#749 Impact of Multi-Station Aggregate Hub Redevelopment on Surrounding Urban Areas-A Case Study of London's King's Cross

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Impact of Multi-Station Aggregate Hub Redevelopment on Surrounding Urban Areas

–A Case Study of London's King's Cross

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ABSTRACT

Multi-station aggregation hubs – interconnected transport nodes in high-intensity urban areas – significantly influence metropolitan growth, yet systematic research on their regional development impacts remains limited. This study examines London's King's Cross–St Pancras hub redevelopment using spatiotemporal data (1996–2023). Three analytical zones (Core zone, Central Impact Zone and Wider Impact Zone) were established to assess transport networks, functional vitality, and development intensity via GIS and qualitative methods. Findings indicate a 25:11:8 ratio of renewed building areas across zones, with development intensity strongly correlated to hub proximity. The core zone saw significant growth in consumer/service-oriented POIs, evolving into a mixed-use creative hub. Insights are provided for redeveloping similar hubs in high-density cities, particularly China.

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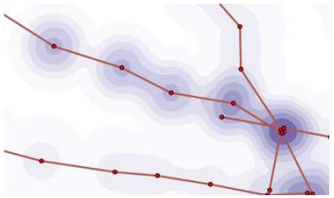
ABSTRACT

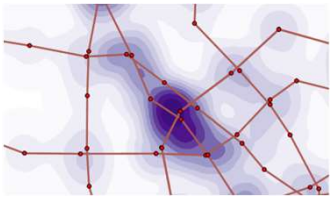
Urban rail transit multi-site aggregation lots generally satisfy four attributes at the same time:
Transportation - there is a strong transportation connection between the stations;
Distance - within a certain spatial distance;
Function -There is a strong public correlation between the stations and the lot, as well as between the functional elements within the lot;
Space - the spatial elements within the lot have an orderly, clear, detailed and rich organizational order.

Multi-site Aggregate Lot Boundary Identification and Typing

1. Initial screening of multi-site lots based on site density

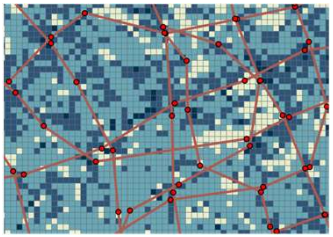
("distance" factor, nuclear density analysis)





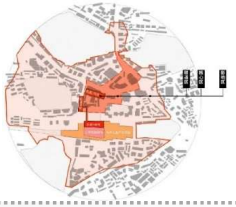
2、Analysis of the morphology of multi-site lot aggregation characteristics

[Transportation (accessibility), density (road network density, intersection density, public space density, population density, building density and height or number of floors), function (functional mix)]



3、Aggregate lot boundary identification

Boundary delineation based on aggregated feature attenuation



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Research Methods

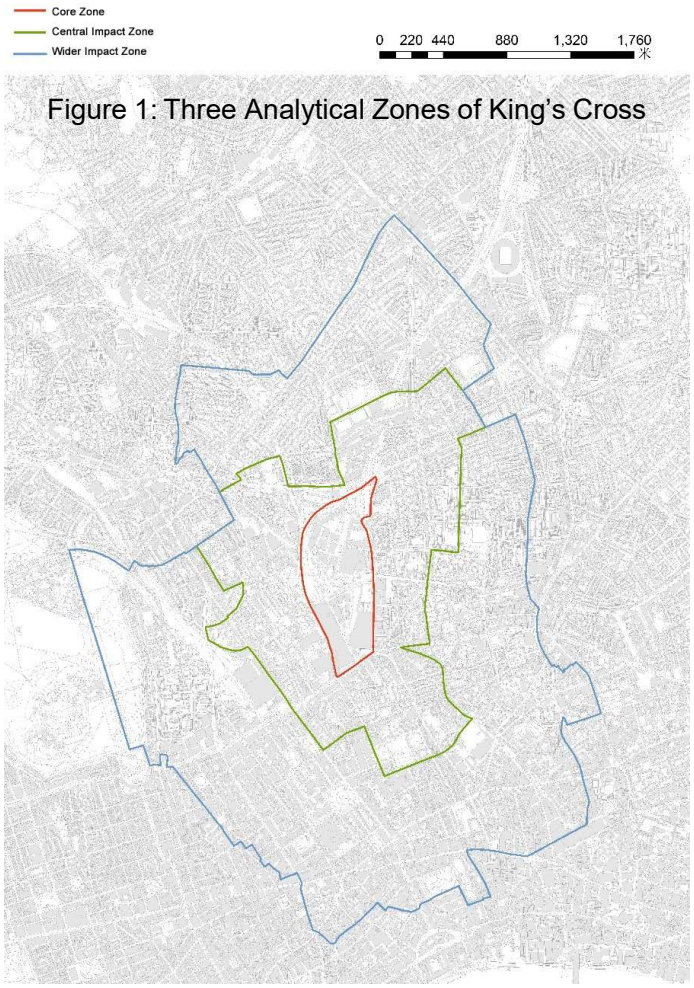

Figure 1: Three Analytical Zones of King's Cross

2.1 Case: King's Cross, London

2.2 Documentary Data

this included historical records of the area, planning and design proposals from developers and urban designers, relevant planning documents published on the official websites of the Camden and Islington local authorities, progress reports on the King's Cross core zone (2008–2024) published by KCCLP on its official website, and a 2017 construction evaluation report for the core and impact zones by Regeneris Consulting (Regeneris Consulting, 2017). For spatial and statistical data, the study acquired: Ordnance Survey datasets (2007–2023): Built-environment typology maps, building height data, and Points of Interest (POIs); Transport for London (https://tfl.gov.uk): Ridership statistics for stations (2007–2017); UK Office for National Statistics (www.ons.gov.uk): Census data (2001, 2011, 2021) at the Output Area (OA) level, with each OA typically covering 40–250 households.

