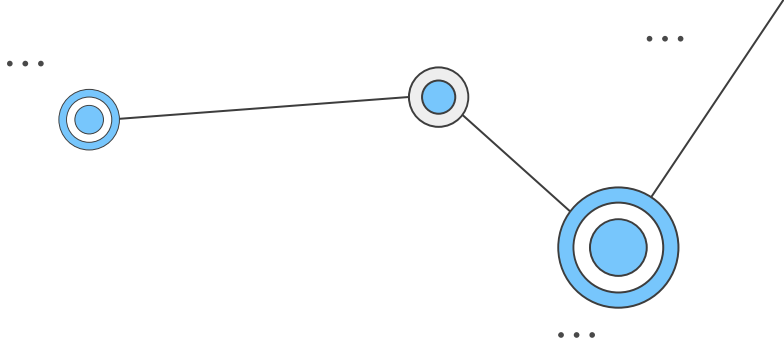


Preschools Resource Planning

Lim Kang Heng

Govtech Case Study - Section 2 (Scenario 1)

Bottom Line Up Front

Key Challenge:

Preschool demand and supply are unevenly distributed across subzones, leading to some preschools being oversubscribed and families have to face long waiting time.

Key Approach:

- Forecast demand from existing residents (population trends) and new households (BTO completions), and match demand against current preschool supply.

Key Findings:

- Prioritse Expansion: Tampines North / West, Punggol–Seletar, Bukit Batok West
- Consider Reallocation: Bedok / Marine Parade, Tampines East

Mismatch of Demand and Supply for Preschools at Various Subzones

20%

of Singapore's preschool capacity was unfilled.

However, familes in high-growth towns (e.g., Punggol) face long waiting times for enrolment
→ Highlighting that pre-school shortage is a distribution problem, not a capacity problem.

This spatial mismatch motivates the need for a data-driven assessment to advise on the redistribution of preschool supply to better align capacity with local demand.

Forecasting of Preschool Demand from Existing Families

Data: 2000 - 2025 Singapore Residents Population, Segregated by Planning Area (PA), Subzone (SZ) and Age (1 - 6 Years Old) (Singstat)

Forecasting Method: Rolling Compound Annual Growth Rate (CAGR)

$$CAGR = \left(\frac{End}{Start}\right)^{1/k} - 1$$

Example (Ang Mo Kio Town Centre SZ)

Year	Actual Population*	CAGR (k = 2) [%]	Predicted Population	Error
2021	230	N.A.	N.A.	
2022	250			
2023	210	- 4		
2024	180	- 15	201	21
2025	150	-15	153	3

* Number of children aged between 1 - 6 years old

Interpretation: Between 2023 & 2021, the population has dropped by 4% each year

CAGR window (k) is selected via backtesting, and the optimal value is assessed to be 5 years for a 5-year prediction horizon. The average forecast error is 110 children.

Forecasting of Preschool Demand from New Families (BTOs)

Data: 2026 - 2030 BTO Completion Data (Github)

Example (Yishun PA, Lower Seletar SZ)

Year	Number of Units Completed	Cumulated # Units Completed	Estimated Demand
2026	0	0	0
2027	0	0	0
2028	699	699	550
2029	2295	2994	2352
2030	0	2994	2353

