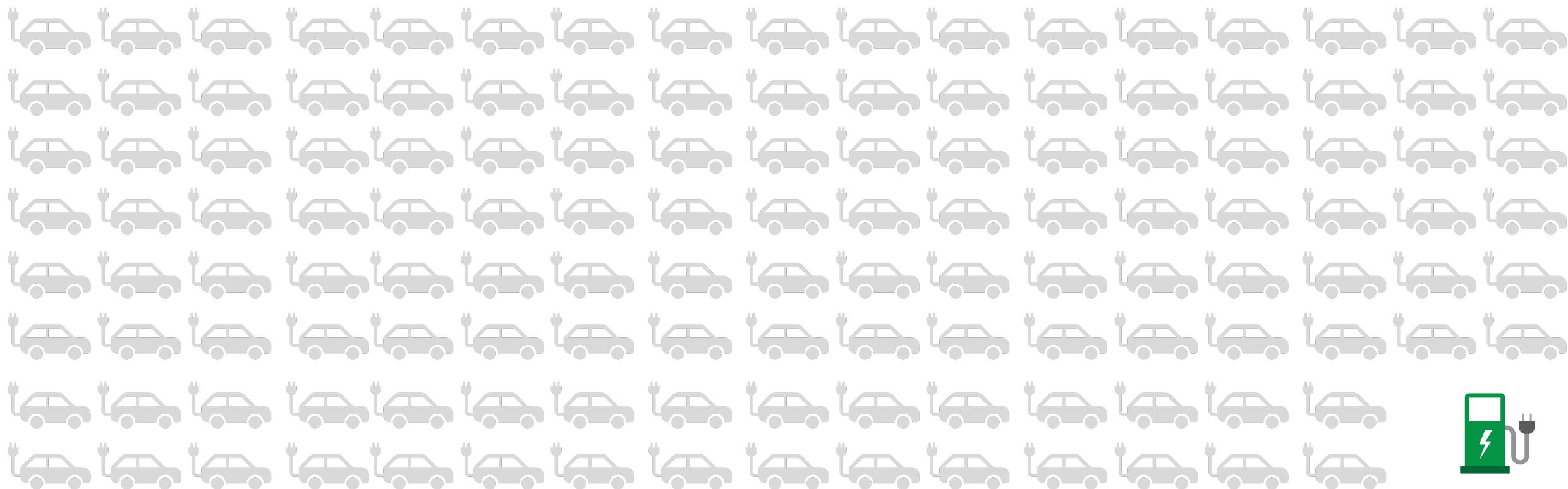


Uncovering of Suitable Locations

FOR EV CHARGING CARPARKS

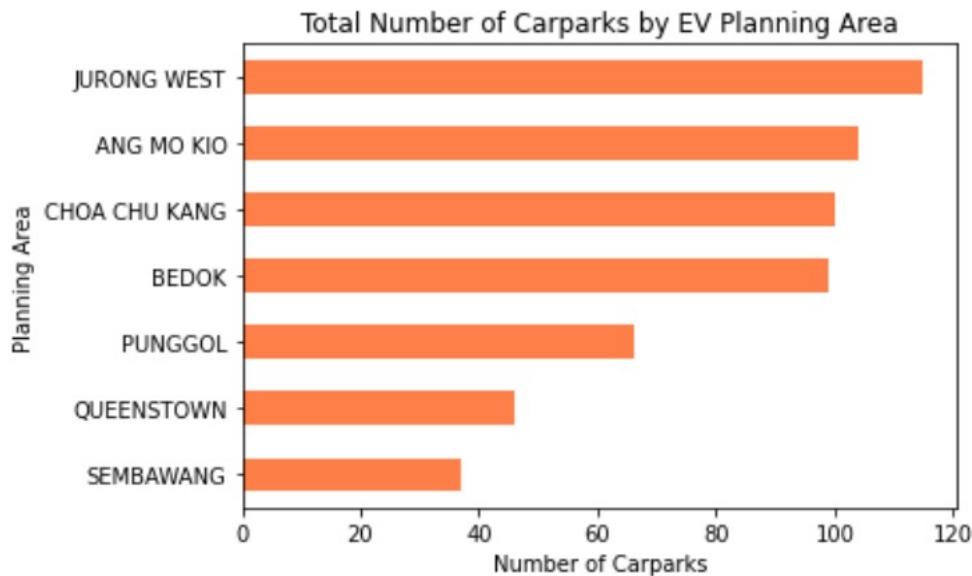


Introduction

- There are challenges in coming up with suitable **Electrical Vehicle (EV) Charging Point locations** in Singapore which is land scarce and high density.
- An **alternative strategy** to charging while EV drivers sleep, could be **charging while EV drivers wait**, by spending their time **meaningfully by engaging in activities in nearby locations** around these EV carparks.
- The **optimal distribution** of EV charging points is important as perceived lack of convenience for potential EV drivers based on a regular routine around where they travel or live, could affect the **perception of EVs as a viable and convenient alternative** to internal combustion engine (ICE) cars.

A Closer Look at the Supply of Existing Carparks

You are
3 times more
likely to see a
carpark in
Jurong West than
Sembawang



Top 3 planning areas within EV towns are:

1. Jurong West
2. Ang Mo Kio
3. Choa Chu Kang

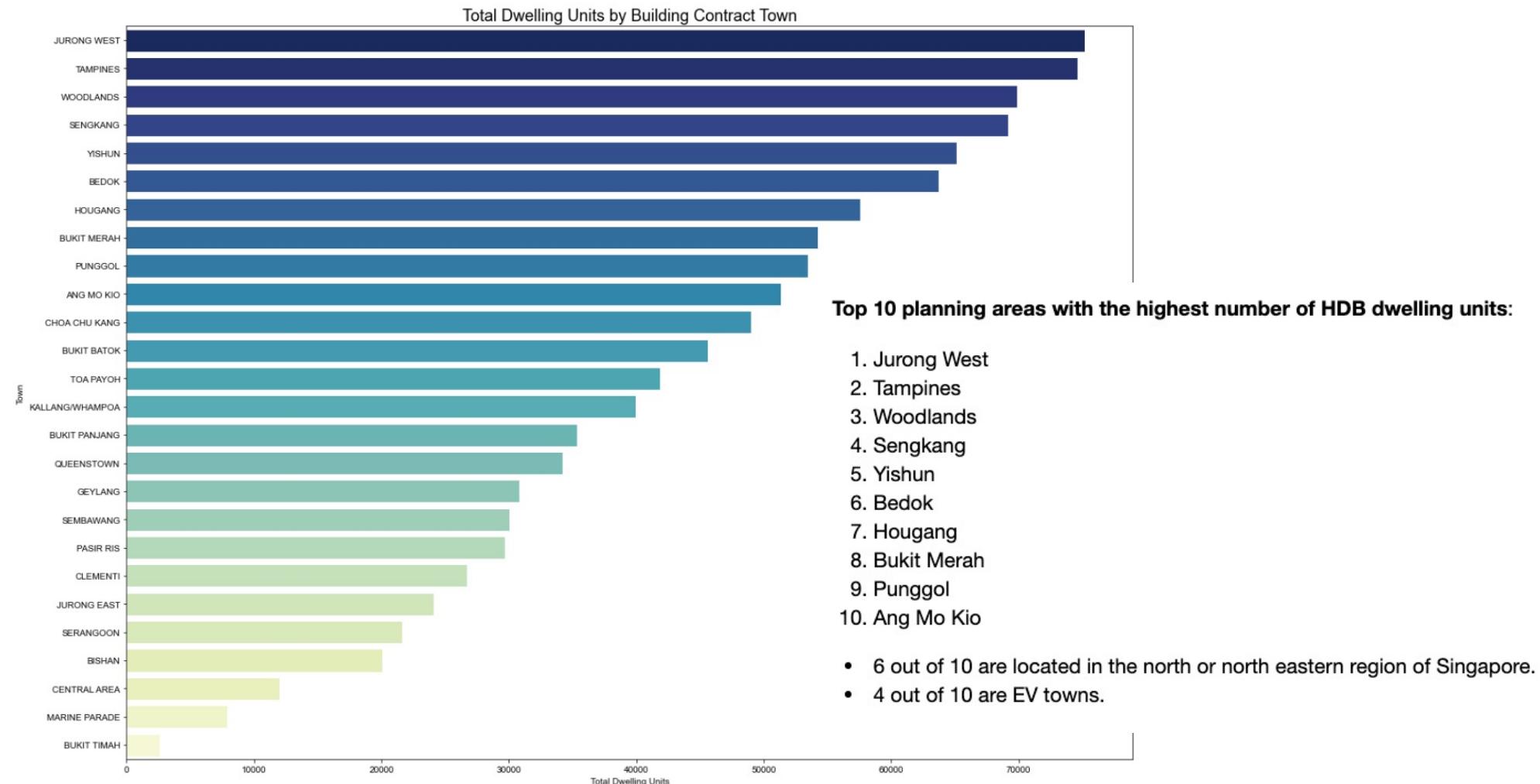
Sembawang has about one third of carparks compared to Jurong West.