2.3 Analytical Methods-

Integration of Qualitative and Quantitative Approaches

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3.1 Aggregation Development of Transport Hubs

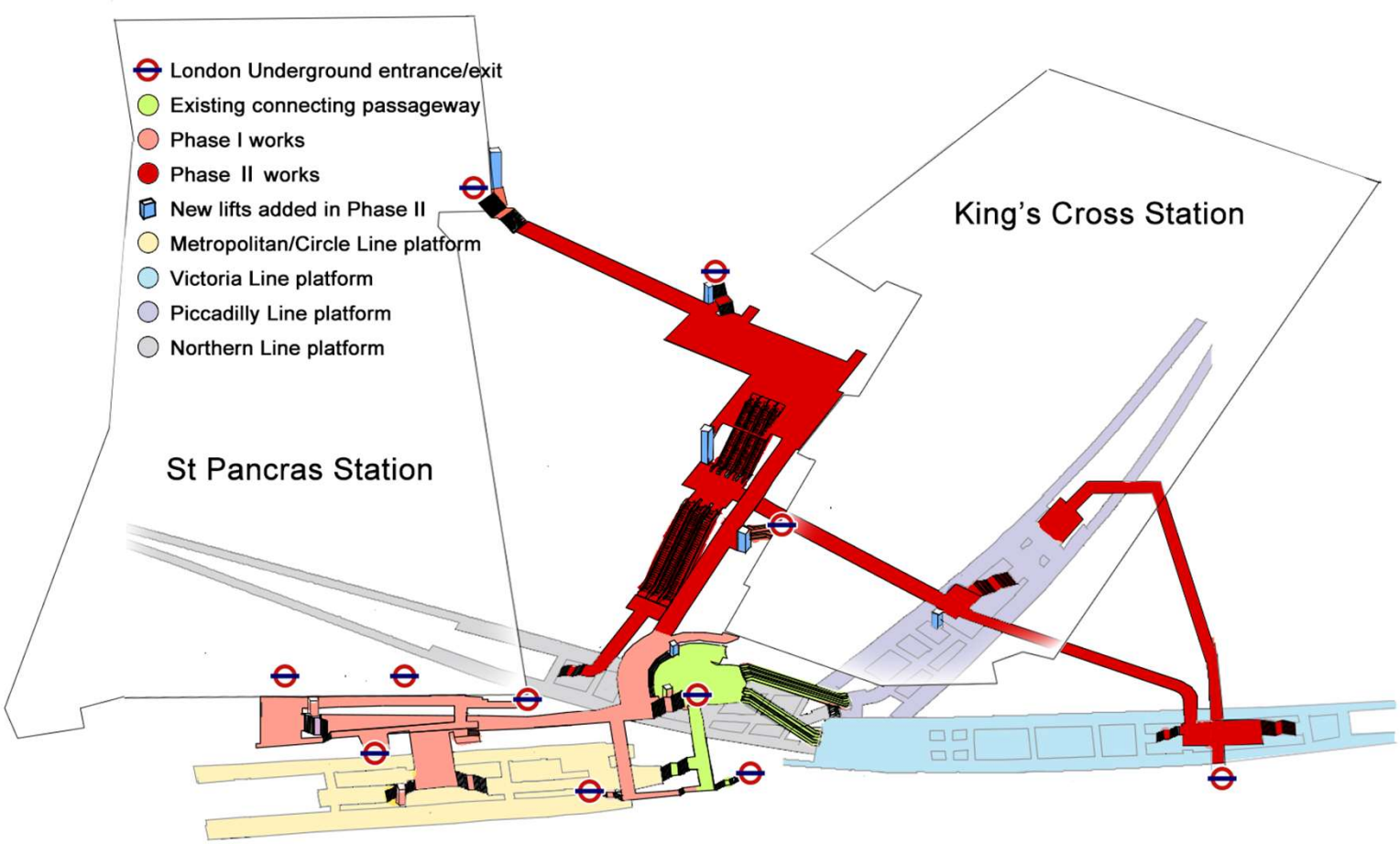

Figure 2: Schematic Diagram of the Multi-Station Aggregation Project at King's Cross

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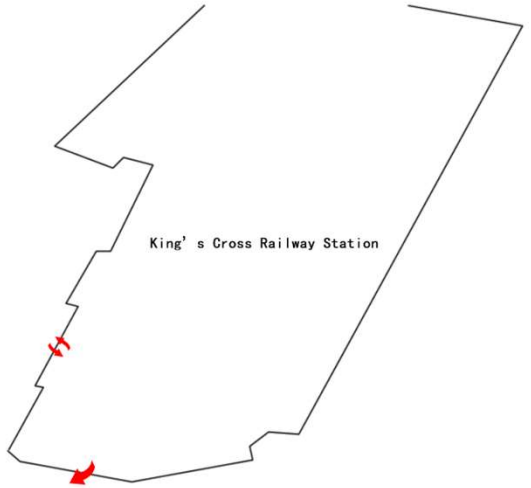
3.1 Aggregation Development of Transport Hubs



