Analysis of Waste Recycling in Hong Kong

Lin Yimeng
Zheng Shuwan
Cheng Yulu
Pan Yier

2023

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Catalog

PART 01

Questions & Objectives

PAN Yier

What issue do we want to cover in this project?

PAN Yier

Since 1986, Hong Kong's population has grown by more than a million people, and everyone is throwing away more waste. Unfortunately, not all individuals are following the rules for proper waste disposal. We are going to explore the amount of waste in Hong Kong in the past years and the data of recyclable collection points. **Our goal is to assist public to increase the awareness of garbage recycling, to promote waste recovery and recycling**, as well as to **promote the maintenance of the public's good and comfortable living environment**.

What is the〝problem〞 we can identify

PAN Yier

In this analysis, we will try to propose more possible or practical waste recycling points setting methods, assisting the government to increase the overall recycling rate, by exploring the population data and the distribution of recyclable collection points in different dirtricts of Hong Kong.

What is our motivation and needs to do this project?

When walking on the streets in Hong Kong, we can always notice a kind of phenomena like this: piles of excessive garbage surrounding a garbage can, and and even the presence of large items, such as discarded furniture, that shouldn't be there. These phenomenas remind us that some people still do not recognize how serious the waste is in Hong Kong, as well as the lack of awareness of waste recycling, and targeted waste disposal.

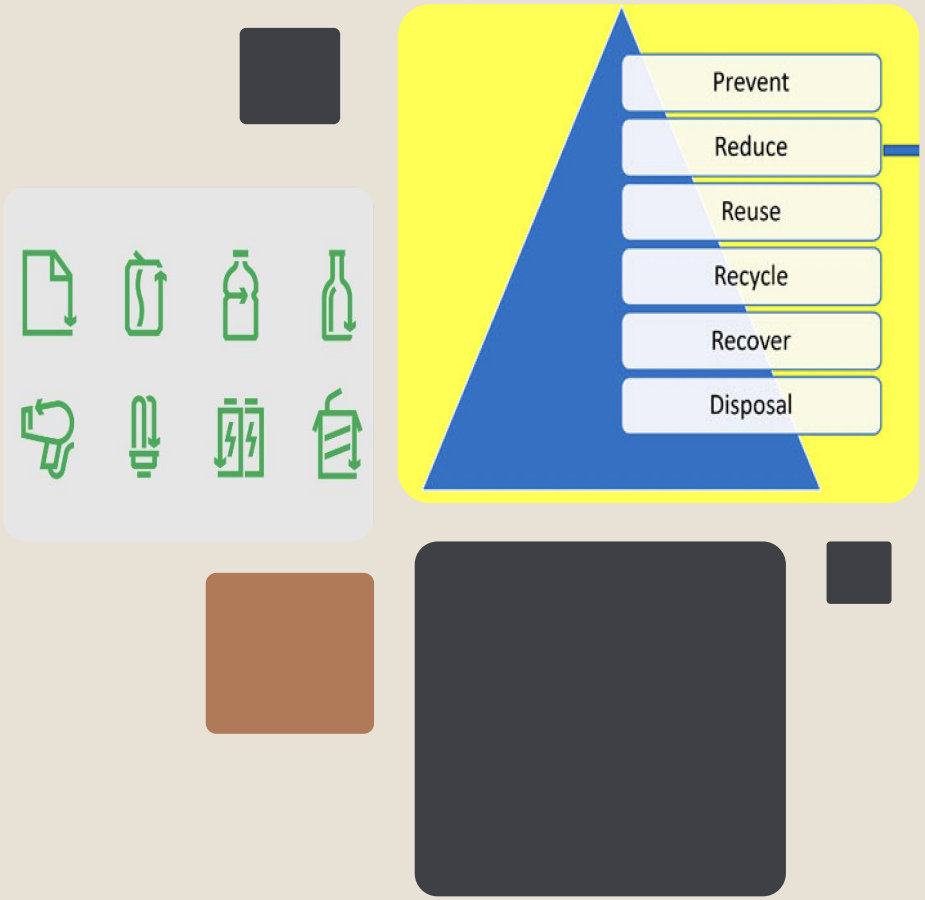
PART 02

Related works & Datasets

LIN Yimeng & PAN Yier

PAN Yier

Sustainable Environmental Management Through a Municipal Solid Waste Charging Scheme: A Hong Kong Perspective



The statistics for Hong Kong indicate that the disposal rate of MSW was 11,057 kg/day in 2019, which accounted for 71% (4.04 million tons) of total waste generation (5.67 million tons), with only 29% of recovered waste (1.64 million tons).

Given the significant volume of waste being generated and little reduction from the source, landfills will soon overflow, and the daily operation of Hong Kong city will be drastically affected.

The purpose of the scheme is to make people more aware of waste disposal and to try to reduce waste through reusing, reducing, and recycling.

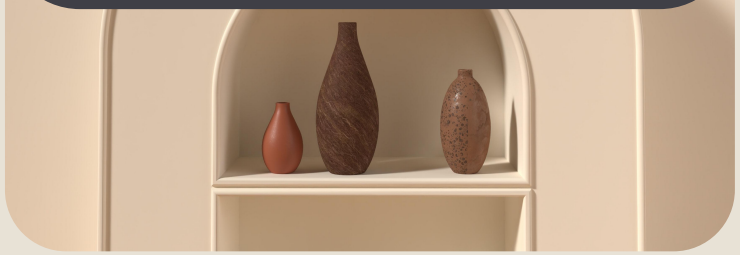
Types of Recycling

PAN Yier

Waste Paper and Cardboard

70%

less energy is used when making new paper from recycled stock than when using virgin pulp!



Plastic

The world generates

381 million

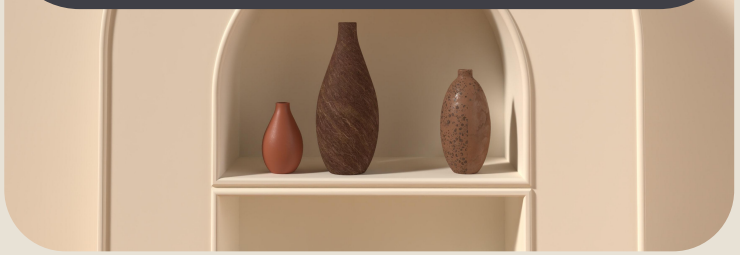
tonnes of plastic waste annually, and with the amount of plastic waste set to double by 2034, recycling plastic is vital

Glass

Glass is

100%

ecyclable and never loses any purity or quality when recycled, meaning we can recycle it many times over.