Potential Factors Affecting the Demand for EV Carparks

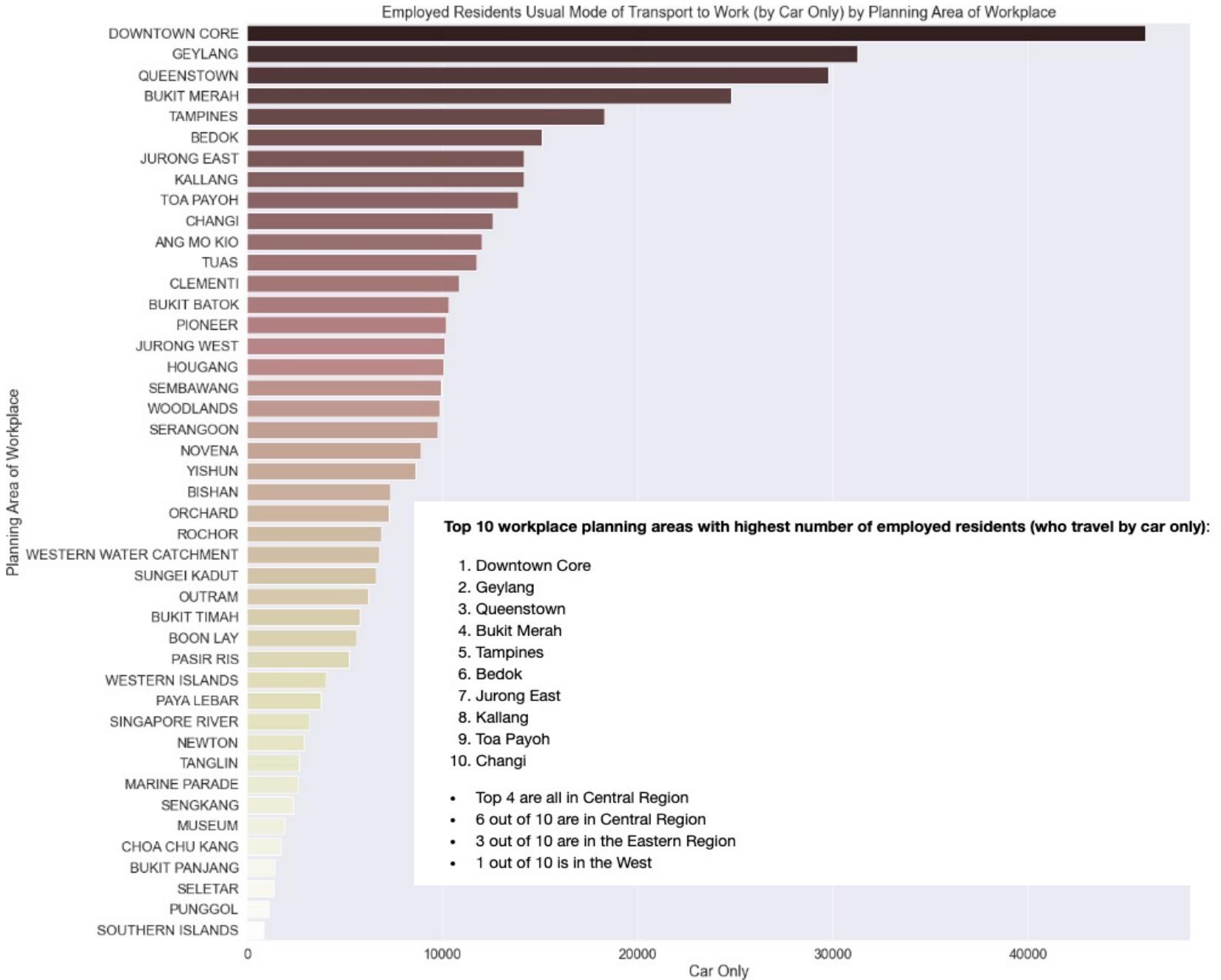
Data Analysis

- To locate the Planning Areas where EV Charging Points are most needed by drivers and potential drivers of EVs, we will be looking at **areas with the most number of HDB dwelling units** as well as employed residents who **travel to work by car only**, taking into account both their workplace and residential areas.
- Planning Areas will also be analyzed by looking at **demographics such as age range** which could inform on the likelihood of these areas having current and potential EV car drivers.

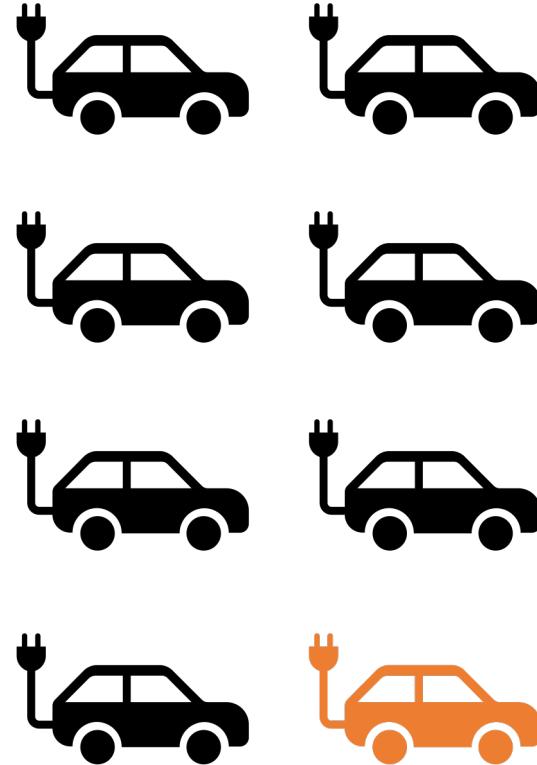
Among Top 10 Towns with highest number of HDB units , only 4 will be EV Towns