1852

King's Cross Station from its inception to the turn-of-the-century development of polymerization

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3.1 Aggregation Development of Transport Hubs

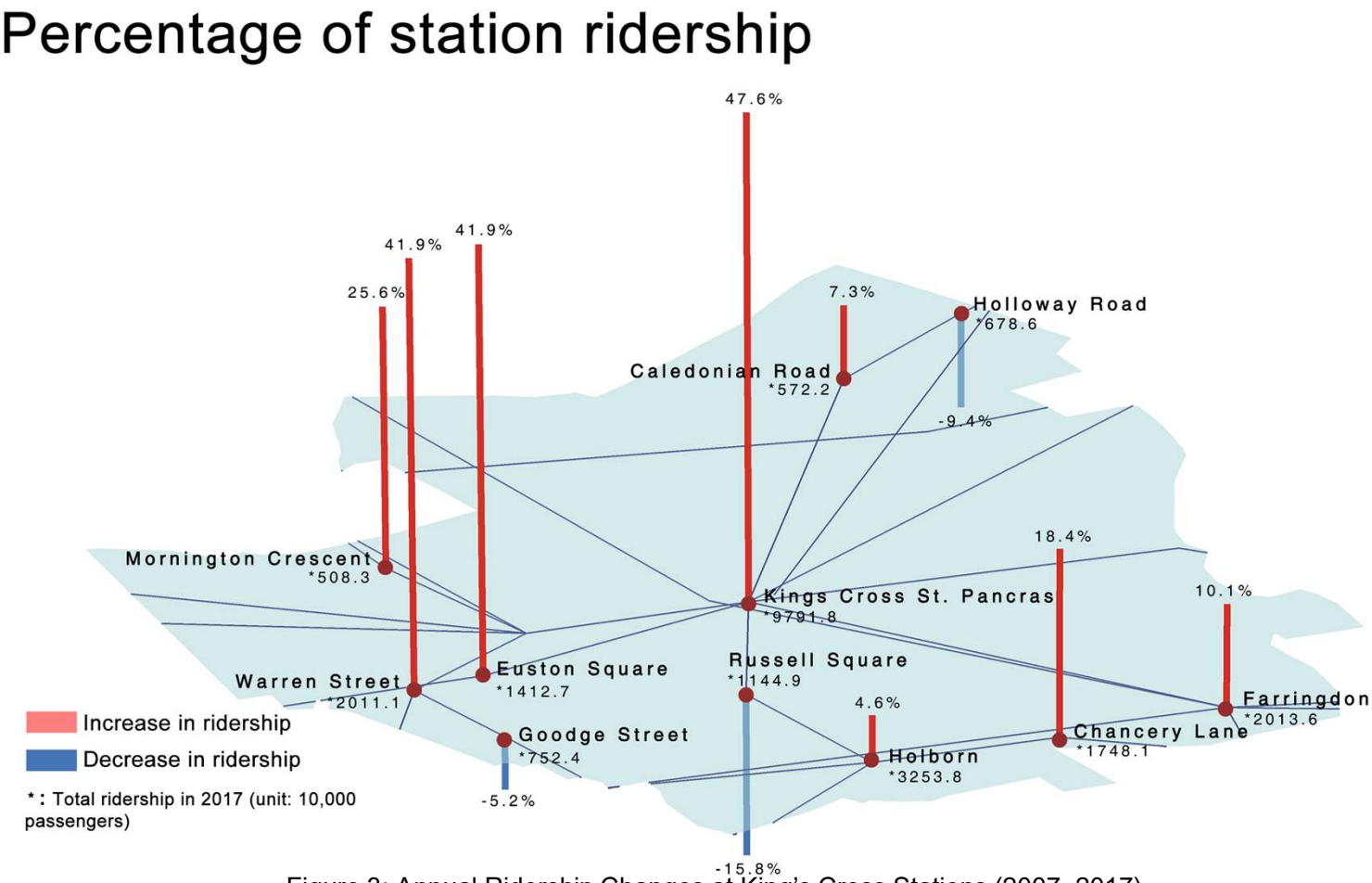

Figure 3: Annual Ridership Changes at King's Cross Stations (2007–2017)

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3.2 Evolution of the Transport Network