Datasets

LIN Yimeng

district_id	Household waste	Commercial and industrial waste	Municipal solid waste	Building waste	All wastes
Kwai_Tsing	346	489	835	230	1900
North	343	508	851	215	1917
Sai_Kung	366	49	415	727	1557
Sha_Tin	516	444	960	118	2038
Tai_Po	326	139	465	165	1095
Tsuen_Wan	244	208	452	37	941
Tuen_Mun	507	328	835	605	2275
Yuen_Long	747	638	1385	90	2860
Central_Western	271	211	482	97	1061
Eastern	459	99	558	85	1201
Southern	223	40	263	88	614
Wan_Chai	178	38	216	115	547
Islands	185	113	298	156	752
Kowloon_City	309	81	390	146	926
Kwun_Tong	541	190	731	210	1672
Sham_Shui_Po	421	82			
Wong_Tai_Sin	328	65			
Yau_Tsim_Mong	535	244			

Name of District Council district (in English)	Total population
Central and Western	235,953.00
Eastern	529,603.00
Islands	185,282.00
Kowloon City	410,634.00
Kwai Tsing	495,798.00
Kwun Tong	673,166.00
North	309,631.00
Sai Kung	489,037.00
Sha Tin	692,806.00
Sham Shui Po	431,090.00
Southern	263,278.00
Tai Po	316,470.00
Tsuen Wan	320,094.00
Tuen Mun	506,879.00
Wan Chai	166,695.00
Wong Tai Sin	406,802.00
Yau Tsim Mong	310,647.00
Yuen Long	668,080.00
Total	7,411,945.00

_id	cp_state	district_id	address_en
283	Accepted	Kwai_Tsing	Kwai Hing Road near Kwai Hing MTR Station
286	Accepted	Kwai_Tsing	Wing Shun Street near Tsuen Wan Abattoir
288	Accepted	Kwai_Tsing	Tai Wong Ha Reste Village RCP
289	Accepted	Kwai_Tsing	Chung Pai Lo Uk Village RCP
293	Accepted	Kwai_Tsing	Entrance to Tsing Fai San Tsuen Village RCP at Lot No. 817-865
294	Accepted	Kwai_Tsing	Kwai Shun Street RCP, near Kwai Wo Street, Kwai Shun Street
295	Accepted	Kwai_Tsing	Wing Kin Road RCP, No.14 Wing Kin Road
296	Accepted	Kwai_Tsing	Hing Shing Road RCP, No. 82 Hing Shing Road, Kwai Chung
297	Accepted	Kwai_Tsing	Tai Yuen Street RCP, near the Car park, Tai Yuen Street
298	Accepted	Kwai_Tsing	Pavement outside No. 3 Kin Chuen Street
302	Accepted	Kwai_Tsing	Shek Tau Street near Kwai Yung Court
303	Accepted	Kwai_Tsing	At side of New Fisherman Village RCP
307	Accepted	Kwai_Tsing	San Kwai Street Public Toilet , Kwai Chung
308	Accepted	Kwai_Tsing	Ha Kwai Chung Tsuen Refuse Collection Point at San Kwai Street, Kwai Chung
309	Accepted	Kwai_Tsing	Kau Wah Keng Sun Chuen Refuse Collection Point at Kau Wa Keng San Tsuen, Lai King Hill Road, Kwai Chung, N.T.
313	Accepted	Kwai_Tsing	Cheung Hang Village (Rifle Range Association) Refuse Collection Point (KwT-21) at Near Rifle Range Association , Cheung Hang Village
314	Accepted	Kwai_Tsing	Cheung Hang Village (Pump Station) Refuse Collection Point (KwT-23) at Near Pump Station, Cheung Hang Village
315	Accepted	Kwai_Tsing	Shek Pai Street Refuse Collection Point at Near Shek Lei Hang Village, Shek Pai Street
316	Accepted	Kwai_Tsing	At the side of Cheung Hang Village Pavilion, Cheung Yuen Road (near Cheung Hang Village Playground)
317	Accepted	Kwai_Tsing	Fung Shan Wo Reste Village Refuse Collection Point at Tsing Yu Street , Tsing Yi
319	Accepted	Kwai_Tsing	Shing Mun Road Refuse Collection Point at Shing Mun Road, Kwai Chung
320	Accepted	Kwai_Tsing	Lower Shing Mun Village Refuse Collection Point near Pump Station, Lower Shing Mun Village
321	Accepted	Kwai_Tsing	O Pui Shan Boy's Home Refuse Collection Point near Cheung Hang Road , O Pui Shan Boy's Home
323	Accepted	Kwai_Tsing	Kau Wah Keng Old Tsuen, Lai King Hill Road
324	Accepted	Tuen_Mun	Pavement of Shun Tat Street (outside No. 750, Shun Fung Wai)
325	Accepted	Tuen_Mun	At side of Bin site at Tong Hang Road (opposite to Ming Wong Garden)
326	Accepted	Tuen_Mun	Cul-de-sac of Heung King Road (near parking space (opposite to the fiberglass refuse collection point))
327	Accepted	Tuen_Mun	Ka Chai Lane RCP
72	Accepted	Tuen_Mun	Bus Terminus at Tai Lam Chung, Castle Peak Road

Solid Waste Recovery : the quantity of municipal waste disposed in Hong Kong from 2009 to 2021.

Solid Waste Generation : the quantity of municipal waste generated in Hong Kong from 2009 to 2021.

Solid Waste by District : the distribution of various types of waste across different districts.

HK Population : the population of different districts of Hong Kong in 2021.

Waste Colletion Points : the distribution of waste collection points across different districts in Hong Kong, mainly includes the location and waste type of each collection points.