× 0.97 × 0.9 × 0.9

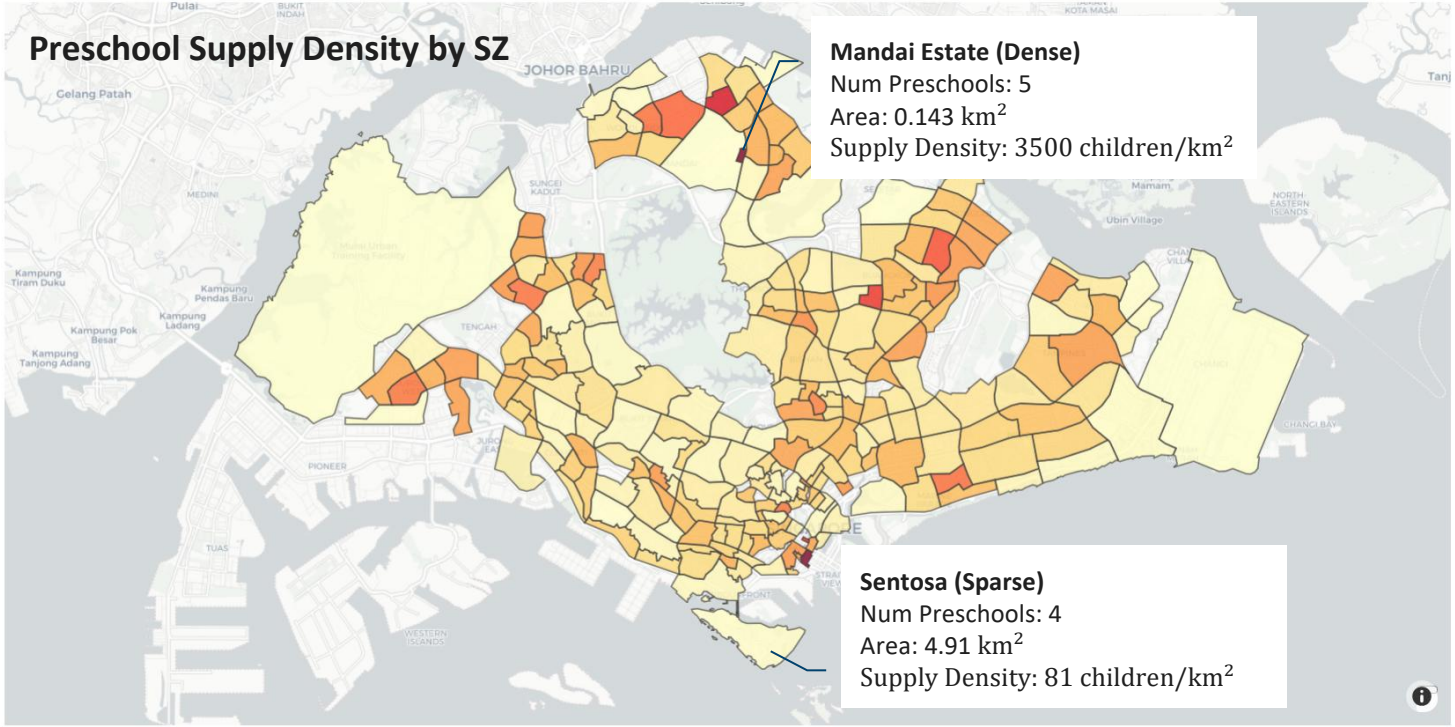
Key Assumptions:

- Total Fertility Rate = 0.97 (Singstat) ⟶ Approx. one 0 - 6 year-old children per household
- Take-up Rate for Pre-school = 0.90 (estimate)
- New Families Factor = 0.90 (estimate) (not all BTO occupants are new families)
- Preschool demand from BTO households is cumulative over the 5-year analysis window, as children remain within the preschool-age cohort (< 6 years) throughout this period

Preschool Capacity Supply

Data: 2024 Preschool Locations (data.gov.sg) and Subzone Boundaries (data.gov.sg)

↳ Post-processed Data: Number of preschools & supply* within each SZ



* This study asssumes that each preschool provides 100 supply / capacity

Expected 2026 - 2030 (5-year) Demand vs. Existing Supply

Assess Preschool Supply Surplus / Shorfall for each SZ. Example (Ang Mo Kio Town Centre SZ)

Year	Demand (From Existing Families)	Demand (From New Familes)	Total Demand	Existing Supply	Supply Surplus
2026	125	0	125	400	275
2027	113	0	113	400	287
2028	99	704	803	400	-402
2029	87	704	791	400	-391
2030	77	704	781	400	-381

* Number of children aged between 1 - 6 years old

Subsequently, extract Top-3 Over/Under-subscribed SZ:

Over-subscribed SZ

PA / SZ	Avg. Supply Shortfall
Tampines / Tampines North	8,900
Bukit Batok / Brickworks	3,900
Punggol / Northshore	3,700