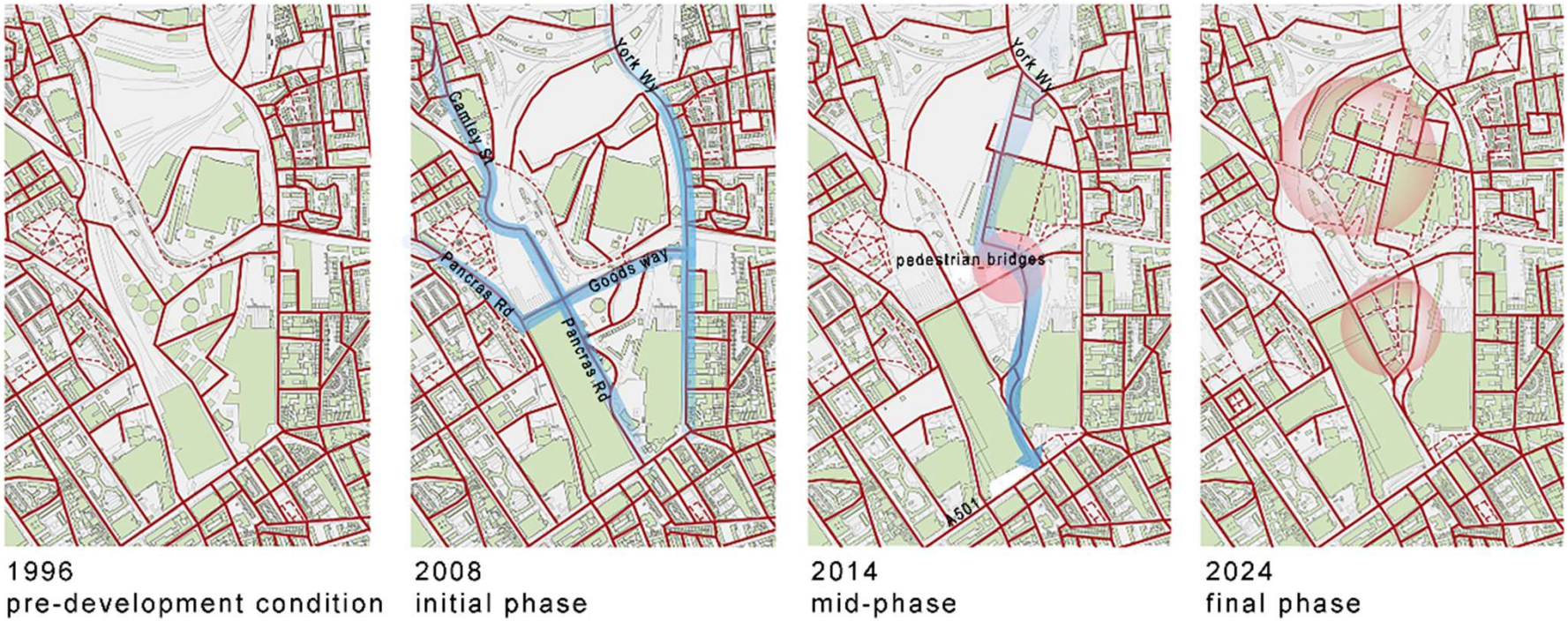

Figure 4: Road network evolution in the core zone (1996–2024)

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3.3 Functional Vitality Transformation

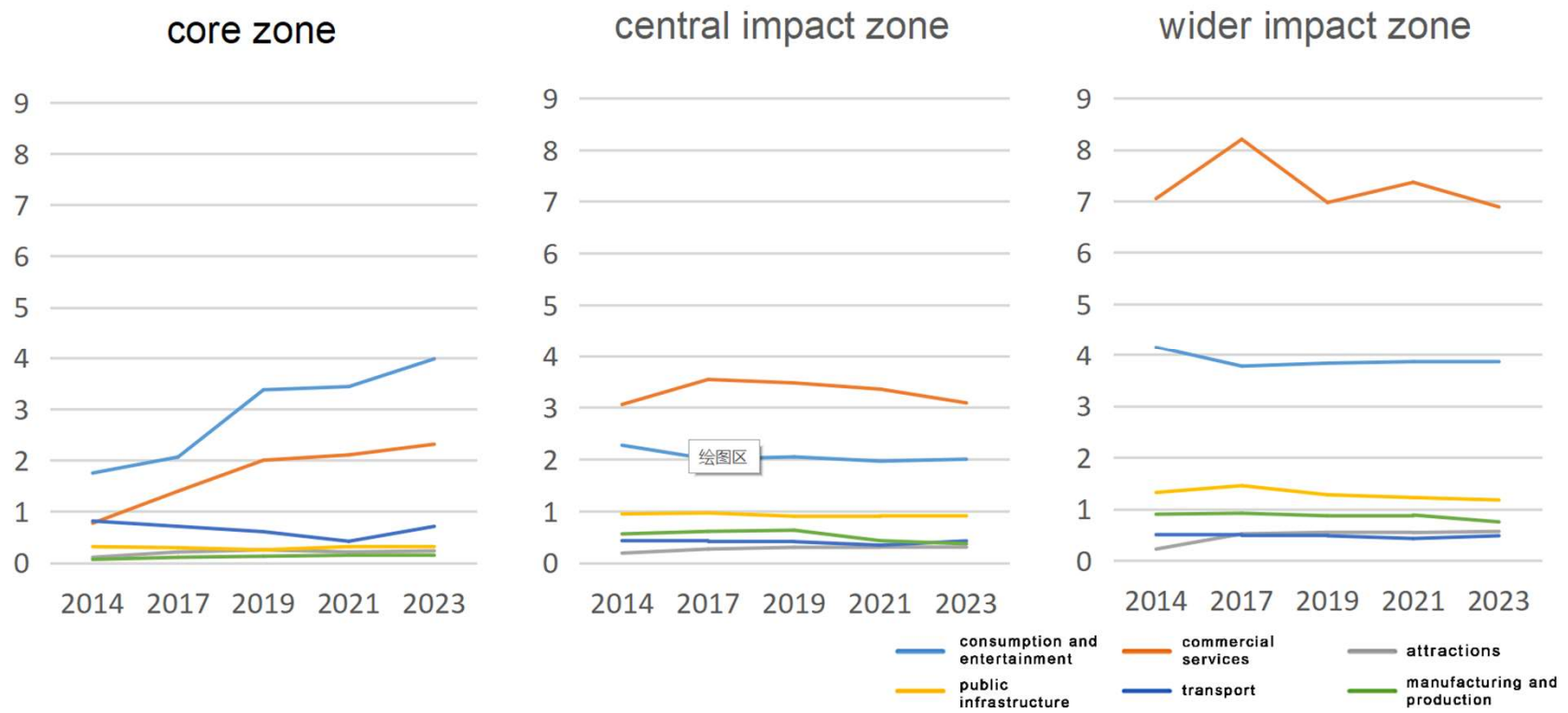

Figure 5: Changes in POI density per hectare across zones (2014–2023)