Source:

Data government HK: https://data.gov.hk/en/

Waste Reduction Website: https://www.wastereduction.gov.hk/en-hk

PART 03

Data processing & Visualization

LIN Yimeng & CHENG Yulu & ZHENG Shuwan

Data processing

LIN Yimeng

In this section, we imported, examined, processed the data and get ready for analysis, including:

1. Import libraries
2. Read the data and map
3. Examine attributes & Case selection
4. Basic statistic

Step1:

Preliminary

Step2:

Examine attributes & Case selection

In this step, we gain an overview of our data tables and form an understanding of their structures.

Besides, we rename some of the table column titles and extract the columns that we will need for use in later steps.

In this step, we check for any blank entries in our tables. If any blank rows are found, we proceed to delete them.

Step3:

Basic statistics

Visualization

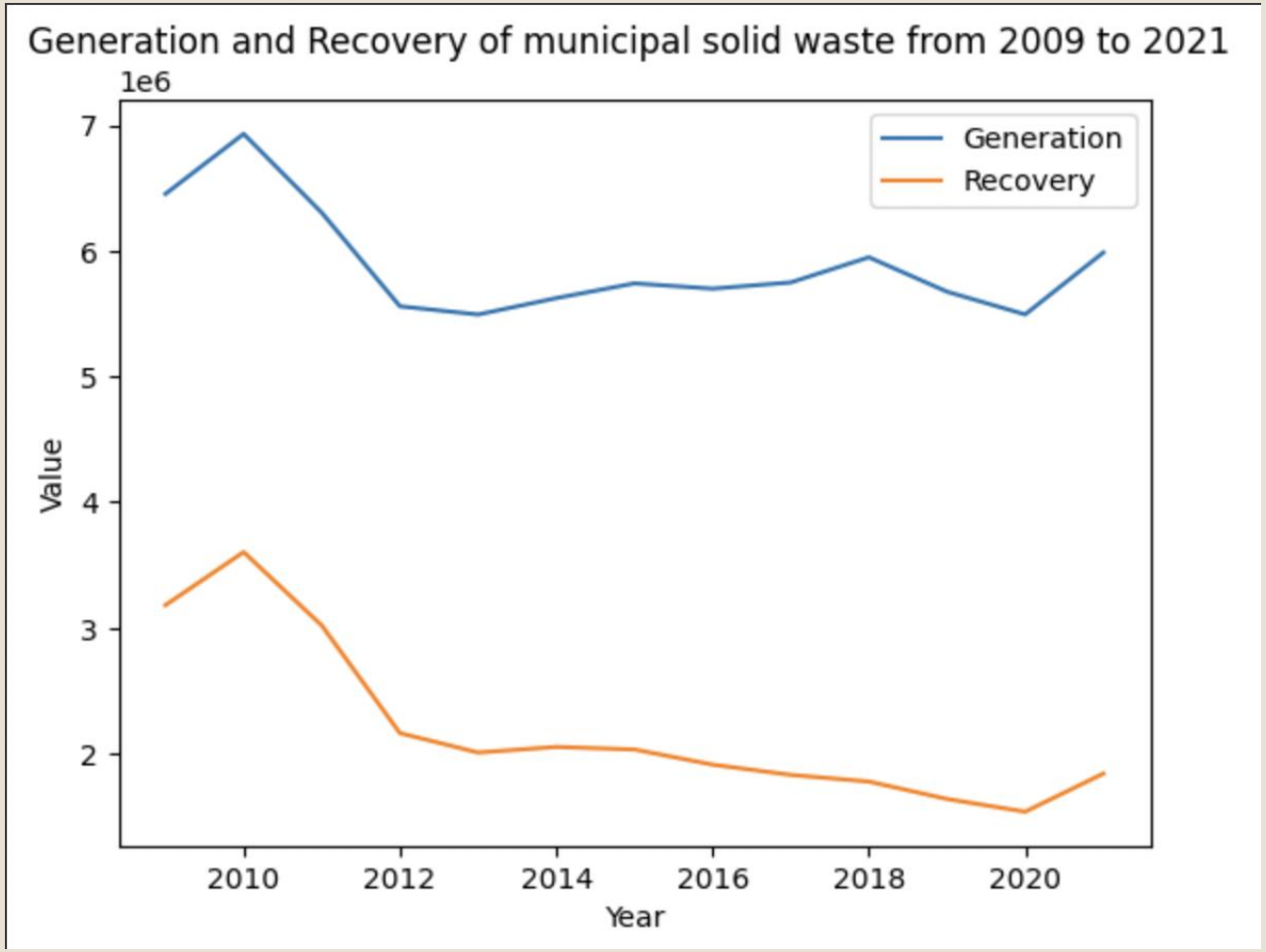
ZHENG Shuwan

Q1: What is the trend in the amount of municipal solid waste in Hong Kong, and what is the distribution of various types of waste in different districts?

In this section, we will explore the changes in the generation of solid waste, the distribution of waste types across different districts, and the variations in the solid waste recycling ratios.