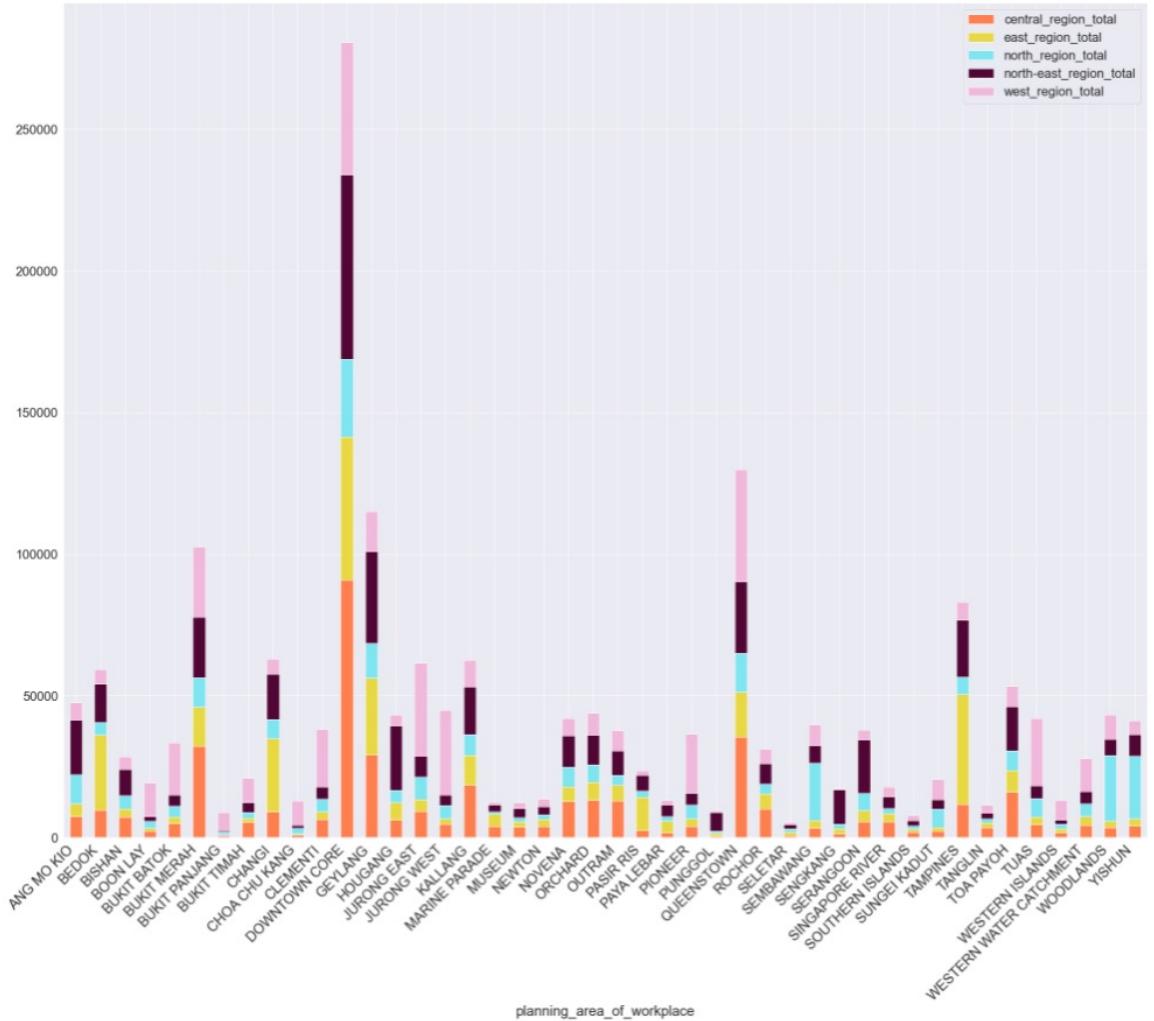


Most People Who Travel by Car to Work, also Work in the Central Region ...



**But only 1 in 8 EV
Towns is in the
Central Region**



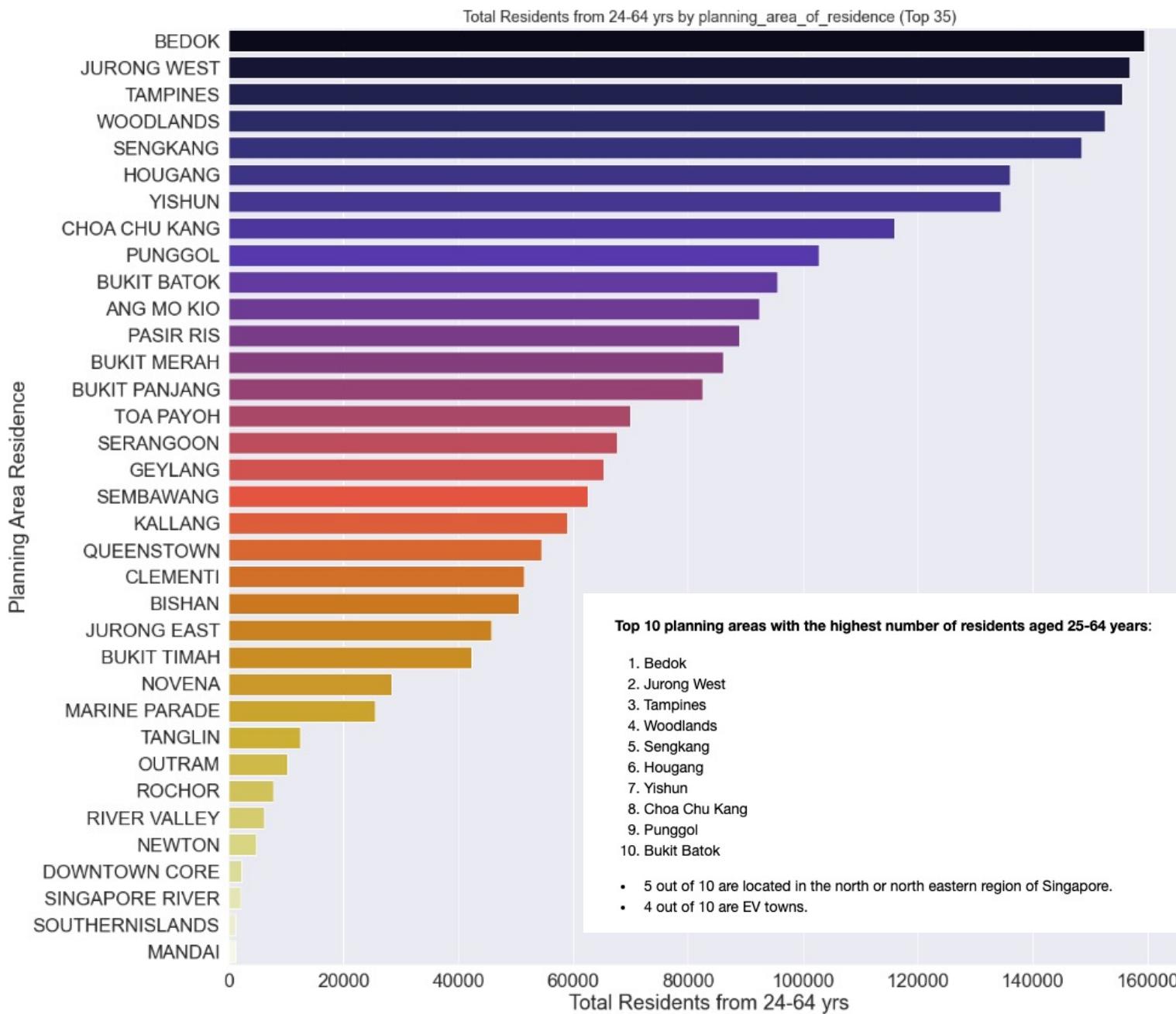


Employed Residents Tend to Work and Stay in Same Region

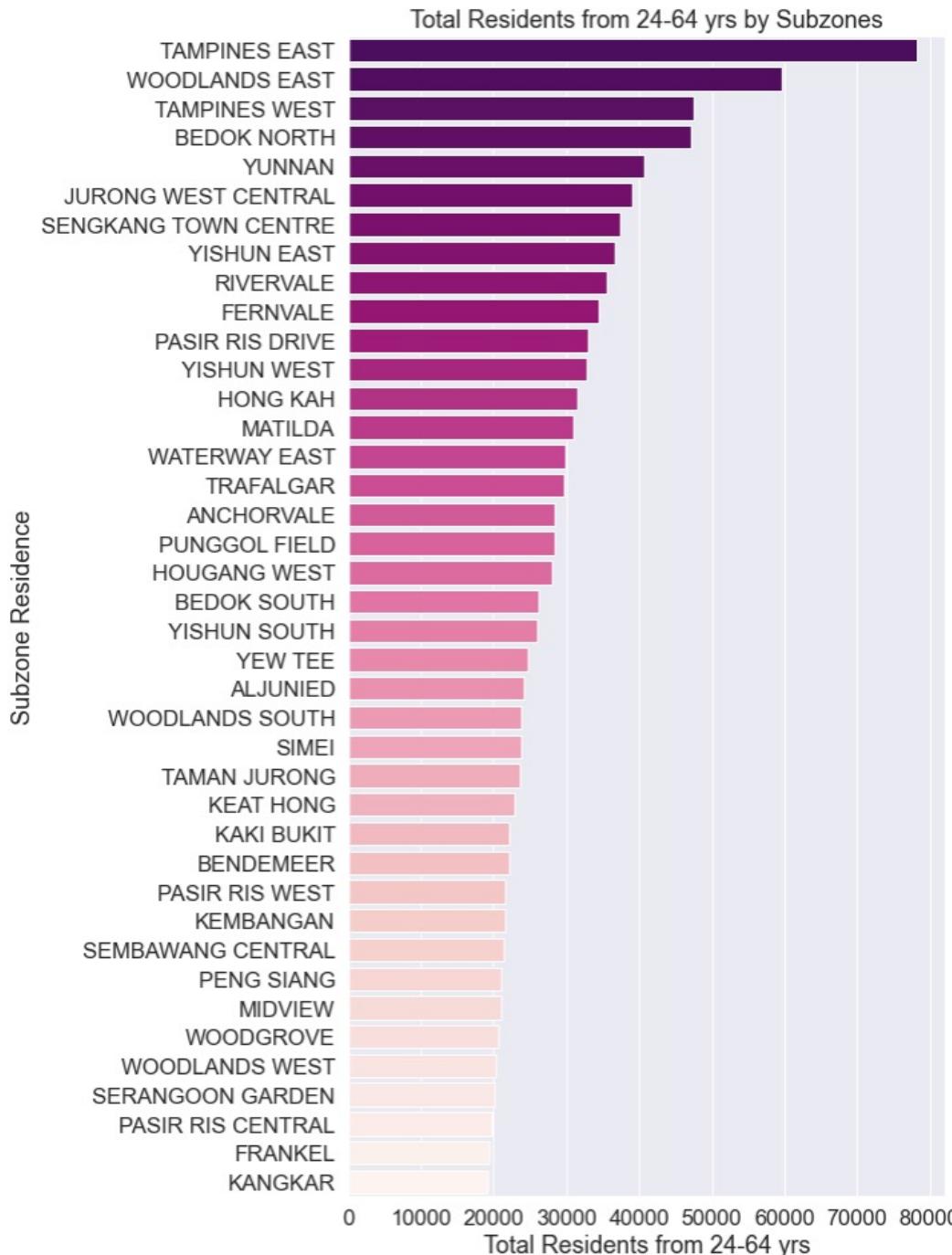
Lower range anxiety?