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3.4 Intensity of Spatial Development

Metric	core zone	central impact zone	wider impact zone
Newly added floor area (10,000 m²)	93.3	73.6	196.8
Total floor area (10,000 m²)	126.5	275.0	977.4
Land area (hectares)	48.0	266.6	709.6
New floor area per hectare (100 m²)	193.7	27.6	27.7
Proportion of building volume renewal	73.7%	26.8%	20.1%
*Floor area is estimated based on building morphology and height data, assuming an average floor height of 3.5m.			

Table 1: Spatial Development Metrics Across Zones (1996–2023)

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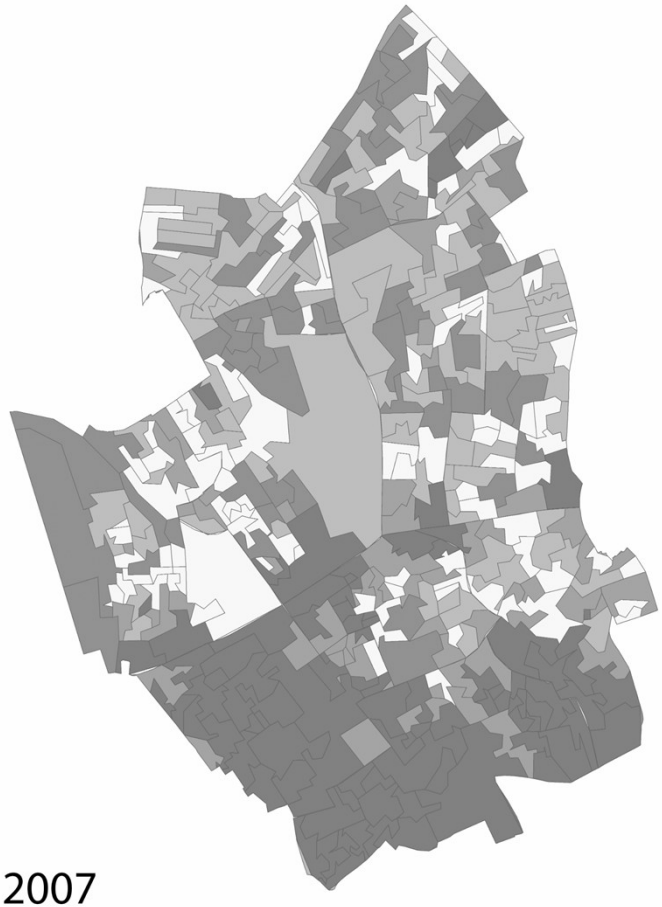
3.4 Intensity of Spatial Development



2007

2007

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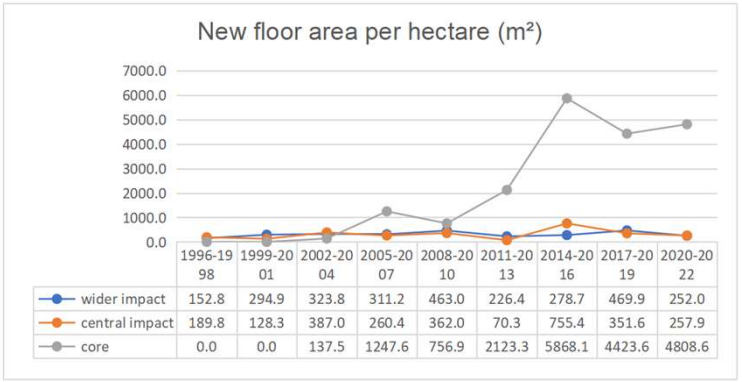
3.4 Intensity of Spatial Development



	1996-1998	1999-2001	2002-2004	2005-2007	2008-2010	2011-2013	2014-2016	2017-2019	2020-2022
wider impact	152.8	294.9	323.8	311.2	463.0	226.4	278.7	469.9	252.0
central impact	189.8	128.3	387.0	260.4	362.0	70.3	755.4	351.6	257.9
core	0.0	0.0	137.5	1247.6	756.9	2123.3	5868.1	4423.6	4808.6

