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1 Pedestrian access to transit in evolution: unfolding the spatialization of 2 rapid-transit planning

3 This article retraces the impact of evolving hegemonic rapid transit planning and
4 design strategies on pedestrian integration between stations and neighbourhoods,
5 using Hong Kong as a longitudinal case. Mixed-methods research, triangulating
6 documentary analysis, spatial analysis, and in-depth interviews, identified six
7 typologies across three historical phases. The findings demonstrate that pedestrian
8 access to transit is spatially heterogeneous, shaping the evolution of the station area
9 from a connecting structure into an interconnecting infrastructure. Unfolding the
10 historical interplay of hegemonic forces in the production of pedestrian spaces, this
11 study innovatively bridges the research gap between planning policies and fine-
12 grained urban design features.

13 Keywords: station area; pedestrian environment; transit urban design
14 (TUD); transit oriented development (TOD); walkability; Hong Kong Mass
15 Transit Railway (MTR).

16 Introduction

17 The growing world urban population and rampant climate change demand the broader
18 application of rapid transit systems. Against the backdrop of a global demand to reshape
19 cities for sustainable transport, the Hong Kong Mass Transit Railway (MTR) station built-
20 up environment emerged as a benchmarking best practice commonly referred to when
21 highlighting ‘the importance of providing well-integrated, seamless pedestrian
22 connections between surrounding neighbourhoods and transit stops’ (Suzuki, Cervero,
23 and Iuchi 2013, 179; see also Cervero, Guerra, and Al 2017; Suzuki et al. 2015). Hong
24 Kong is a paradigmatic case of a transit railway structured along highly populated and
25 densely built-up areas. The structure serves as a model in developing contexts in which
26 policymakers aim to achieve sustainable transport amidst compact urbanization (Suzuki
27 et al. 2015).

1 This study aims to challenge the well-established interpretation of the Hong Kong
2 station area pedestrian environment (SAPE) as a monolithic concept, demonstrating that
3 the network of pedestrian linkages to the transit stop is multifaced and in continuous
4 (re)development. This paper, employing documentary and spatial analysis complemented
5 by interviews with planning experts, disentangles the historical interplay of the forces
6 shaping SAPE. Subsequently, it analyzes planning strategies, financial instruments, and
7 spatial forms, retracing the historical and geographical evolution of the Hong Kong SAPE
8 over four decades (1979–2020), and identifies three phases of development. In Phase One
9 (1970s–80s), stations were integrated with well-connected outdoor SAPEs. Conversely,
10 in Phase Two (1990s–the 2000s), SA developments comprising sizable commercial
11 complexes often incorporated part of the PEs, serving as final destinations while limiting
12 the SA route directness for pedestrians. The more recent Phase Three (2010s–) marked a
13 shift in the production and integration of SAPE, facilitating pedestrian navigation to
14 destinations further apart in the neighbourhoods.

15 The remainder of this paper is organized as follows. The first part reviews the
16 literature on the determinants of pedestrian-oriented SA design and defines the analytical
17 framework guiding data collection and analysis. The findings are presented in a discursive
18 form, describing the evolution of pedestrian access to transit by focusing on the planning
19 approach and produced spatial forms. The dual-level analysis reports the findings of the
20 qualitative (planning) and quantitative (spatial form) analyses. The final sections discuss
21 the findings within the context of the literature and conclude the article by drawing
22 attention to their significance in the current development of SA planning in Asian cities
23 and beyond.

1 **Pedestrian-oriented urban design in station areas**

2 Numerous studies have highlighted the importance of micro-space pedestrian design for
3 SAPE and examined how the design impacts micro-level urban forms and programmatic
4 functions. Transport studies have identified urban design variables related to pedestrian
5 connectivity, such as block size (Ewing and Cervero 2010), street network connectivity
6 (e.g. number of intersections per km²), and route directness (Agrawal, Schlossberg, and
7 Irvin 2008; Jiao, Chen, and He 2017). Results of prior studies also suggest that smaller
8 blocks, higher intersection density, and the most direct route might create favourable
9 conditions for pedestrian-oriented design (Handy 1996; Cervero et al. 2009). Focusing on
10 investigating the PE connected to stations, recent studies have considered the structure or
11 level of a station and its exit system (Loukaitou-Sideris et al. 2013; Loo and du Verle
12 2017). Loukaitou-Sideris et al. (2013) showed how the level at which a station is
13 constructed is related to pedestrian accessibility and connectivity challenges in the SA.