Top 10 workplace planning areas with highest number of employed residents (who travel by car only):

- The highest number of employed residents who travel by car only stay in the Western Region
- The lowest number of employed residents who travel by car only stay in the North-East Region
- In 24 out of 29 planning areas, a larger proportion of employed residents who work in particular region, also stay in that region.



The Most
Number of
Residents
Can Be
Found in
Bedok,
Jurong West
& Tampines



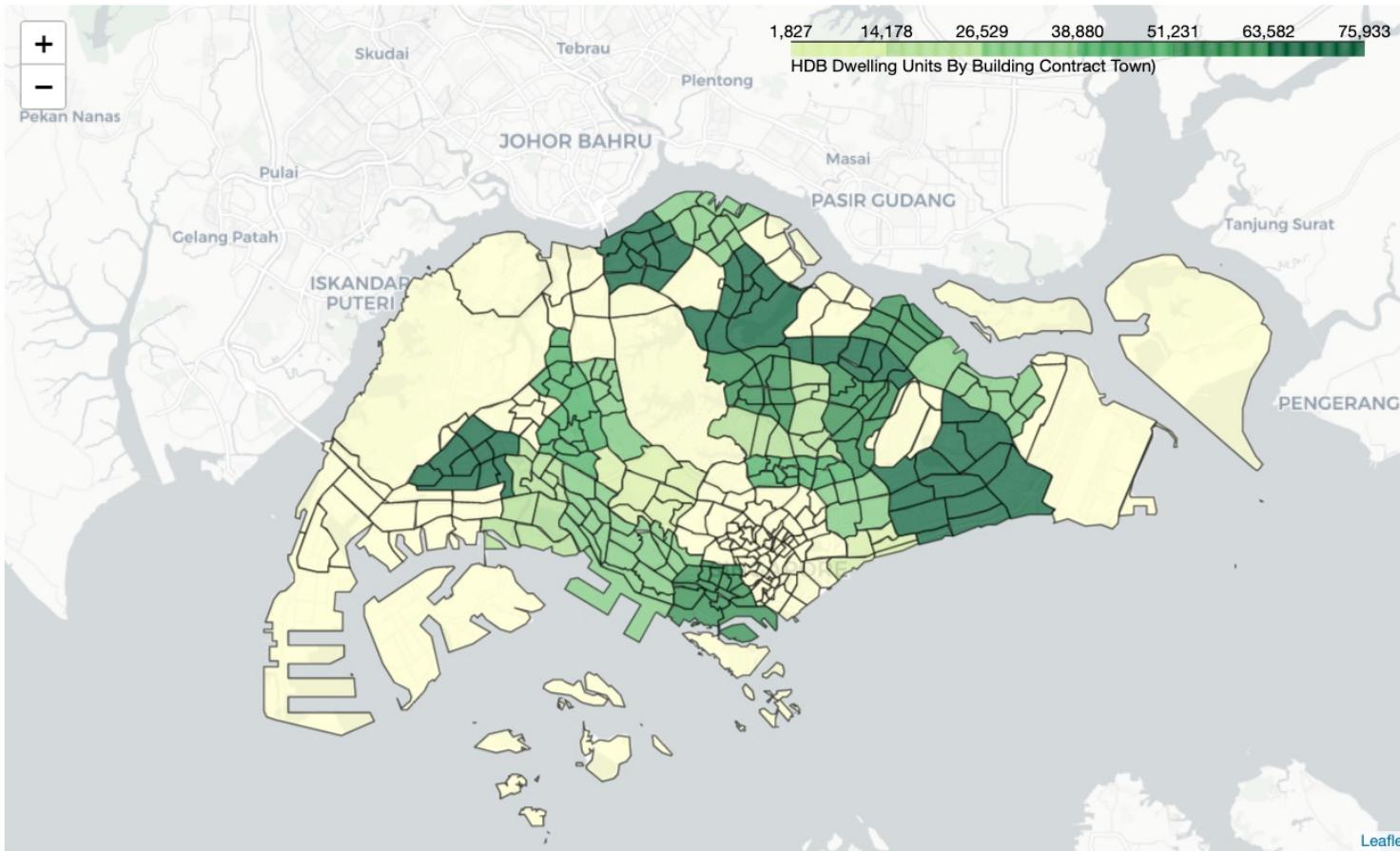
Potential Future EV Towns?

Top 10 subzones with the highest number of residents aged 25-64 years:

1. Tampines East
2. Woodlands East
3. Tampines West
4. Bedok North
5. Yunnan
6. Jurong West Central
7. Sengkang Town Centre
8. Yishun East
9. Rivervale
10. Fernvale

- 5 out of 10 are in North or North-Eastern Region
- 3 out of 10 are in EV Towns (Bedok North, Yunnan and Jurong West Central)

Map of the Total Number of HDB Dwelling Units (By Building Contract Town)

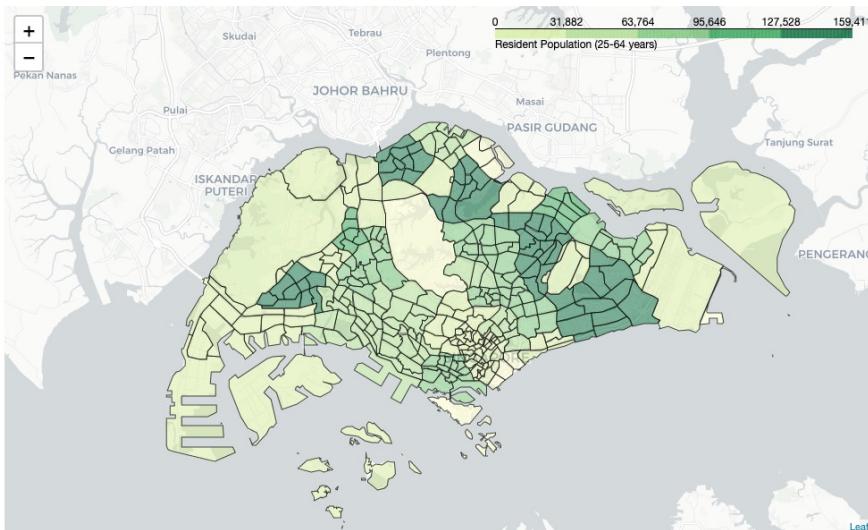


**Highest Number
of Housing Units
in North and
North East**

The highest number of HDB dwelling units are in the North and North-Eastern Region.

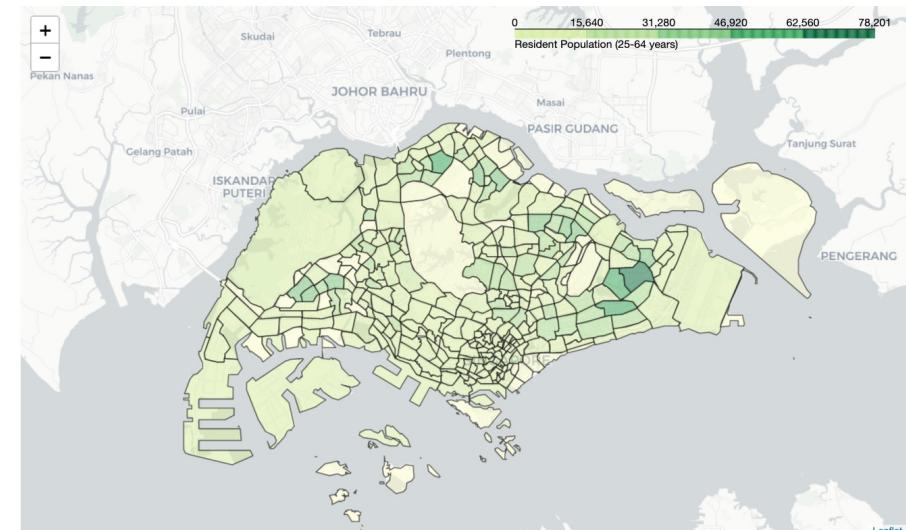
Potential Demand for EV Charging by Highly Populated North and North Eastern Planning Areas?