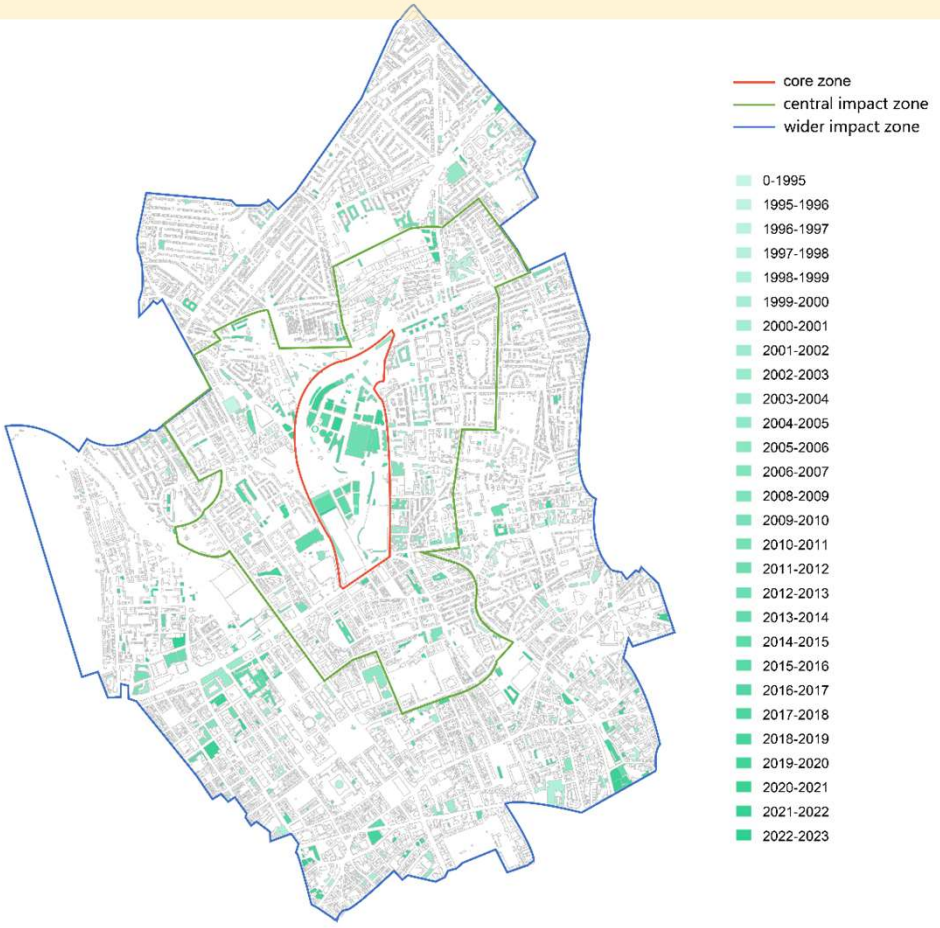


Figure 6: Spatial distribution and comparative metrics of redeveloped buildings (1996–2022)

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Spatial Renewal Methods in King's Cross Area

- **Brownfield Redevelopment Mode**
- **Demolition-Reconstruction Mode**
- **Functional Retrofitting Mode**
- **Upward Addition and Perimeter Expansion Models**