Non-mature** Estates

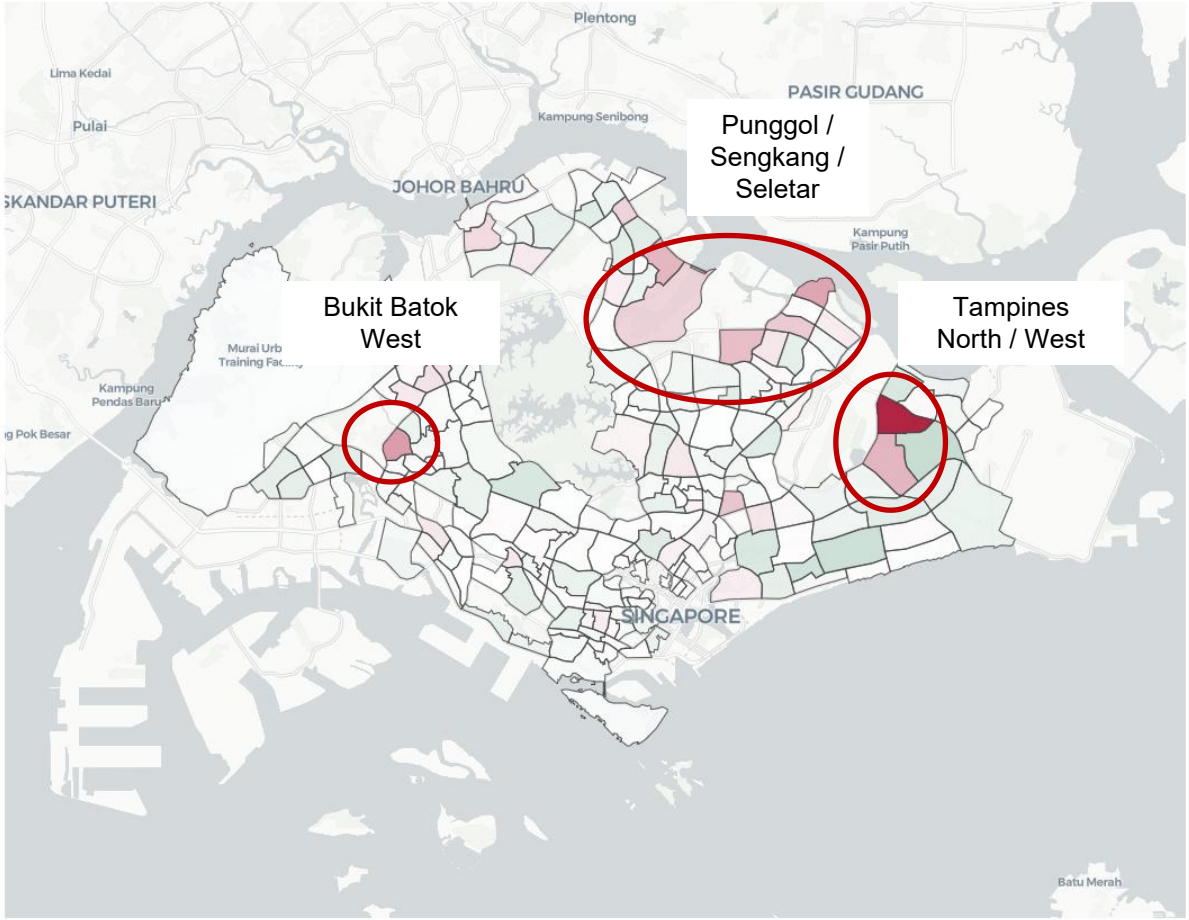
Under-subscribed SZ

PA / SZ	Avg. Supply Surplus
Tampines / Tampines East	2,200
Bedok / Frankel	2,000
Marine Parade / Katong	1,800

