

Impacts of Metro Line 1 on Housing Development and Population Distribution

Empirical Evidence from Thu Duc City, Ho Chi Minh City



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Problem Statement & Research Context

1. Background

Metro Line 1 (Ben Thanh – Suoi Tien) is the first urban railway line in Ho Chi Minh City, connecting the city center with the eastern development corridor (**Thu Duc City**).

2. Research Gap

- Previous TOD studies mostly evaluate **after infrastructure completion**, without fully capturing dynamics during construction.
- Few studies examine both **housing development (supply)** and **actual population growth (absorption capacity)** simultaneously during project implementation.

3. Research Objectives

Analyze the spatial distribution and temporal relationship (time lag) between housing development and population dynamics in Thu Duc City for the period 2015–2025.

Research Questions & Hypotheses

Research Questions (RQs)

RQ1

How has housing development changed in Thu Duc City during 2015–2025?

RQ2

How is housing development distributed along Metro Line 1 corridor and stations?

RQ3

What is the time-lag relationship between housing development and population dynamics?

Research Hypotheses (H)

H1

Housing development is concentrated at higher density near Metro Line 1 stations.

H2

Population growth experiences a time lag relative to housing supply development.

H3

Spatial & temporal responses differ across planning, construction, and operation phases.

Study Area & Infrastructure Corridors



Spatial Overview

Metro Line 1 Corridor **Blue Line**

The primary metro axis connecting central Ho Chi Minh City with emerging Thu Duc City.

Major Road Corridors **Green & Orange Lines**

Mai Chi Tho Boulevard and Pham Van Dong Street provide key arterial connections across the study area.

Geographic Scope

Residential development projects in Thu Duc City, mapped in relation to transport corridors and accessibility buffers over the 2015–2025 study period.

Data & Methodology

Data Sources (2015–2025)

Housing Project Dataset

73 screened residential projects in Thu Duc City with detailed spatial and capacity info.

Demographic Indicators

- Actual Population (ATP): Annual recorded population statistics.
- Projected Population (PJP): Housing supply capacity.
- Planned Population (PLP): Master plan targets.

Methodological Framework

Spatial Analysis (GIS)

800m buffer zones around Metro Line 1 stations, major road corridors, and remaining areas.

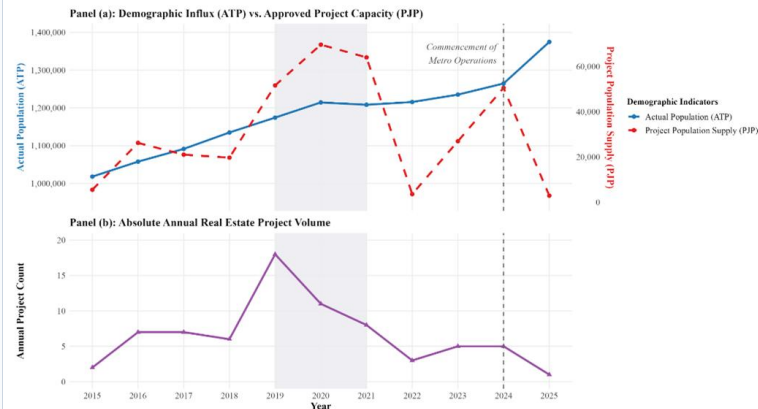
Cumulative Capacity & Correlation

Measures capacity accumulation over time: $CPRC_t = \sum PJP_i$

Lagged Spearman Correlation: Evaluates rank alignment between PJP at year t and ATP at year $t+k$ ($k = 0..3$).

Demographic Influx vs. Supply Trends

Figure 5. Integrated vertical layout illustrating demographic supply-demand decoupling and the urban infrastructure lag effect (2015–2025)
Integrated longitudinal analysis of Housing Supply Capacity, Project Volumes, and Population Absorption (2015–2025)



KEY INSIGHT

Visualizing the multi-panel temporal alignment between actual population growth (ATP) and approved project capacity (PJP) from 2015 to 2025.

Results – Spatial Distribution of Housing (H1)

Metro Line 1 Spatial Concentration

33

PROJECTS

224,768

CAPACITY (PJP)

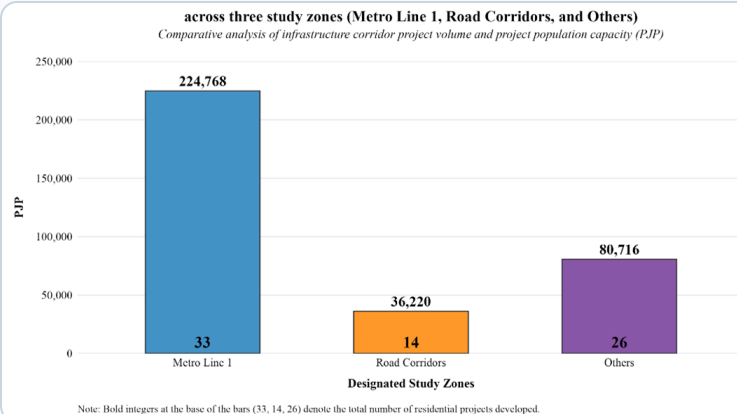
High concentration within the **Metro Line 1** influence zone, absorbing the primary share of residential capacity in Thu Duc City.