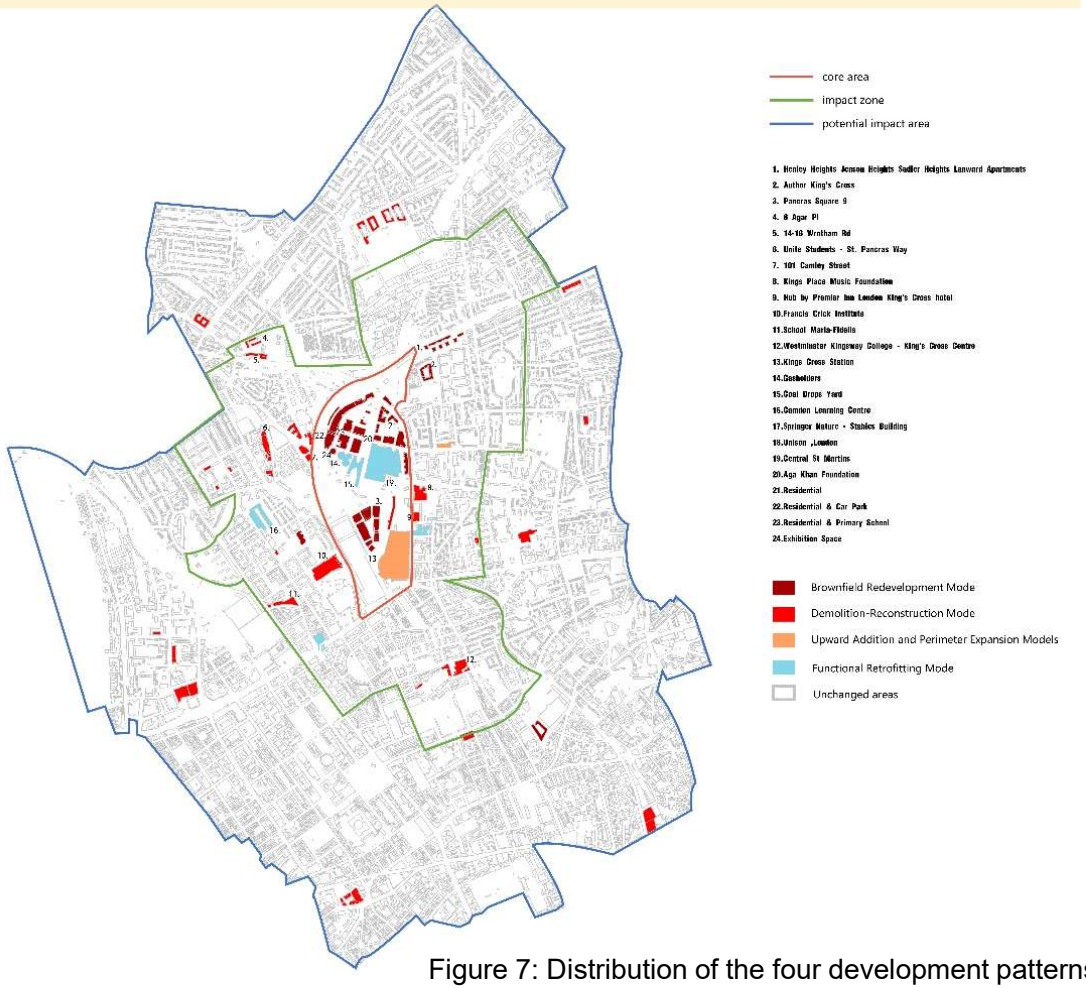

Figure 7: Distribution of the four development patterns in the King's Cross area

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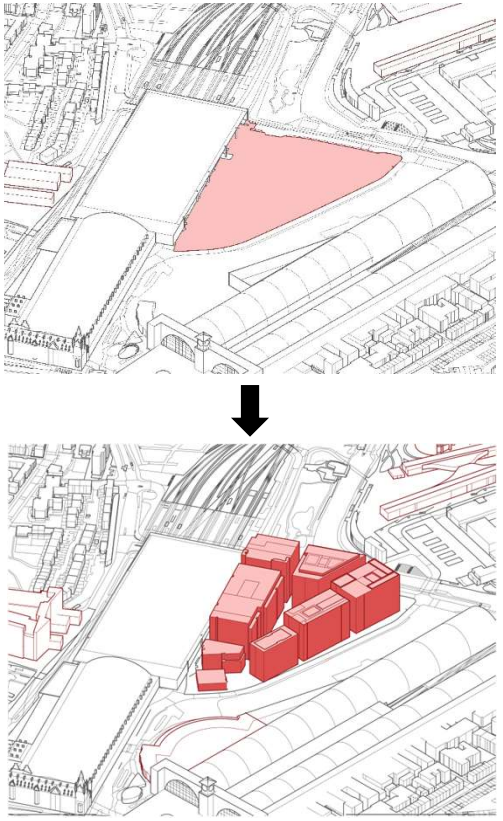
4.1 Brownfield Redevelopment Mode

Aerial view of **Pancras Square** (Source: Apple 3D Maps)



Before-and-after comparison of **Pancras Square**

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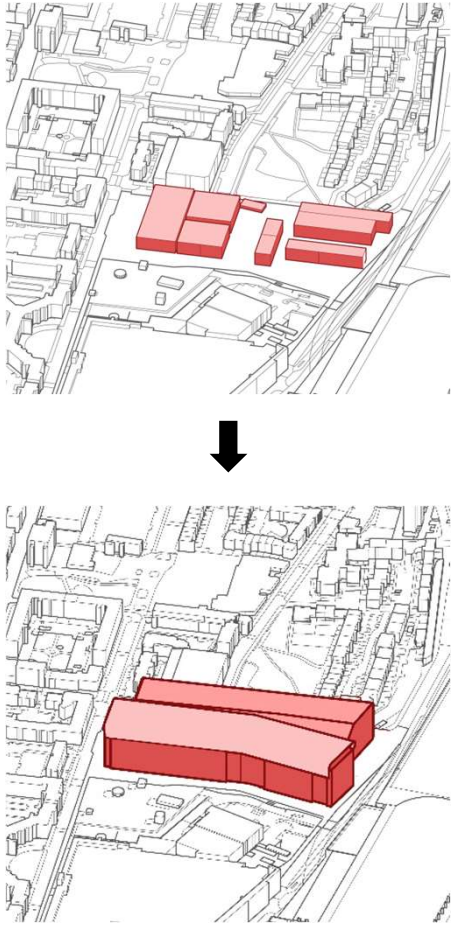
4.2 Demolition-Reconstruction Mode



Aerial view of the **Francis Crick Institute** (Source: Apple 3D Maps)

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4.3 Functional Retrofitting Mode