Visualization

ZHENG Shuwan

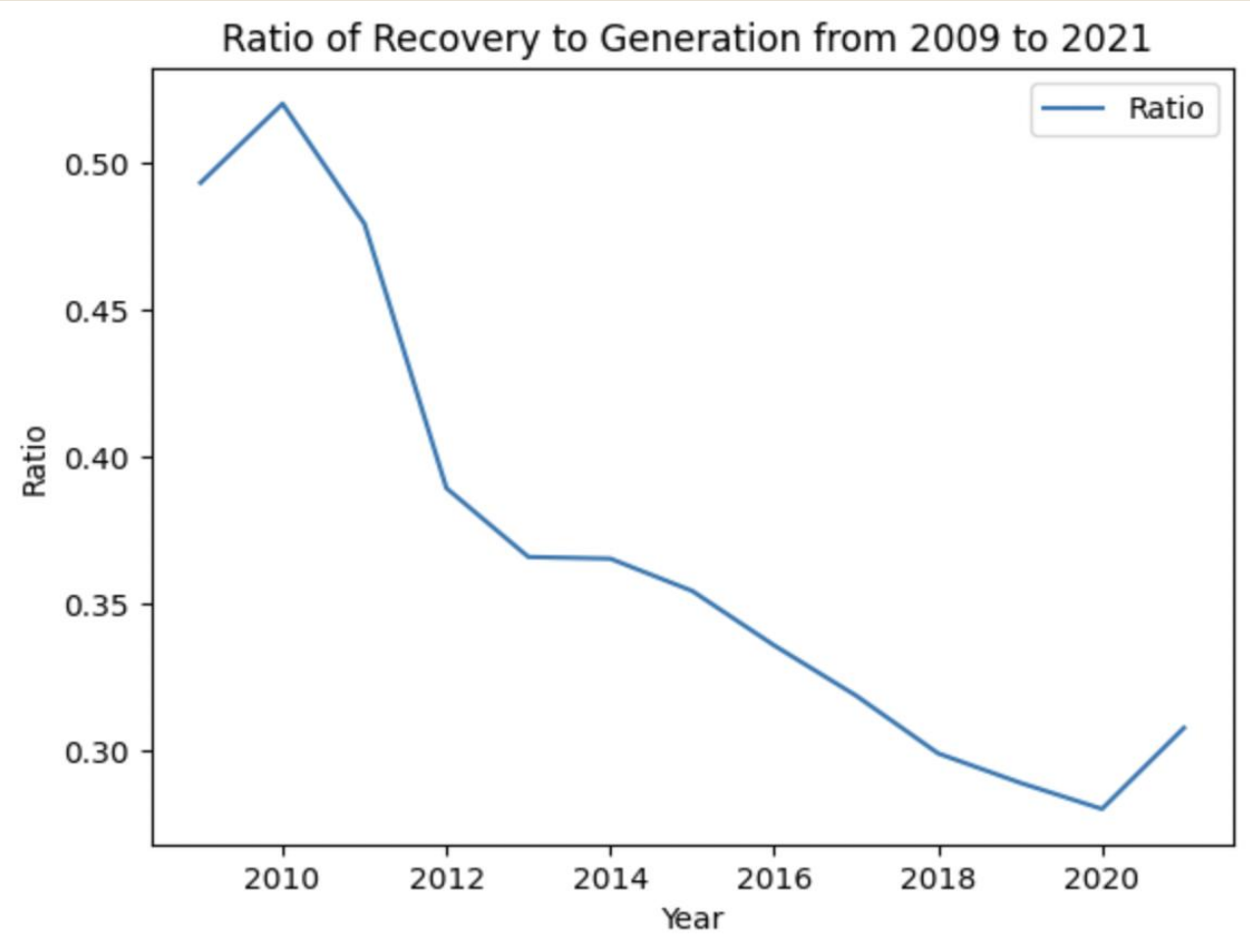


Analysis:

The line chart presents a trend of decreasing total municipal solid waste generation from 2009 to 2021. However, it also illustrates a **concurrent decline** in **waste recovery** over the same period.

Visualization

ZHENG Shuwan



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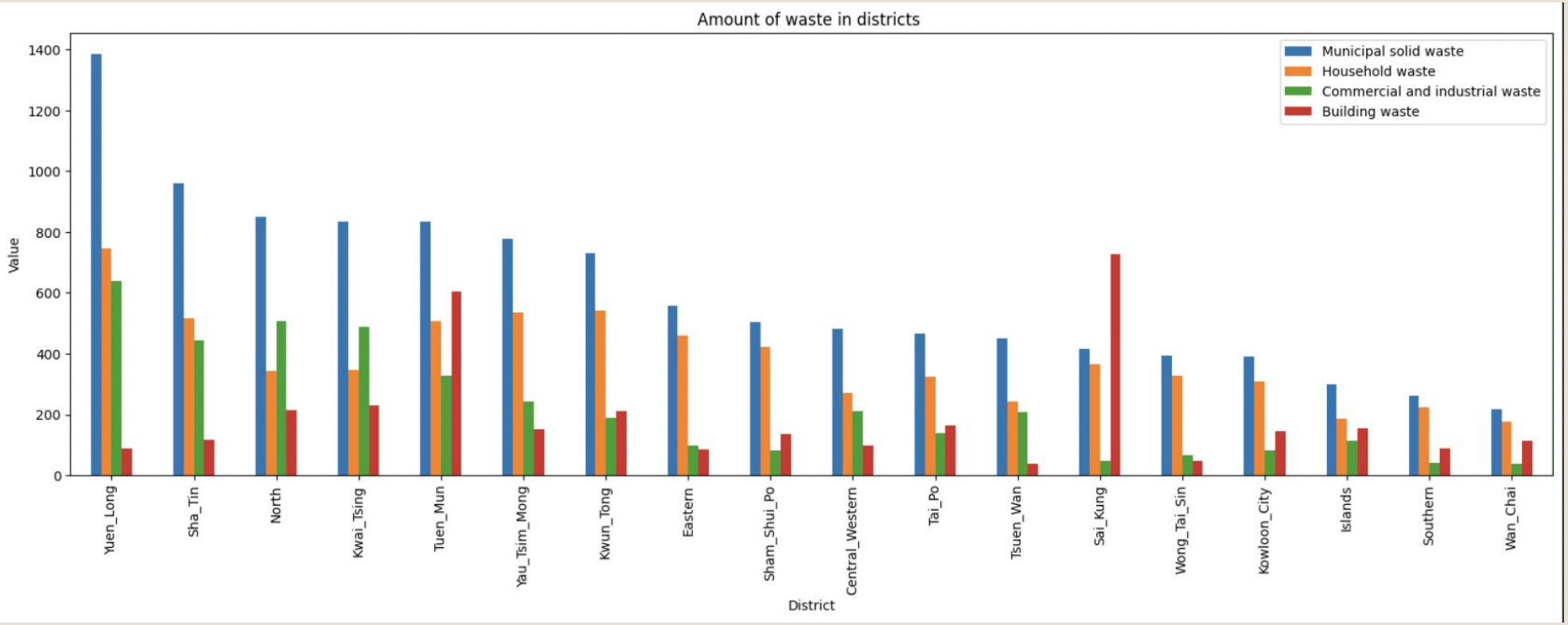
Visualization

ZHENG Shuwan



Analysis:

The bar charts above shows that the distribution of differnt type in of wastes in different distrcits in Hong Kong. The bar charts clearly indicate that municipal **solid waste** is the **primary waste category** in Hong Kong's daily life. Thus, **developing effective strategies for maximizing the recycling of municipal solid waste and enhancing the efficiency of these recycling processes is critical for environmental conservation in Hong Kong**.