14 The station exit/entrance system impacts pedestrian accessibility to and from the
15 neighbourhood surrounding the station. The total number of exits per station indicates the
16 degree of accessibility within the neighbourhood (Loukaitou-Sideris et al. 2013; Loo and
17 du Verle 2017). For example, a higher number of exits might be associated with higher
18 pedestrian accessibility to remote areas of the neighbourhood or with the possibility of
19 alternative walking routes, thus making the station a pedestrian connector that enhances
20 pedestrian movement to and from different parts of the neighbourhood (Loo and du Verle
21 2017; Murakami, Villani, and Talamini 2021). In high-density cities, where stations
22 develop in three-dimensional urban contexts, studies suggest that the type of exit (e.g.
23 covered/uncovered) and the programmatic function of spaces connected to the station exit
24 might be critical elements for pedestrian use (Cui, Allan, and Lin 2015; Villani and
25 Talamini 2020). Hong Kong, one of the most exemplary and extreme volumetric urban

1 environments worldwide, exemplifies this notion. Zacharias and He (2018) suggested that
2 transit-connected underground paths almost invariably lead pedestrians directly to the
3 streets.

4 Hong Kong also has a large variety of transit-connected spaces (Xue, Ma, and Hui
5 2012). Loo and Du Verle (2017) deemed covered access to metro stations an essential
6 factor for walkability and encouraging the use of public transport. Zacharias and He (2018)
7 correlated different exit spaces (on streets or commercial spaces) with street-level
8 pedestrian flows. Although these recent studies have focused on only a few stations in
9 limited high-density environments, the findings suggest that spatial analysis can provide
10 crucial information on pedestrian connectivity and accessibility in SA in vertically
11 developed urban contexts such as Hong Kong.

12 **Hong Kong: from transnational influences to a prototypical development**

13 Since the 1960s, the city has been at the centre of an international urban planning thinking
14 network (Bristow 1989; Forsyth 2019). International influences have stimulated the
15 planning of new towns in peri-urban areas as a strategic response to growing population
16 pressures and congestion (He et al. 2020). Concurrently, the seminal work of the British
17 planner Colin Buchanan introduced the concept of ‘traffic architecture’(Buchanan 1963),
18 which became instrumental in the development of Hong Kong’s extensive grade-
19 separated pedestrian systems—elevated, underground, or indoor pedestrian networks
20 (Cui, Allan, and Lin 2013, 2016). To address crowded street spaces, these pedestrian
21 systems were designed around transit hubs throughout the central urban core (Wan 2010)
22 and new towns (Tan and Xue 2014) to mitigate conflicts between the ever-increasing
23 motorized traffic and pedestrians.

1 Since the end of the colonial era, in the 1,104 km² area of the Hong Kong Special
2 Administrative Region, urban development has been deeply intertwined with railway
3 station area planning. Within this environment, the MTR Corporation (MTRC) has gained
4 a city-shaping role in the urbanization of transit corridors through its particular financing
5 tools, constituting a model for pursuing transit value capture through the synchronized
6 development of the railway infrastructure and the property above and around stations to
7 finance rapid transit through private development land premiums and rents (Cervero and
8 Murakami 2009; Tang et al. 2004). As a result, approximately 41% of Hong Kong's
9 population resides within 500 m of an MTR station (Tang et al. 2004), approximately
10 49% of the high share of public transport trips are through the railway (MTRC 2018), and
11 private automobile ownership is low. In 2019, five million of the seven million residents
12 used the MTR daily, making this transport mode an essential part of Hong Kong's
13 everyday life (HKSAR Transport Department 2019).

14 In recent years, the expansion of MTR with the completion of new stations has
15 resulted in a shift in the approach to SA pedestrian planning (Higgins 2019; He et al.
16 2021).

17 **Research gap**

18 Some crucial questions remain unanswered. (RQ1) How has SA planning evolved since
19 the construction of the first railway line? (RQ2) What are the spatial characteristics and
20 morphological developments of SAPE?

