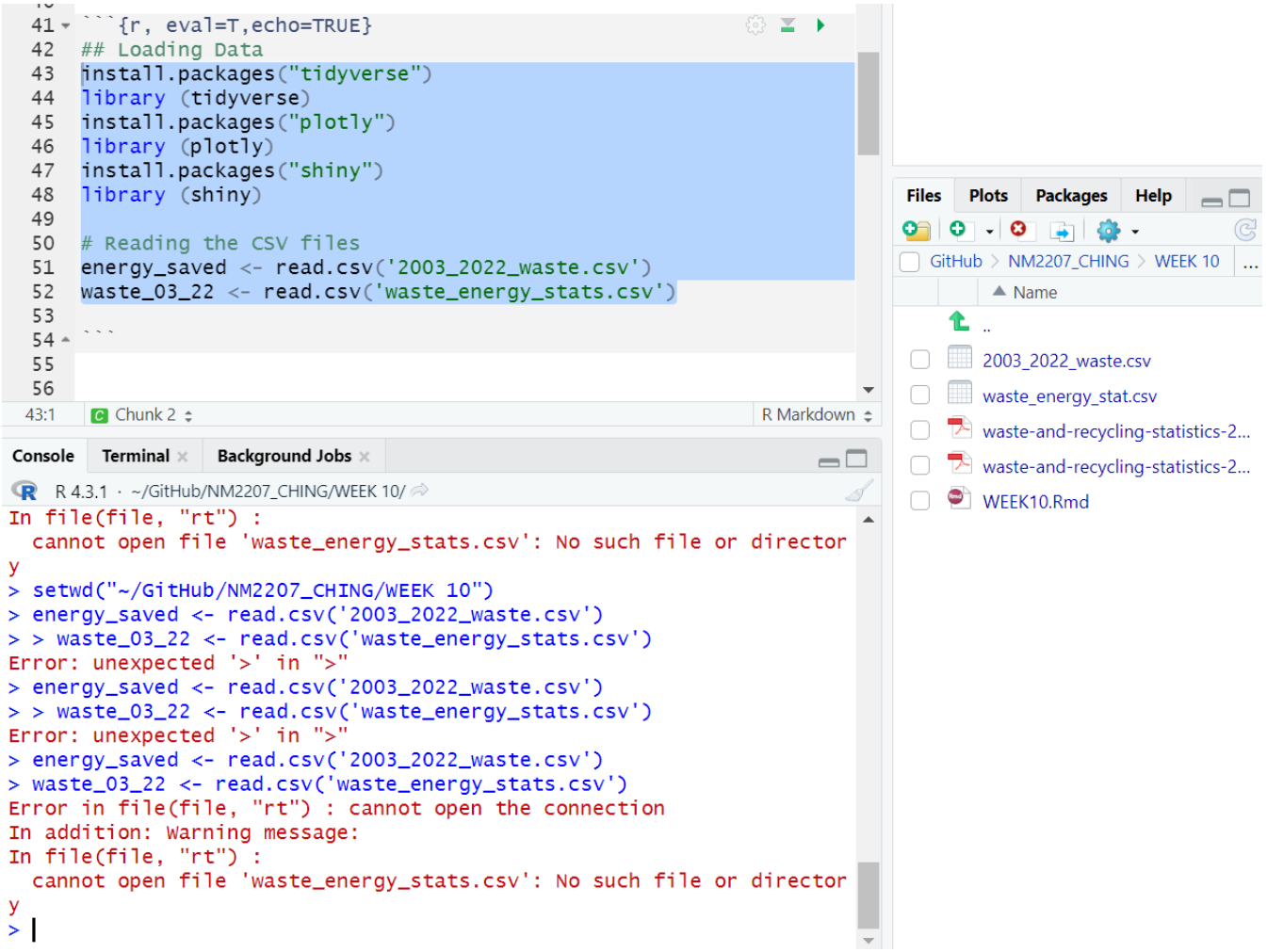
```
library (shiny)
library(dplyr)

# 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

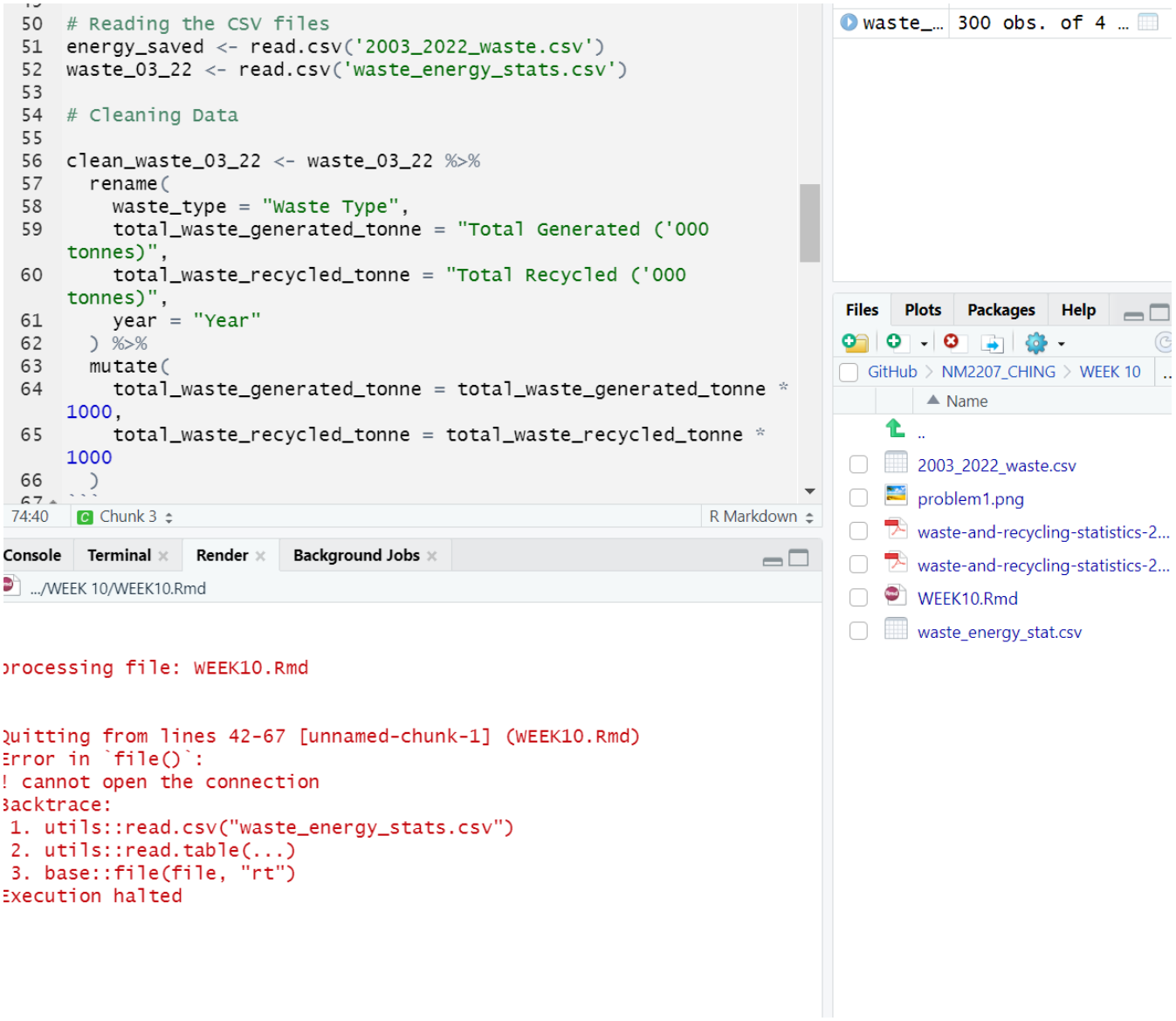
```
knitr::include_graphics("problem1.png")
```




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

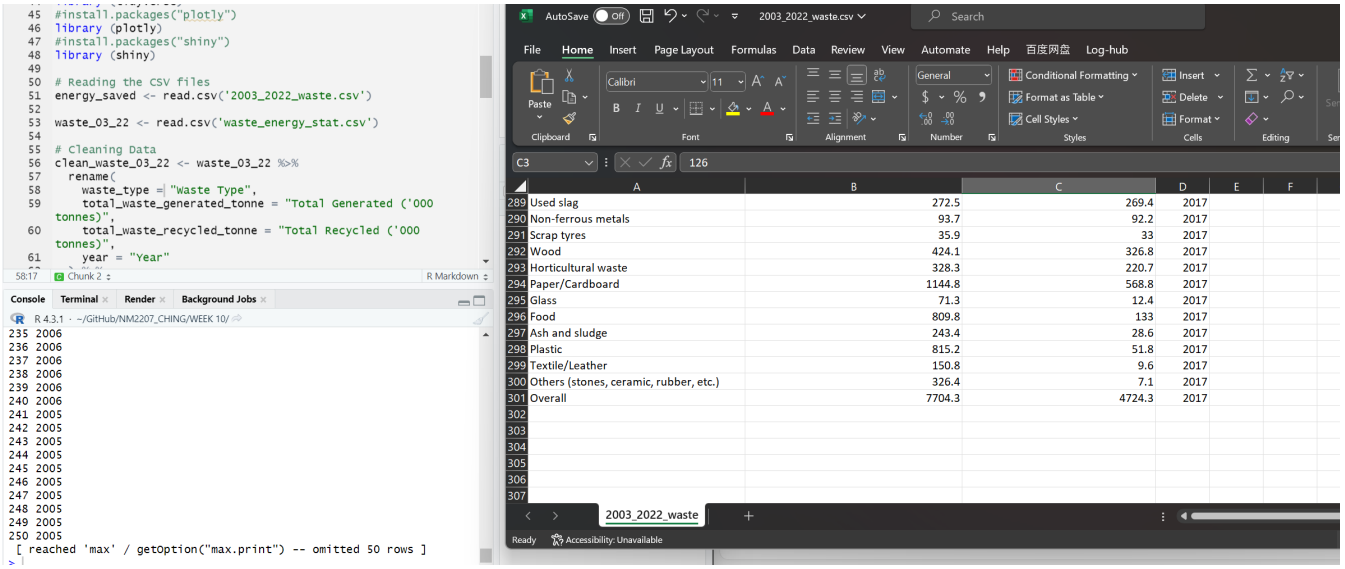
Name

- ..
- 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 (https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling (https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling)), 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 (https://greentumble.com/how-does-recycling-save-energy/ (https://greentumble.com/how-does-recycling-save-energy/)). 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.