Visualization

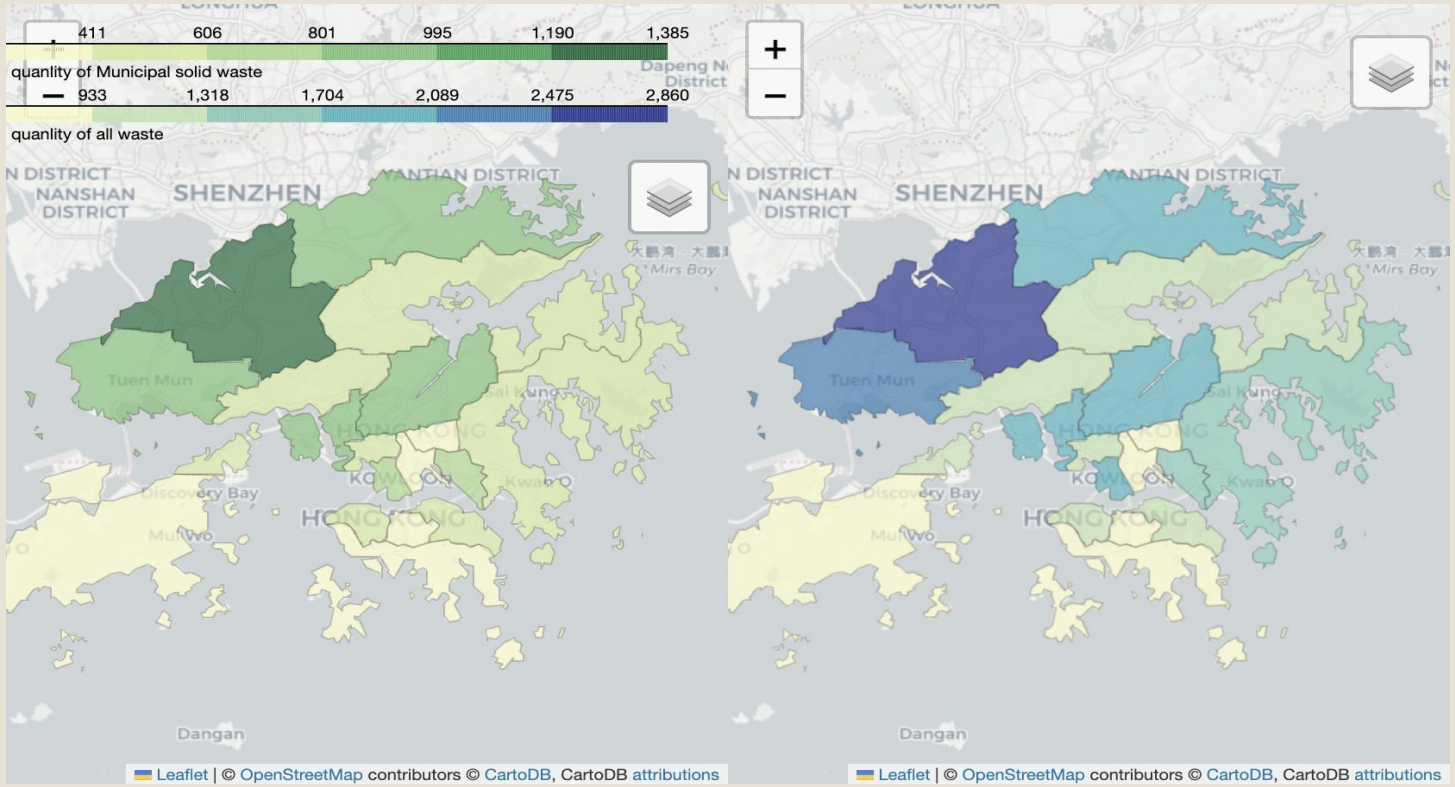
ZHENG Shuwan

Q2: What is the difference between the distribution of Municipal solid waste and all wastes?

In this part, we study the distribution of urban solid waste and total waste in various districts, analyze the differences through different map colors, and improve solutions.

Visualization

ZHENG Shuwan



Analysis:

It is evident from the distribution of both municipal solid waste and all wastes in different regions that only the combined amount of waste in **Sai Kung** and **Yau Tsim Mong** exceeds the amount of municipal solid waste.

In addition to setting up a sufficient number of trash cans, we should **assign more committed employees** to these two regions to handle the leftover waste at designated locations. Reduce the burden of garbage volume.