Map of Residents (25-64 yrs) By Planning Area of Residence



The highest number of residents stay in the North and North eastern.

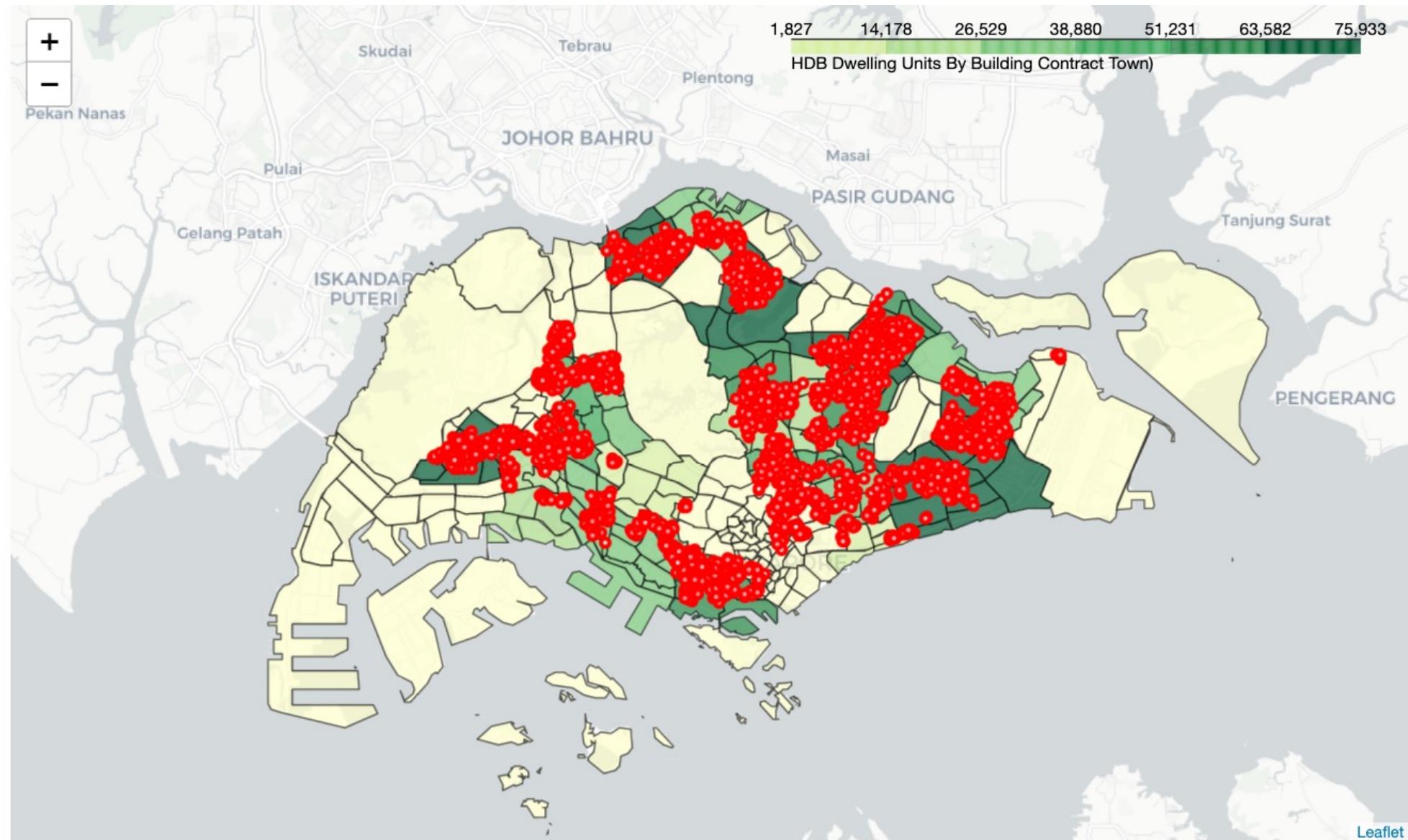
Map of Residents (25-64 yrs) By Planning Area of Subzone



The highest number of residents stay in the Tampines and Woodlands subzones.

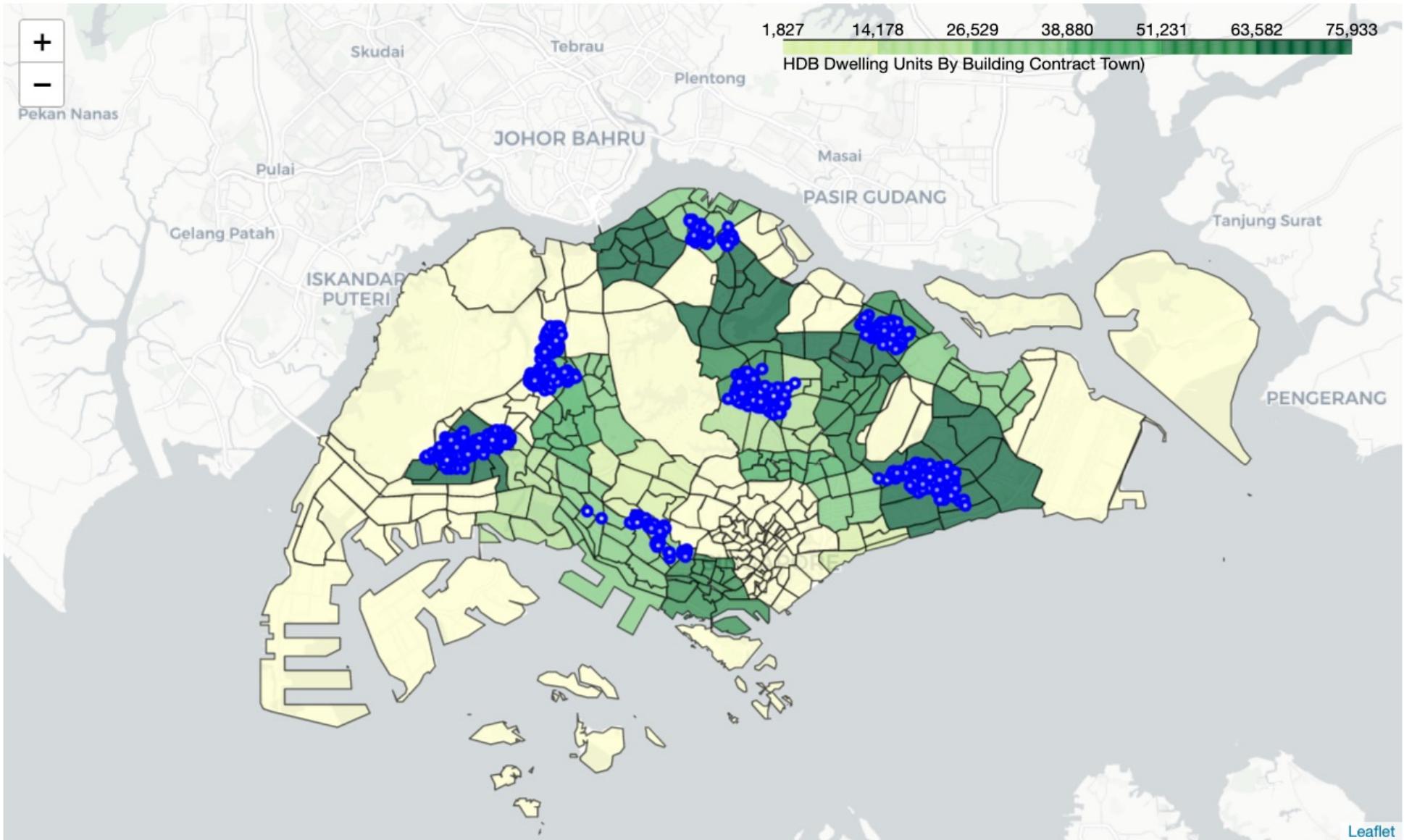
Visualization of Distribution of HDB Carparks across Singapore and in EV Towns

Map of All HDB Carparks and Total Dwelling Units



North-Eastern Region, such as Sengkang and Pongol are more densely populated with HDB carparks as compared to other planning areas.