Figure 12: **Coal Drop Plaza** Elevation and Existing Conditions

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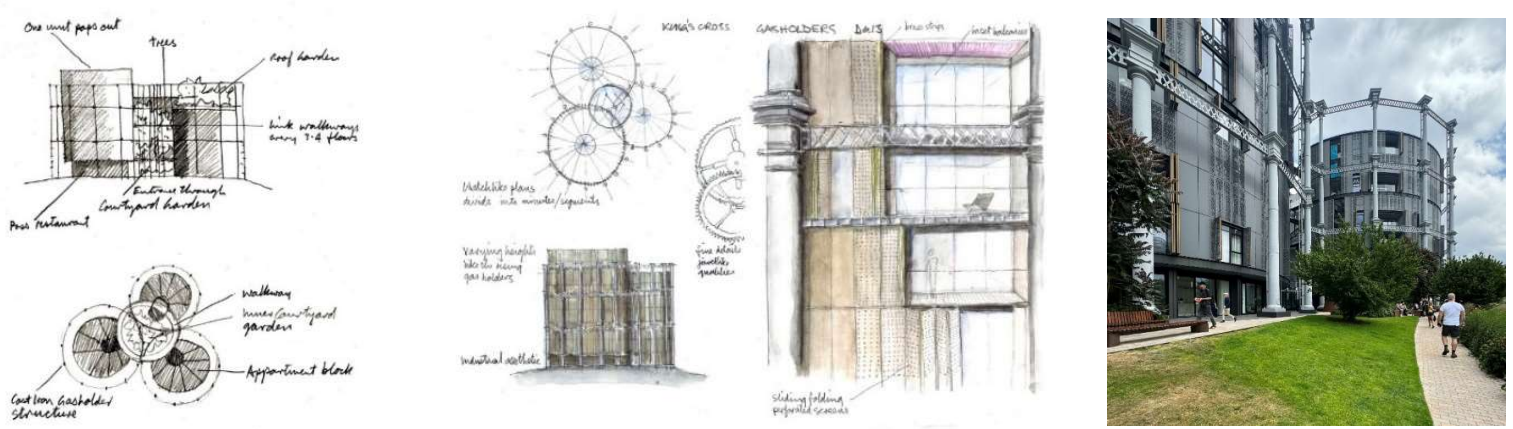
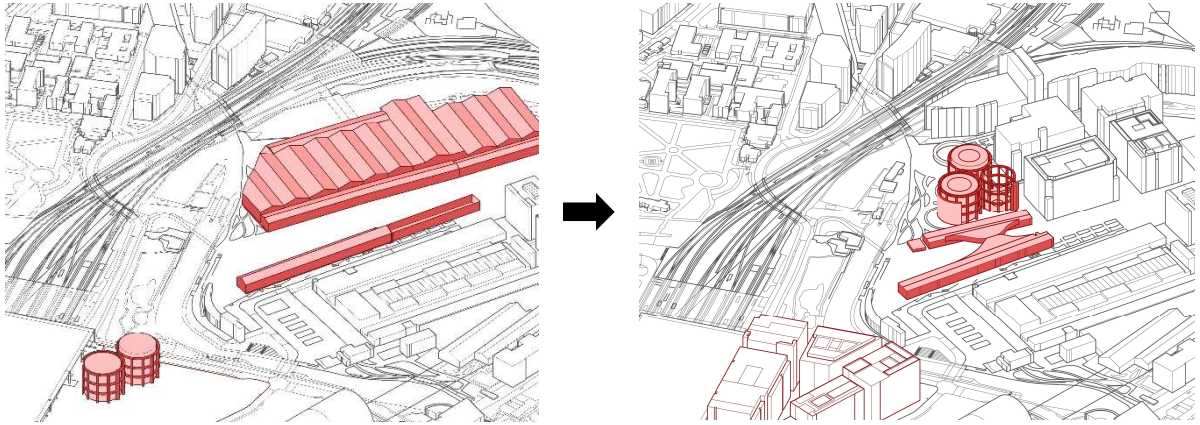
4.3 Functional Retrofitting Mode



Triplex Gas Storage Tank Design Analysis Diagram and Current Status



Comparison of **Triplex Gas Storage Tank and Coal Drop Plaza** before and after construction

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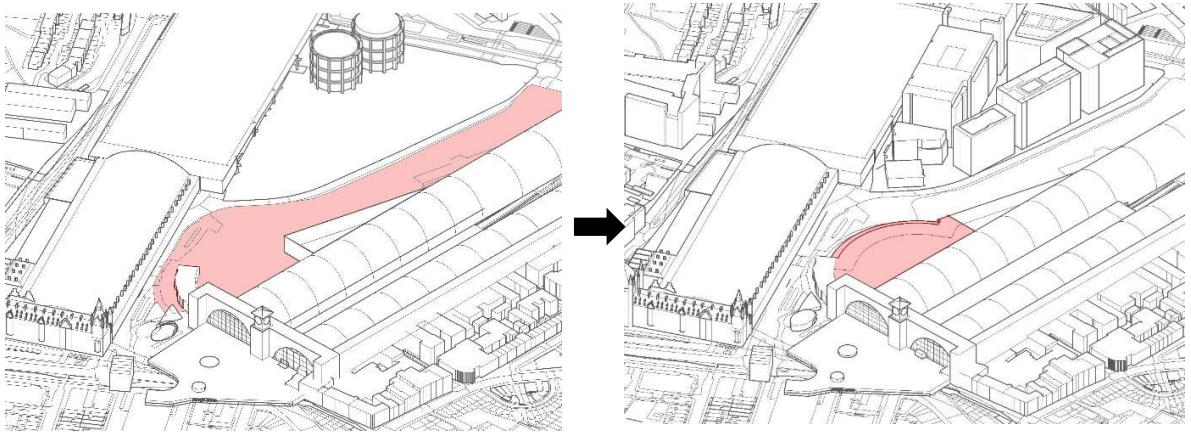
4.4 Upward Addition and Perimeter Expansion Models

Aerial view of the **new Western Ticket Hall** and human eye viewpoints



Comparison of the **New Western Ticket Hall** before and after its completion

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Discussion and Conclusions

- The redevelopment of King's Cross demonstrates that **the aggregation of transport hubs**—through the expansion of rail networks and integration of existing stations—**creates efficient connectivity, driving increased passenger flows and stimulating demand for complementary functions and spatial provisions**.

- **Proximity to the multi-station hub strongly correlates with development intensity.** From 1996 to 2023, 25: 11: 8 of new floor area per hectare was added in the core, central impact, and wider impact zones, respectively.

- It is foreseeable that with continuous advancements in transportation technology, **the reduced demand for ancillary transport infrastructure and increased functional integration will enable sophisticated mixed-use design to unlock greater development potential in urban multi-hub aggregation zones.**

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Thanks for listening!

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