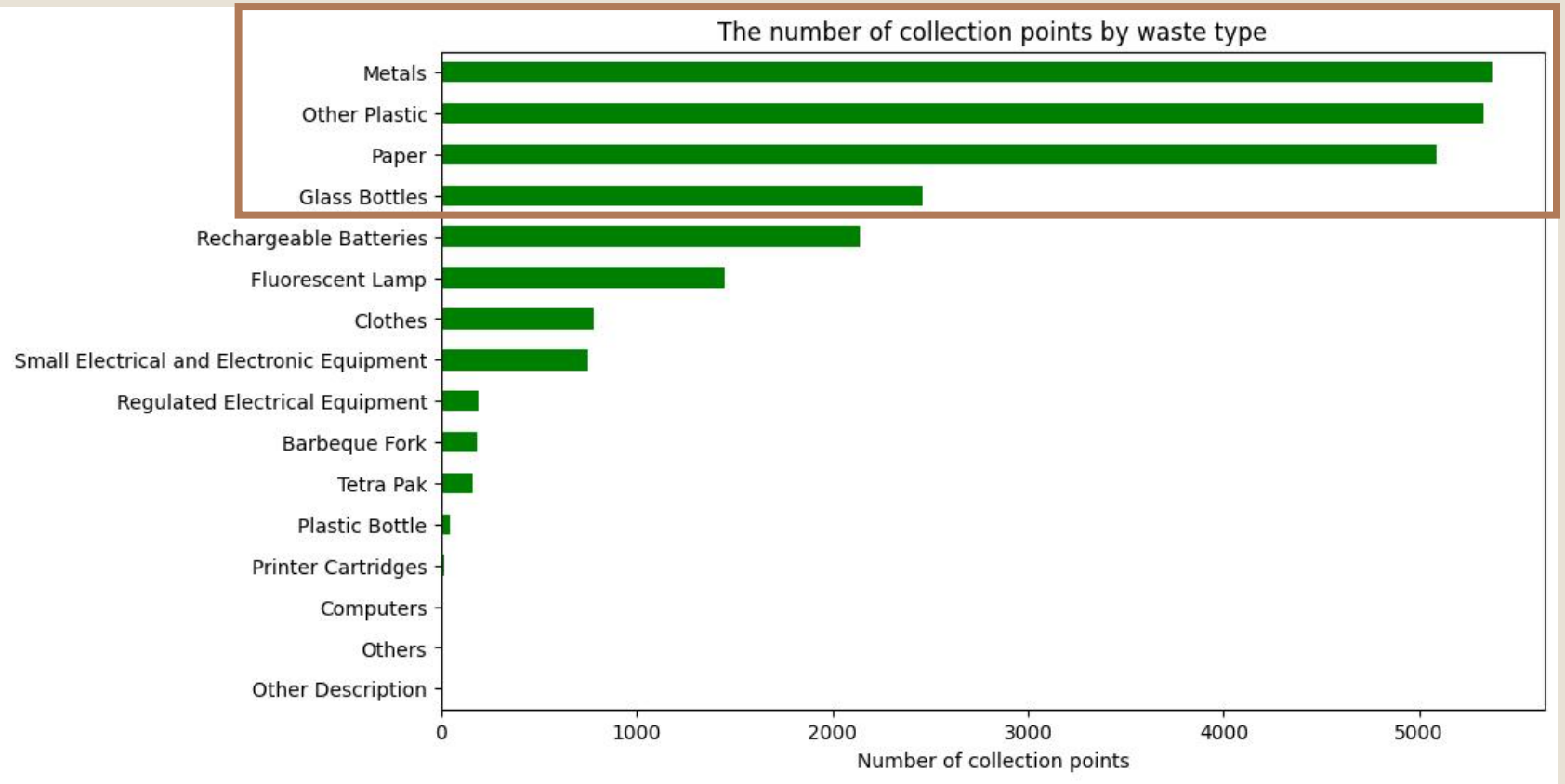
CHENG Yulu

Q3: How about the waste collection points?

In this section, we will study population distribution of Hong Kong and where recycling points are located. We want to figure out if the current arrangement of recycling points makes sense by calculating how many people share each recycling point in different areas.

1. What type of waste is the government recycling?

CHENG Yulu



Analysis:

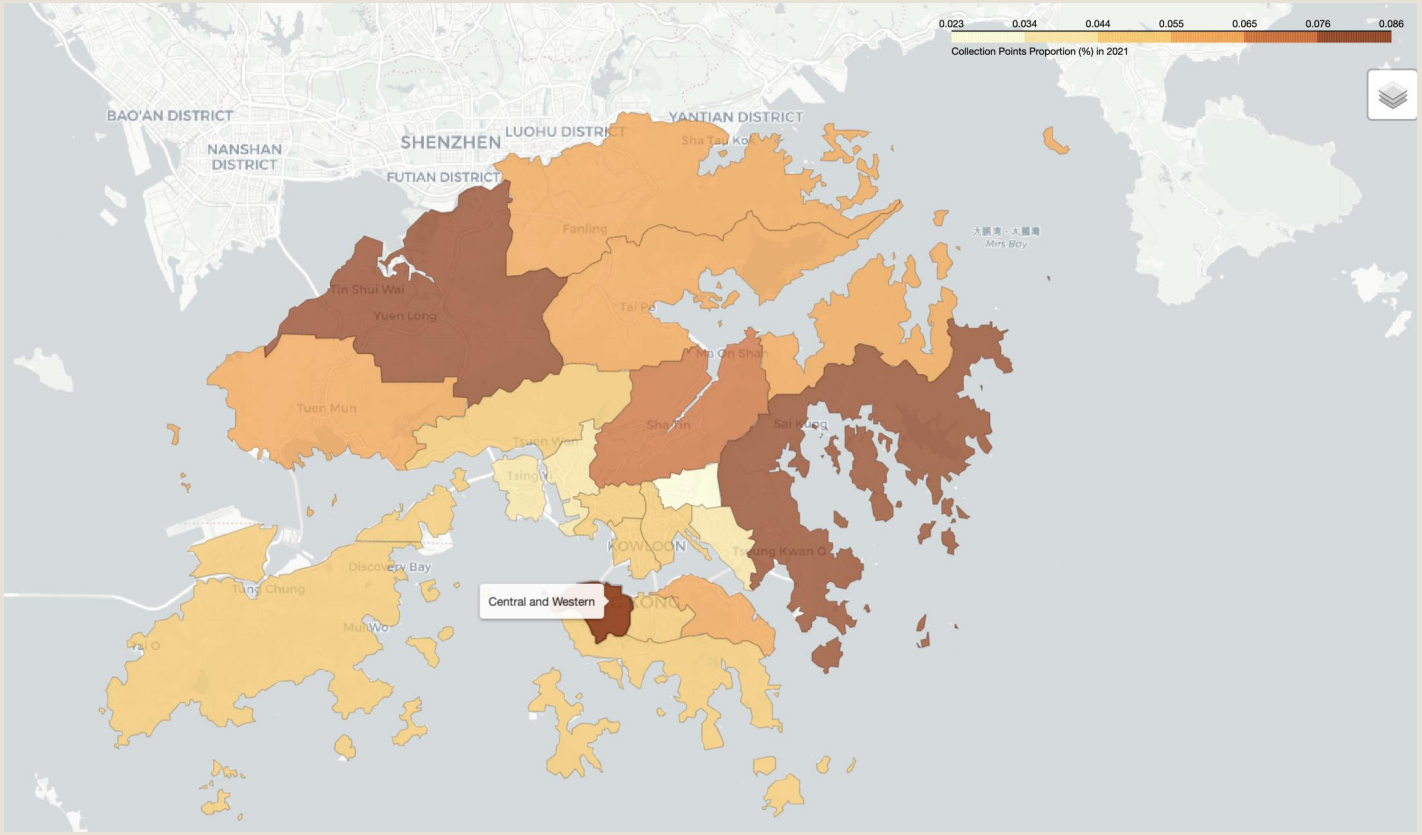
The government has categorized recyclable waste into **16** types. Apart from Other Plastics, the top three materials that are commonly recycled are **Metals**, **Paper**, and **Glass bottles**. In Hong Kong, **over 5000** waste collection points have been established to offer fixed-location collection services for recyclable Metals and Paper.