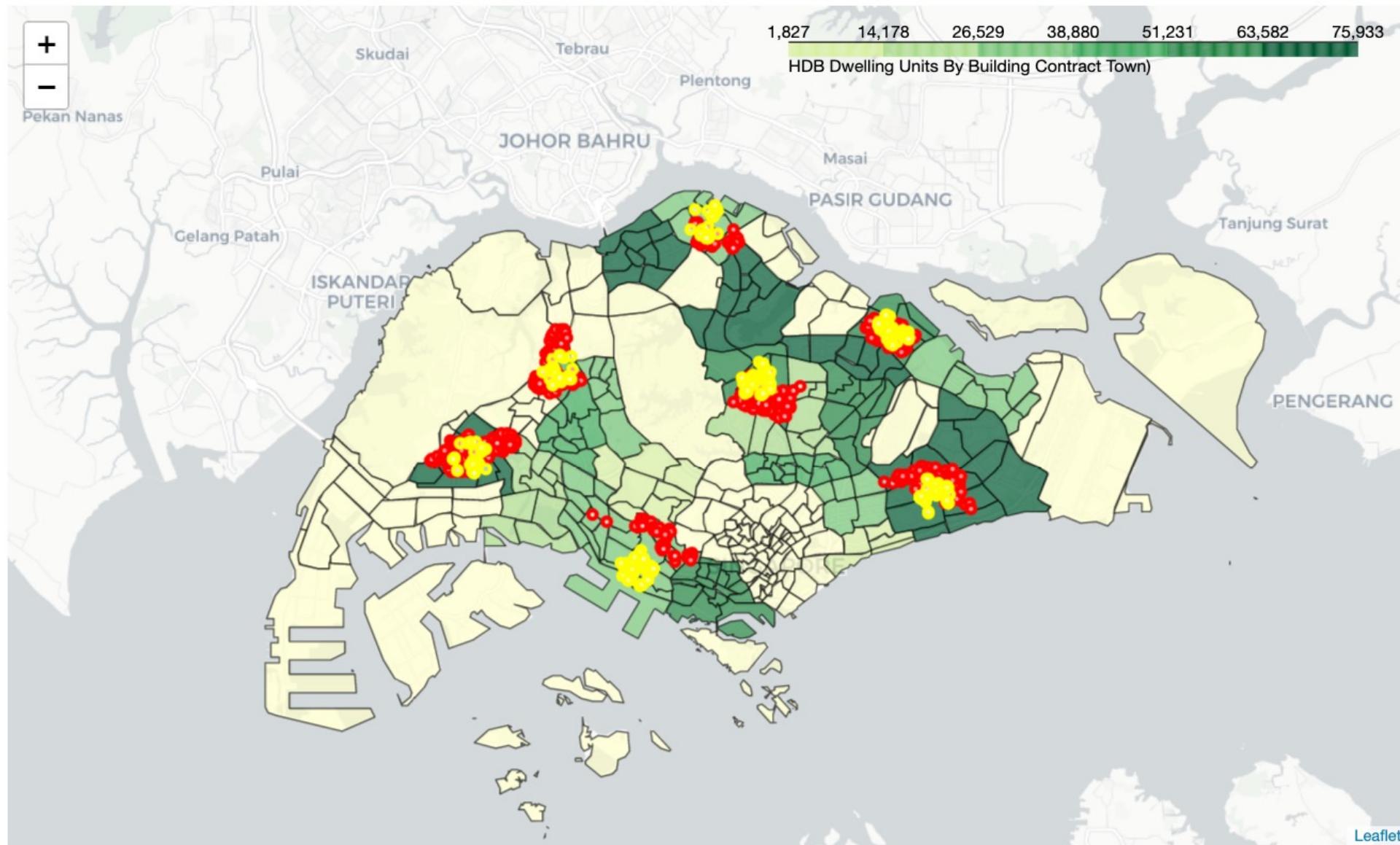
Map of HDB Carparks in the 8 EV Towns



Among the EV towns, Sembawang and Quenstown appear to have the lowest number of carparks.

**Visualization of Distribution of Carparks across
Singapore along with nearby venues scraped
from Foursquare API.**

Map of HDB Carparks in the 8 EV Towns and Nearby Venues



Pongol's nearby venues are well distributed and in close proximity to most of the HDB carparks within the planning area.

Clustering Planning Areas into 5 Clusters Using KMeans and with the Top 10 Venues for Each EV Town

Displaying DataFrame that includes Cluster as well as top 10 Venues for each EV Town Planning Area

	planning_area	area_longitude	area_latitude	cluster_labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue
0	CHOA CHU KANG	103.747191	1.385556	4	Fast Food Restaurant	Coffee Shop	Food Court	Playground	Snack Place	Grocery Store	Café	Gym / Fitness Center
1	SEMBAWANG	103.818828	1.455747	1	Coffee Shop	Fast Food Restaurant	Food Court	Bus Station	Shopping Mall	Buffet	Pharmacy	Harbor / Marina
2	BEDOK	103.928409	1.324047	3	Coffee Shop	Chinese Restaurant	Food Court	Café	Supermarket	Noodle House	Asian Restaurant	Sandwich Place
3	ANG MO KIO	103.842097	1.380092	2	Food Court	Fast Food Restaurant	Bus Station	Pool	Convenience Store	Chinese Restaurant	Park	Electronics Store
4	PUNGOL	103.910043	1.405363	3	Chinese Restaurant	Fast Food Restaurant	Supermarket	Coffee Shop	Food Court	Bubble Tea Shop	Bakery	Clothing Store
5	QUEENSTOWN	103.784559	1.289073	0	Asian Restaurant	Coffee Shop	Café	Food Court	Fast Food Restaurant	Sandwich Place	Korean Restaurant	Gym
6	JURONG WEST	103.704903	1.341612	3	Japanese Restaurant	Asian Restaurant	Fast Food Restaurant	Chinese Restaurant	Dessert Shop	Coffee Shop	Supermarket	Café

Cluster 0: (QUEENSTOWN) This cluster is characterised by Asian Restaurants, Coffee Shops and Cafes. The Gym is also the 8th most common venue.

Cluster 1: (SEMBAWANG) This cluster is characterised by Coffee Shops, Fast Food Restaurants and Food Court. The Bus Station and Shopping Mall are also the 4th and 5th most common venues.

Cluster 2: (ANG MO KIO) This cluster is characterised by Food Court, Fast Food Restaurant and the Bus Station. The Pool and Park are also the 4th and 7th most common venues.

Cluster 3: (BEDOK, PUNGOL, JURONG WEST) This cluster is characterized by Asian (Japanese, Chinese) Restaurants and Supermarkets.

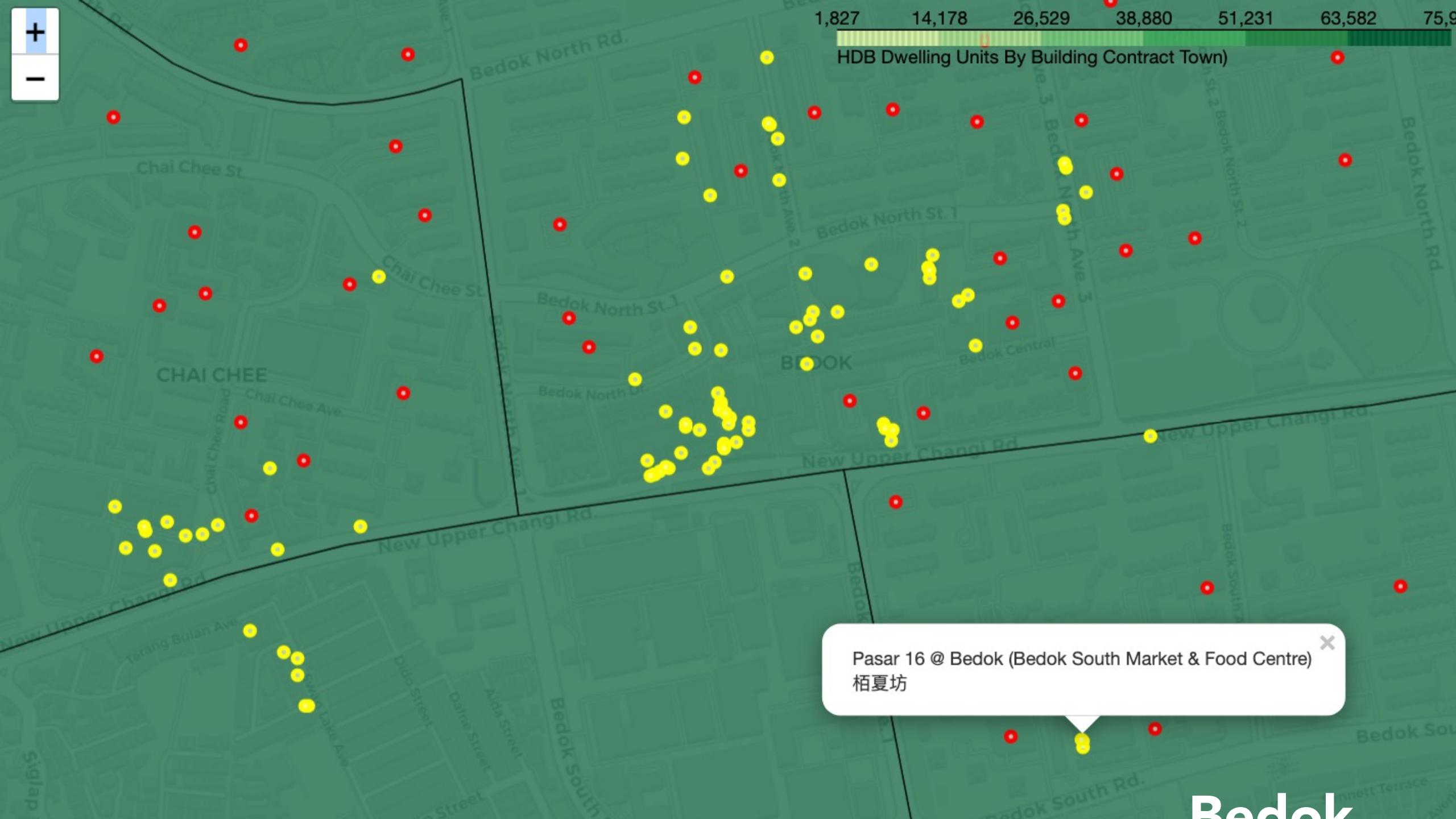
Cluster 4: (CHOA CHU KANG) This cluster is characterised by Fast Food Restaurants, Coffee Shops, Food Courts, Playgrounds and Gym.