Comparison with Major Corridors:

- **2 Major Road Corridors:** 14 projects | 36,220 PJP
- **Other Urban Areas:** 26 projects | 80,716 PJP

Metro corridor capacity significantly outweighs other major transportation axes combined.

Distance Decay & Hypothesis Confirmation



Hypothesis H1 Confirmed

Housing project intensity peaks in areas **adjacent to stations** and follows a distance-decay function relative to transit proximity.

Real estate developers respond early to anticipated transit improvements, concentrating supply well before operational launch.

Results – Housing Supply Dynamics & Population Lag (H2 & H3)

Supply & Population Decoupling

~70,000

PEAK PJP / YEAR (2020)

1.018M → 1.374M

ATP GROWTH (2015–2025)

- Projected Capacity (PJP): Sharply increased, reaching an annual peak of ~70,000 in 2020.
- Actual Population (ATP): Experienced steady, smooth growth from 1.018M (2015) to 1.374M (2025).

Key Observation

A distinct temporal decoupling exists between market housing supply capacity and actual demographic absorption along the corridor.

Housing supply develops well ahead of population settlement due to multi-stage delivery processes.

Lagged Spearman Correlation Analysis

- Lag Analysis: **Lag 0** ($p=0.052$), **Lag 2** ($p=0.483$, $p<0.05$), **Lag 3** ($p=0.619$, $p<0.05$)
- **H2 & H3 Confirmed:** Population growth lags **2–3 years** behind residential supply creation.

Table. Spearman Lag Matrix between Projected (PJP) & Actual Population (ATP)

Lag Offset (k)	Variable Comparison	N	Spearman (p)	p-value	Relationship / Effect
Lag 0	PJPt vs. ATPt	11	0.052	0.879	Contemporaneous (Same-year)
Lag 1	PJPt vs. ATPt+1	10	0.345	0.329	1-Year Time Lag
Lag 2	PJPt vs. ATPt+2	9	0.483*	0.0081	2-Year Time Lag
Lag 3	PJPt vs. ATPt+3	8	0.619**	0.046	3-Year Time Lag

Discussion – Development Phases & Institutional Context

Phase-Specific Development Dynamics

2015–2020: Planning & Initial Construction

Housing development boomed rapidly, driven primarily by market expectations of future transit connectivity.

2021–2023: City Merger & Realignment

Planned population (PLP) surged past 1.3 million; new project launches slowed during master plan & legal restructuring.

2024–2025: Commercial Operation

Actual demographic absorption accelerated as Metro Line 1 launched, steadily narrowing the gap between CPRC and ATP.

Institutional & Land Drivers

Land & Administrative Conversion

Site clearance, land-use conversion from industrial/logistics uses, and complex multi-stage permitting created fundamental physical delays in housing delivery.

Mechanism Behind Population Lag

These institutional bottlenecks explain why demographic settlement naturally trails physical construction and market supply, validating the observed 2-to-3 year absorption lag.

Policy Implications – Synchronized TOD Framework

Phased TOD Zoning

DEVELOPMENT CYCLES

Synchronize planning with infrastructure delivery timelines.

Adjust density and height controls across transit construction lifecycles to prevent supply-demand imbalances.

Mitigate market decoupling along developing transit corridors.

Land Value Capture

RESOLUTION 98/2023/QH15

Capture land appreciation generated by transit investment.

Deploy LVC mechanisms (e.g., developer fees, tax increments) to fund first/last-mile connections.

Reinvest in pedestrian infrastructure and high-quality public spaces surrounding stations.

Integrated GIS Monitoring

URBAN DATA DASHBOARD

Establish dynamic tracking for spatial and demographic shifts.

Monitor project supply capacity (PJP) alongside actual population (ATP) in real time.

Enable evidence-based, adaptive governance for future metro lines.

Conclusion & Research Limitations

Key Conclusions

CORE FINDINGS

Demonstrated spatial concentration of housing development around Metro Line 1.

Identified a distinct 2 to 3-year time lag in actual population absorption relative to supply.

Research Limitations

METHODOLOGICAL CONSTRAINTS

Relies on an 11-year data series, resulting in a small sample size for lagged statistical analysis.

Demographic data is collected at the broader administrative ward level rather than station-specific buffers.

Key Contributions

POLICY & PRACTICE

Provides empirical evidence to help rapidly urbanizing cities build more synchronized TOD strategies.

Offers a framework to manage supply-demand imbalances across transit implementation cycles.

Thank you!

Questions & Discussion

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