CHENG Yulu

2. What is the regional distribution of collection points??

```
cpDist.describe()
```

	cpNum	cp_proportion
count	18.00	18.00
mean	362.22	0.06
std	102.67	0.02
min	152.00	0.02
25%	295.75	0.05
50%	351.50	0.05
75%	407.00	0.06
max	563.00	0.09



Analysis:

On average, each district has more than **100** recycling collection points at least.**Wong Tai Sin** has the **lowest** number of just **152** collection points. Interestingly, the **Central and Western** district has the **highest** number of recycling points. I**t appears that the government tends to prioritize establishing additional collection points in economic and political hubs to ensure the cleanliness of the city center.**

3. How many people share a collection point in each district?

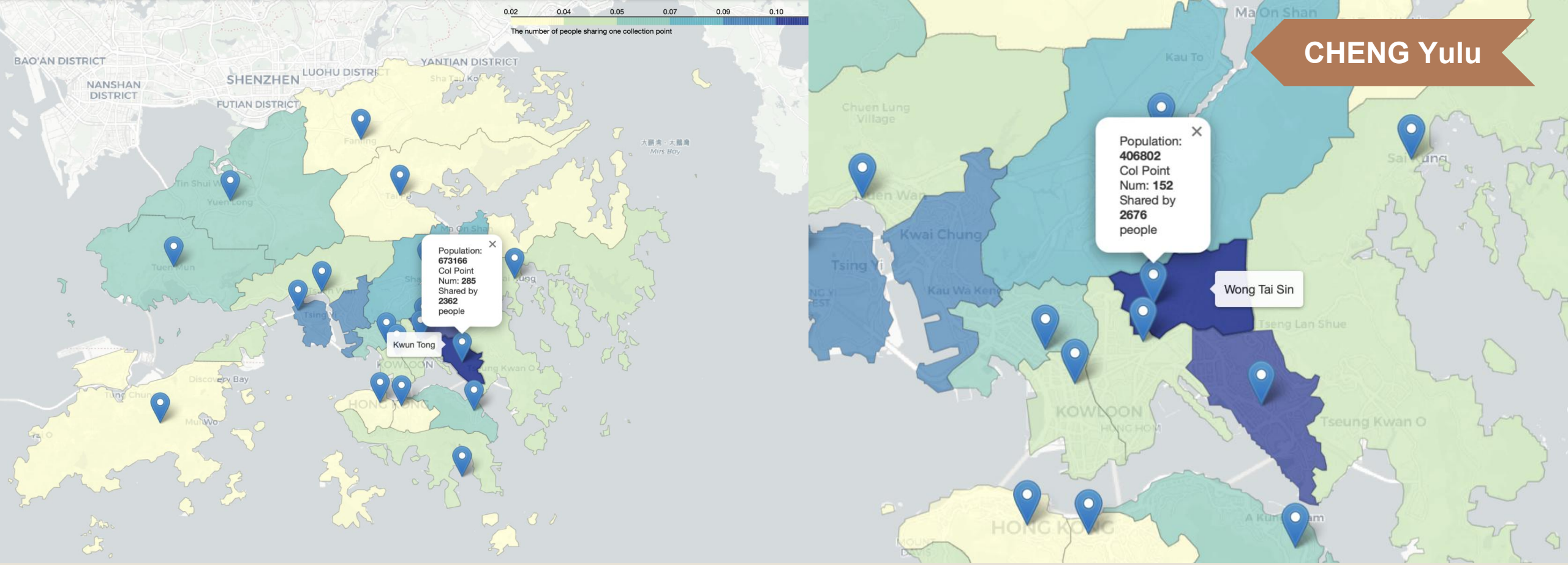
CHENG Yulu

mergedData

	District	cpNum	cp_proportion	Population2021	pop_proportion	popNum_per_cp	proportion
0	Central and Western	563	0.09	235953	0.03	419	0.02
1	Eastern	409	0.06	529603	0.07	1295	0.06
2	Islands	294	0.05	185282	0.02	630	0.03
3	Kowloon City	356	0.05	410634	0.06	1153	0.05
4	Kwai Tsing	246	0.04	495798	0.07	2015	0.09
5	Kwun Tong	285	0.04	673166	0.09	2362	0.11
6	North	399	0.06	309631	0.04	776	0.04
7	Sai Kung	514	0.08	489037	0.07	951	0.04
8	Sha Tin	428	0.07	692806	0.09	1619	0.07
9	Sham Shui Po	324	0.05	431090	0.06	1331	0.06
10	Southern	312	0.05	263278	0.04	844	0.04
11	Tai Po	401	0.06	316470	0.04	789	0.04
12	Tsuen Wan	301	0.05	320094	0.04	1063	0.05
13	Tuen Mun	375	0.06	506879	0.07	1352	0.06
14	Wan Chai	347	0.05	166695	0.02	480	0.02
15	Wong Tai Sin	152	0.02	406802	0.05	2676	0.12
16	Yau Tsim Mong	293	0.04	310647	0.04	1060	0.05
17	Yuen Long	521	0.08	668080	0.09	1282	0.06

Highest abundance

Top 3 shortage



Analysis:

When it comes to recycling collection points per person, **Wong Tai Sin**, **Kwun Tong**, and **Kwai Tsing** are facing the biggest shortage. On average, more than **2000** people have to share a single recycling collection point in these districts. In contrast, the **Central and Western** area has the **highest abundance** of recycling collection points, with only **419** people sharing one point. That's about **one-sixth** of the ratio in Wong Tai Sin.