21 This paper aims to contribute to academic and practical debates against the
22 backdrop of a growing demand for context-dependent SA planning that acknowledges
23 neighbourhood heterogeneity, local complexity, specificity, and diversity (Loo 2017; Loo
24 and du Verle 2017). In addition, understanding the evolution of the physical features

1 characterizing the SAPE may prove crucial for evaluating pedestrian access to transit,
2 referring to the ability of pedestrians to access and navigate the environment in proximity
3 to transit stations, which is considered central to station–neighbourhood integration
4 (Schlossberg and Brown 2004; Cervero and Sullivan 2011; Handy 1996).

5 **Research approach and methods**

6 This mixed-methods research focuses on the longitudinal case (Yin 2014) of Hong Kong.
7 It triangulates (Creswell and Creswell 2018) documentary analysis, quantitative spatial
8 analysis, and in-depth interviews for interpretative policy investigation. Our research
9 approach answers the call for multidimensional investigations of the urban environment,
10 requiring epistemological broadening by combining the political, economic, and cultural
11 aspects of urban design and development (Madanipour 2006). Adopting this perspective
12 includes applying dynamic analytical lenses to address the process of spatial change over
13 time rather than being confined to a particular place or time in the process (Lefebvre
14 1991). Employing a multidimensional and dynamic perspective, this study considers
15 urban design as part of the broader context of the urban development process and
16 examines the significance of PE’s urban design from the planning, transport, finance, and
17 user perspectives. Aiming to address the research questions, our investigation employs
18 (1) documentary analysis to investigate the planning and financial strategies supporting
19 SA development, (2) spatial analysis to categorize and examine the SAPE produced by
20 specific planning and financial mechanisms adopted, and (3) content analysis of in-depth
21 interviews with knowledgeable planners and urban designers to increase validity and
22 provide supplementary information on the strategies, spatial characteristics, and
23 challenges of SAPE development.

24 First, our investigation is based on a thorough review of the planning strategies
25 and financial instruments supporting Hong Kong SA development for the period 1979–

1 The following PE features were considered for quantitative analysis: (1) the
2 structure or level of the station, (2) the type of exit, (3) the function of the space connected
3 to the exit, (4) the exit location in the surrounding environment, and (5) the street
4 intersection density. Data were collected from the MTRC website through a Google Street
5 View audit of the environment (Rundle et al. 2011) and onsite fieldwork. First-hand data
6 related to the MTR exit locations were collected using online satellite imagery (OSI)
7 (Monkkonen 2008). PE data were geoplotted using a GIS platform. Overall, the observed
8 space connected to the exit consisted of six functional areas (Fig. 1): open space at ground
9 level, underground road or parking, commercial complex space, residential or office
10 complex space, open space on the podium, and footbridge space. Four total exit structure
11 types were observed (Fig. 2): an independent box structure on the sidewalk, exit
12 integrated into a building's façade, exit inside a building, and exit as a pedestrian
13 footbridge. Most MTR stations have remained largely unchanged since construction
14 completion; nevertheless, information on the stations constructed during early phases
15 which underwent major redevelopment in more recent years was made available by the
16 MTRC. The following findings are presented through descriptive statistics and fieldwork
17 observations of the evolution of PE in Hong Kong over the three phases mentioned above
18 for each infill and greenfield project.

19

20

< Insert Fig.2 here >

21

Figure 2. The four MTR Exit structure types in Hong Kong

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In addition, this study conducted in-depth face-to-face interviews with senior experts. Purposive sampling selected four senior planners, urban designers, and experts in Hong Kong's SAPE planning for in-depth interviews. The aims of the interviews were (1) to examine with expert informants the evolution of station area integration with the

1 neighbourhood's pedestrian environment; (2) to elicit expert opinions on the underlying
2 logic and motives that guided the planning of SA over time; and (3) to identify the
3 significant challenges in the development of the SA (including local population concerns
4 upon announcement of MTR station).