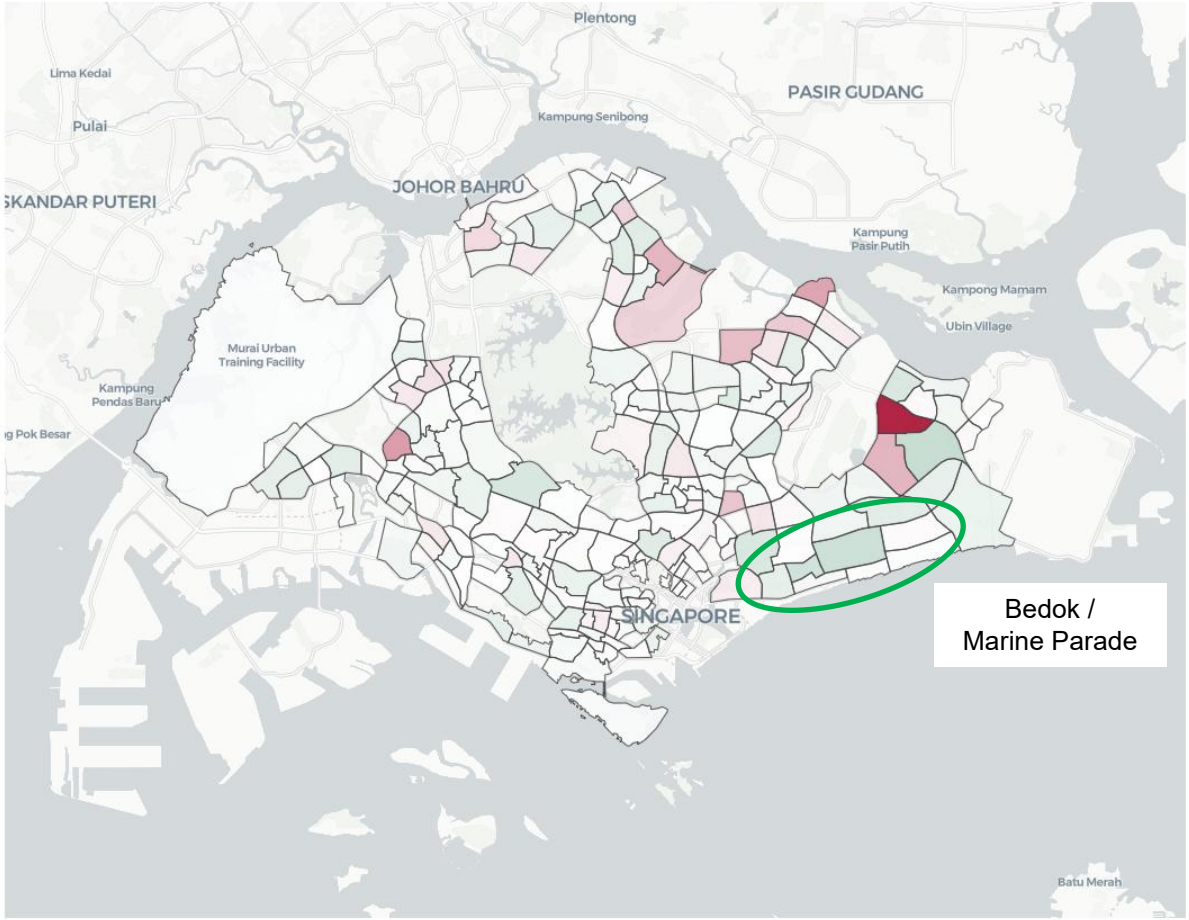
Mature** Estates

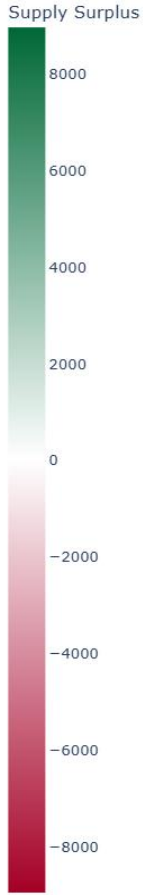
** In this analysis, estate maturity is referenced from the relative median age between SZ as of 2025. SZ below the 33rd percentile of median age are treated as non-mature, otherwise mature

Prioritization of Building Preschools (2026 - 2030)



Reallocation of Existing Preschools (2026 - 2030)





Reallocation

Prioritization

Software Development Architecture

Data Layer

- Population Statistics (DOS)
- BTO Project Information (HDB)
- Preschool Location & Capacity (ECDA)
- Subzone Boundaries (URA)
- Model Parameters & CONFIG

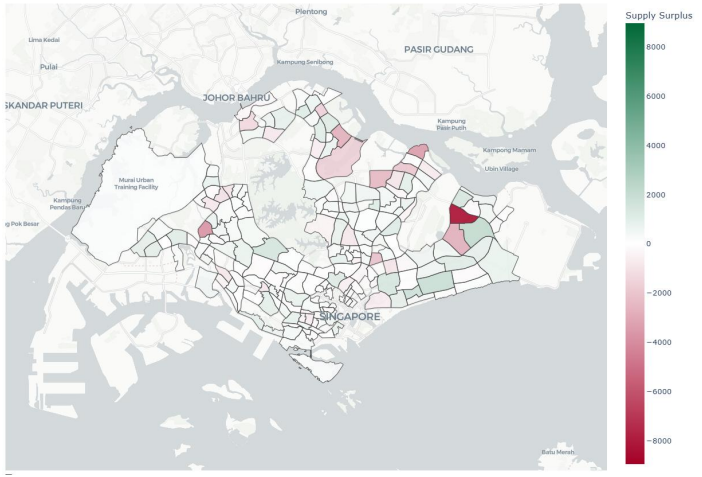
Analytics & Processing Backend

Flask

- Data Preprocessing
- Demand Forecasting
- BTO-driven Demand Estimation
- Model Evaluation & Recalibration - Triggered upon updates in population statistics or BTO pipelines

Decision-Support Frontend

- Subzone Heatmaps
- Time Slider (Forecast Horizon)
- Summary Data Tables & Rankings



Study Limitations & Future Considerations

1. Spatial Accessibility within Subzones

Preschools may be unevenly distributed within a subzone, resulting in longer travel distances for some households.

2. Non-spatial Enrolment Considerations

Religious affiliation, pedagogical preferences, and affordability may limit effective access to nearby preschools.

3. Cross-subzone Enrolment Behaviour

Families may enrol children in preschools outside their residential subzone.

4. Simplified BTO move-in Assumptions

Household occupancy and child enrolment may occur gradually rather than immediately upon project completion.

Overall, this study demonstrates how integrating demographic trends, housing pipelines, and spatial data can support more targeted and efficient preschool infrastructure planning.