For future urban planning, we suggest that the government should prioritize setting up more recycling points in these districts to address the shortage effectively.

RART 04

Research Findings & Suggestions

LIN Yimeng

Finding

LIN Yimeng

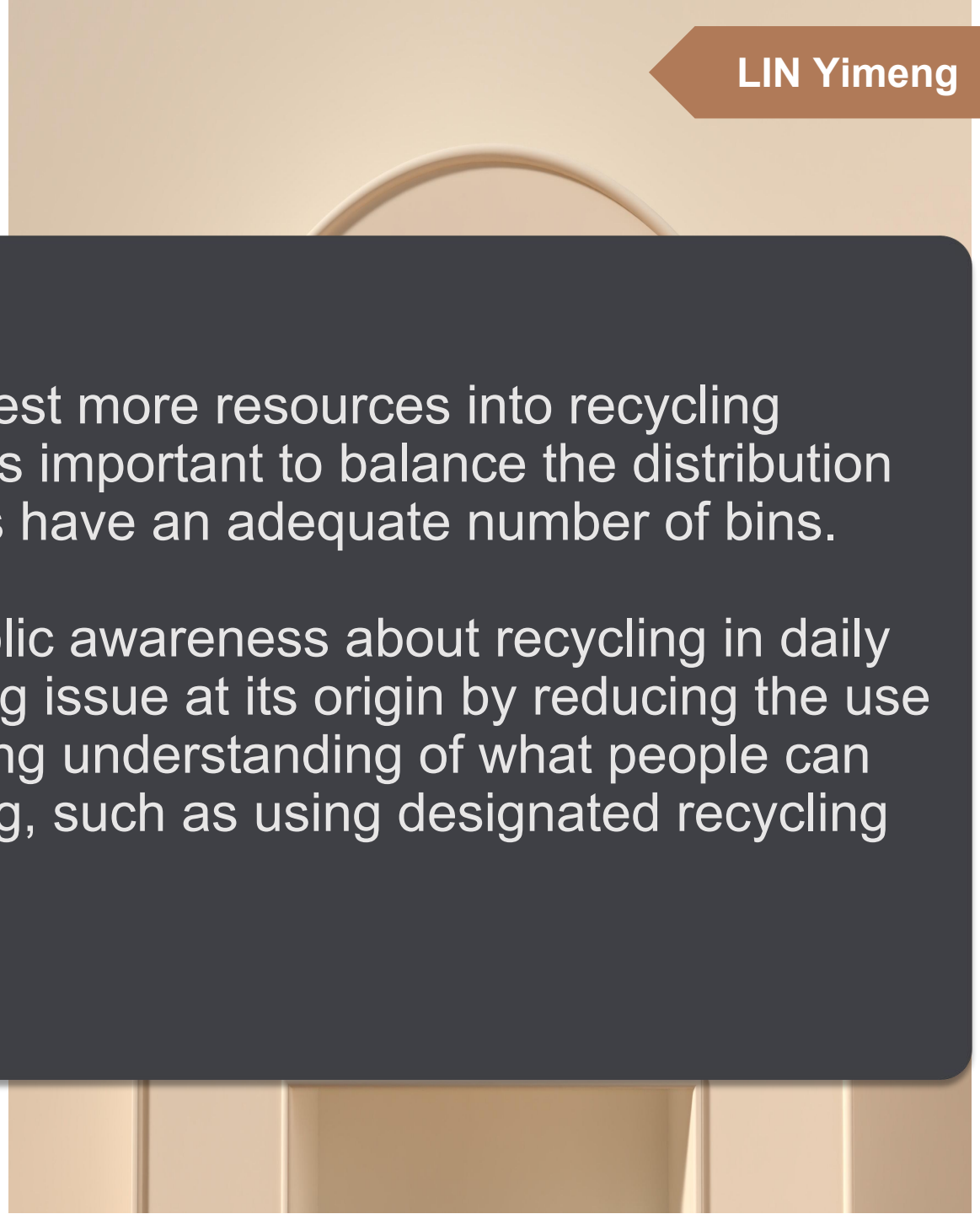
From the trend observed between 2009 and 2021, **a decline is evident in both the generation and recovery of municipal solid waste (MSW)**. **The recovery-to-generation ratio of MSW also displayed a decreasing trend, reaching just 31% by 2021.** When this ratio is compared with countries like Japan or some European nations, known for their advanced waste management systems and recycling ratios higher than 50%, it's clear that Hong Kong has substantial room for improvement.

Examining the distribution of Municipal Solid Waste and all wastes on a map, we find that the **combined amount of waste in Sai Kung and Yau Tsim Mong exceeds the quantity of municipal solid waste.** This suggests a need for a more balanced distribution of resources to enhance recycling or cleaning efforts in a more scientific and effective manner.

Looking at the map of **recycling points**, it's apparent that the Central Western district has the highest number of these points. This implies a need for a more balanced placement of recycling points across all districts. Furthermore, when considering the number of **recycling collection points per person, Wong Tai Sin, Kwun Tong, and Kwai Tsing districts face the most significant shortages**. This indicates that Hong Kong's placement of recycling points may not be optimally arranged.

Suggestion

LIN Yimeng



The Hong Kong government should invest more resources into recycling infrastructure, such as recycling bins. It's important to balance the distribution of these facilities and ensure all districts have an adequate number of bins.

There's a pressing need to improve public awareness about recycling in daily life. This means addressing the recycling issue at its origin by reducing the use of non-recyclable products and promoting understanding of what people can do in their daily lives to support recycling, such as using designated recycling points for recyclable materials.

Workload Distribution

LIN Yimeng

	Questions & objectives	Related works & datasets	Data processing & visualization	Proposal	Slides
Lin Yimeng	✅	✅	✅✅	✅	
Zheng Shuwan			✅	✅	
Cheng Yulu	✅		✅	✅	
Pan Yier		✅✅		✅	✅

Workload Distribution

	Questions & objectives	Related works & datasets	Data processing & visualization	Proposal	Slides
Lin Yimeng					
Zheng Shuwan					
Cheng Yulu					
Pan Yier					

Ciao~

2023