Potential Locations for EV carparks



1,827 14,178 26,529 38,880 51,231 63,582 75,9

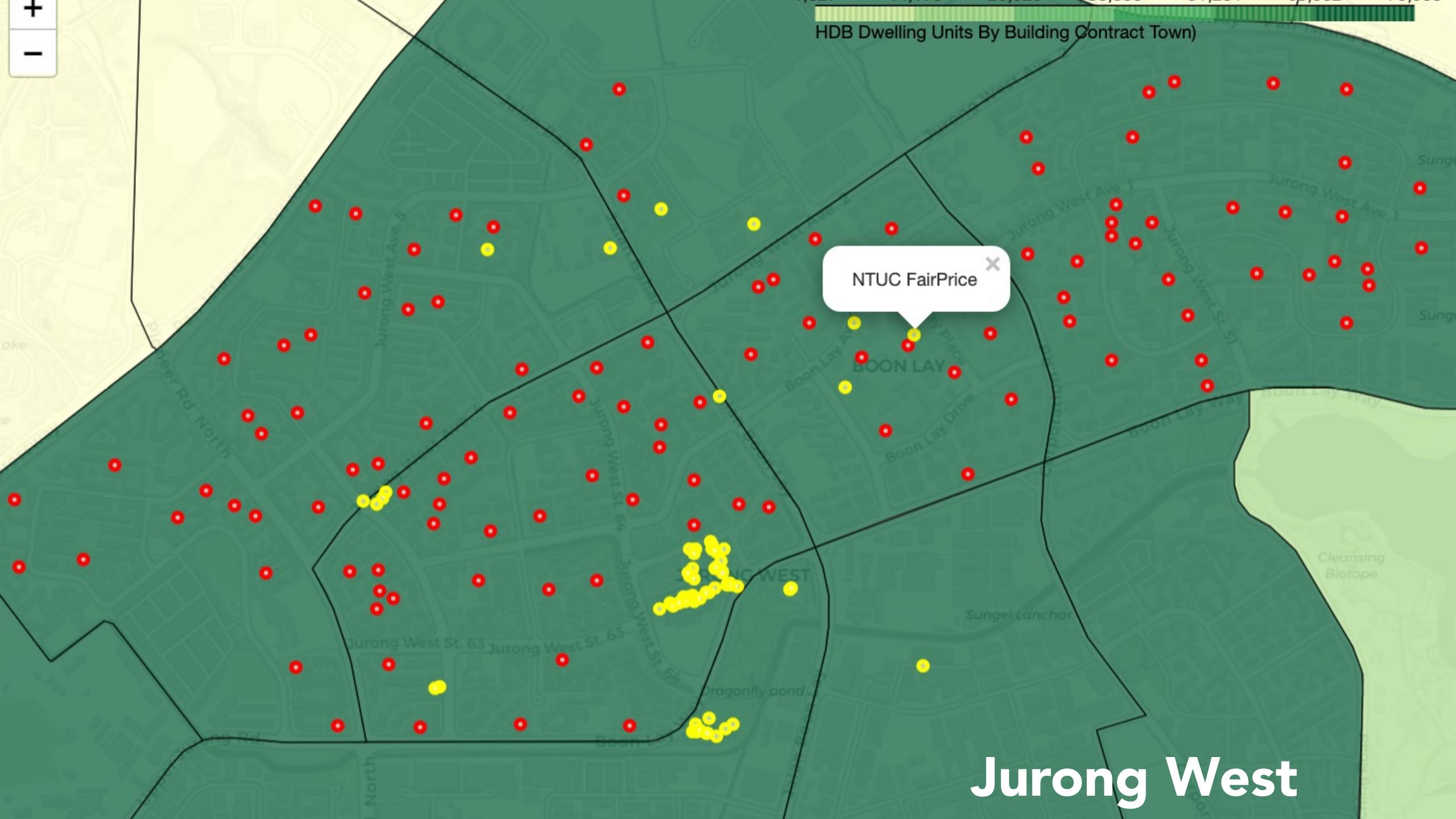
HDB Dwelling Units By Building Contract Town)



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HDB Dwelling Units By Building Contract Town)



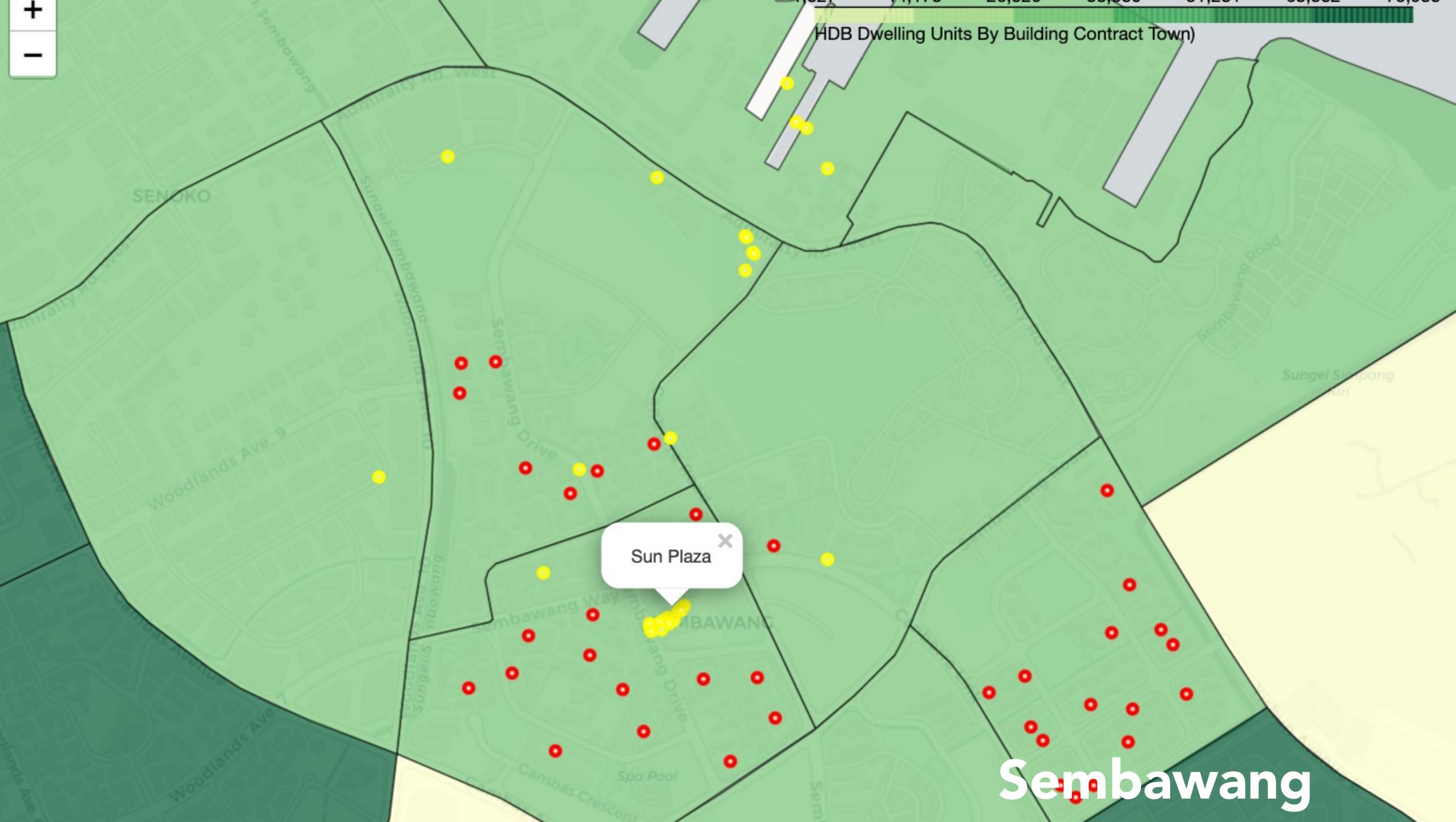
Jurong West

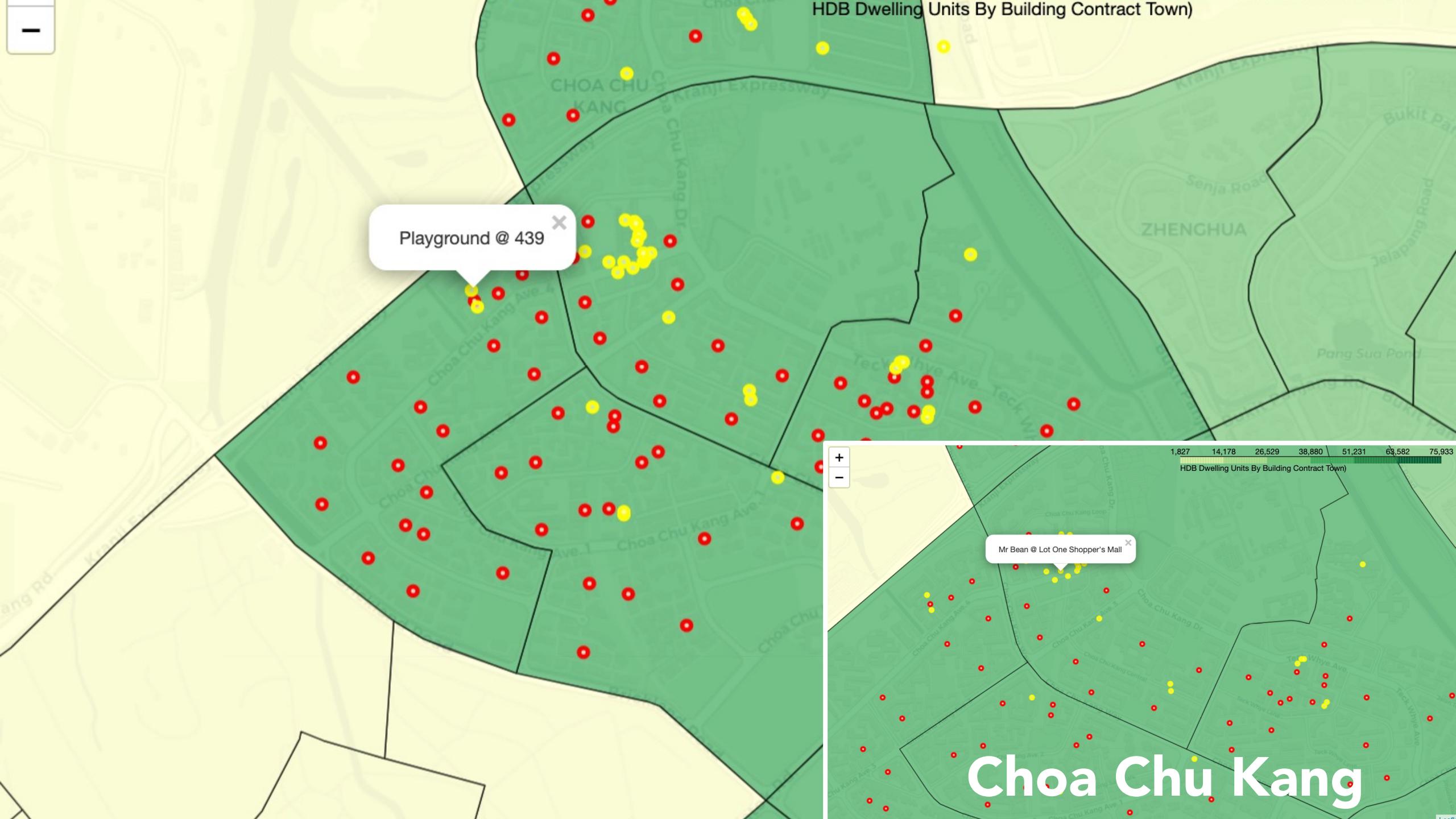
1,827 14,178 26,529 38,880 51,231 63,582 75,933

• HDB Dwelling Units By Building Contract Town

Sheng Siong Supermarket 昇菘超

Punggol



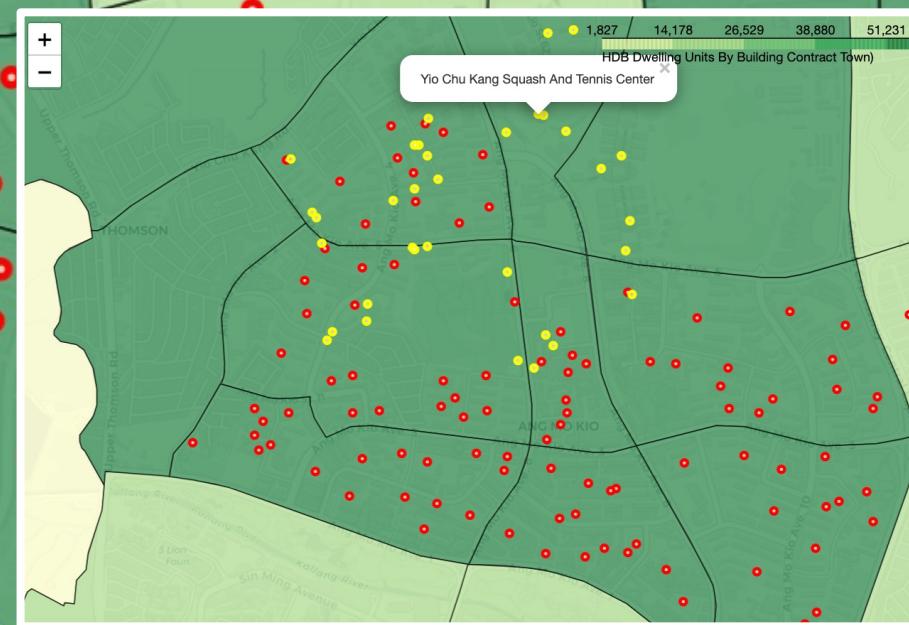
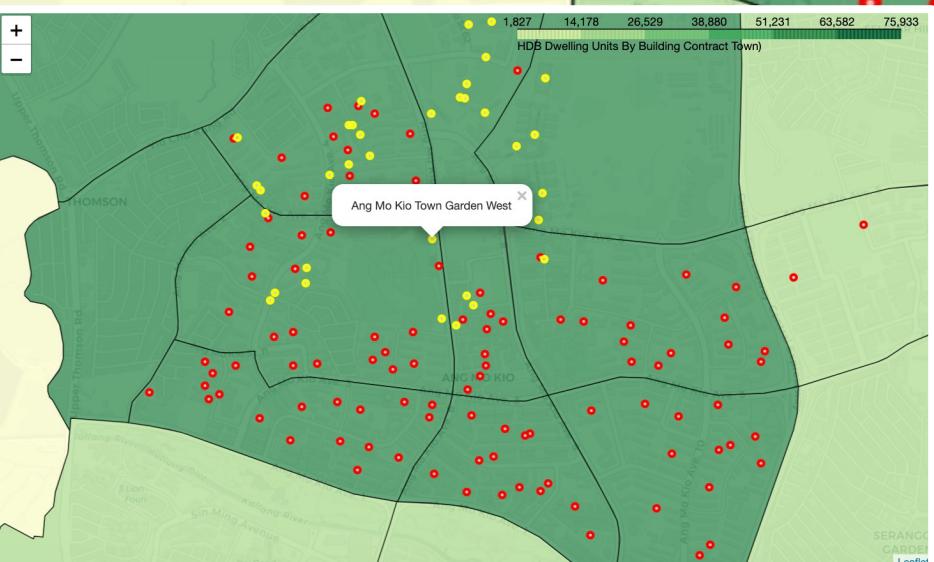


1,827 14,178 26,529 38,880 51,231 63,582 75,938

HDB Dwelling Units By Building Contract Town)



Yio Chu Kang Swimming Complex



Ang Mo Kio

The End