5 Each interview lasted between 45 and 120 minutes. The interviewees were a
6 former director of the HKSAR Planning Department (Interview #1), an associate director
7 of a major transport consultancy firm (Interview #2), a director of a major planning
8 consultancy firm and former president of the Hong Kong Institute of Planners and the
9 Hong Kong Institute of Urban Design (Interview #3), and a vice chairman of a local
10 district council and chief executive officer of a non-profit organization devoted to urban
11 design (Interview #4). While the first interview occurred in September 2019, the other
12 informants were interviewed in August 2021. The interviewees offered diverse vantage
13 points ranging from urban planning to urban design, occupying positions situated within
14 the local government, private sector, and advocacy orientation. The different
15 positionalities have been crucial for disentangling the complex matrix of intervening
16 forces that shaped pedestrian access to transit production in Hong Kong over the last four
17 decades. A standard iterative process, including content analysis (Hsieh and Shannon
18 2005), was employed to analyze the transcribed interview materials. The main reference
19 for this methodological approach was Parajuli and Pojani's examination of barriers to the
20 pedestrianization of city centres (Parajuli and Pojani 2018). The analysis was manual and
21 performed by two researchers. The first researcher screened all materials and identified
22 the content related to planning strategies, spatial characteristics of the pedestrian
23 environment, and challenges in SAPE development. Interpretations were based on
24 briefings and in-depth discussions with the second researcher.

1 The triangulation of methods enabled the identification of three main phases of
2 historical development: Phase One (1979–1980s), Phase Two (1990s–2000s), and Phase
3 Three (2010s–2020).

4 **Findings**

5 This nonconforming section presents the findings in the form of narrative history. The
6 three identified phases were divided into ‘planning’ and ‘spatial form’ for a total of six
7 sub-sections. The ‘planning’ chapters focus on the apparatuses of value and conceptual
8 models that drove the planning discourses and set the financial mechanism for
9 infrastructural development. The ‘spatial form’ sections provide an account of the spatial
10 production of pedestrian space as quantitatively measured through a series of parameters
11 and qualitatively interpreted through direct observations and in-depth interviews. The
12 narrative history describes (RQ1) how SA planning evolved over time and (RQ2) the
13 spatial characteristics and morphological development of the SAPE. Finally, the section
14 ‘From planning visions to produced space’ offers an expert-based critical summary of the
15 historical spatializations of hegemonic visions.

16 *Phase One—planning: from the connection of an expanding urban area to the*
17 *introduction of the ‘railway + property’ development model.*

18 < Insert Fig. 3 here >

19 Figure 3. Evolution of the MTR properties total GFA per year of station
20 construction and percentage of exits leading to connected commercial or residential
21 properties per year of station construction. (compiled by authors from MTRC (2020))

22 In the 1960s, owing to intense population growth and rapid economic development, the
23 viability of the Hong Kong transportation system was threatened. Thus, the first large-
24 scale railway system plan was commissioned from Freeman Fox and Partners, based on

1 the model of the Japanese public transport bound-form-built environment in metropolitan
2 areas (Tan 2014; Tan and Xue 2016; Mizuoka 2018). Initiated by the 1970 Colony Outline
3 Plan, the Hong Kong railway system was conceived as a rapid transit system built in
4 existing urban areas consisting of a street grid with rectangular blocks and an overall
5 compact form, mainly developed on Hong Kong Island and some parts of the Kowloon
6 Peninsula (Tan and Xue 2016; Shelton, Karakiewicz, and Kvan 2011; Tong and Wong
7 1997). By the mid-1980s, three lines (Kwun Tong, Tsuen Wan, and Island Lines) shaped
8 a cross-harbor rapid-transit system, connecting urban areas to greenfield peri-urban
9 stations (commonly referred to as New Town stations). Although these new towns were
10 primarily planned to host the booming population, they served a mix of residential,
11 commercial, and office functions (Interview #2). The first MTR experiences and projects
12 applying the land value capture model, specifically the ‘railway + property’ development
13 model (R+P), started in this period with the Kowloon Bay Station and the Central Station.
14 The application of R+P involves the construction of a podium with a shopping mall, office
15 buildings, and residential towers above the station (Cervero and Murakami 2008). For
16 both projects, the colonial government offered a land plot to the MTRC for free or made
17 highly favourable arrangements. Since then, raising capital through property development
18 to cover transport infrastructure construction costs has become common for the MTRC;
19 by 1991, there were 19 projects developed along the three MTR lines(Mizuoka 2018).

20 ***Phase One—spatial form: flowing into open public space***

21 < Insert Fig. 4 here >

22 Figure 4. a) Distribution of space connected to the exit and b) distribution of exit
23 structure type

1 During Phase One of the MTR SA planning, 26 of the 39 stations opened between 1979
2 and 1985 were built as underground structures serving commuters living in the built areas
3 above stations. Stations opened during these years had a utilitarian design, and the MTR
4 owned or managed a few properties in the surrounding area (1,265,300 m²; Fig. 3). Phase
5 One (see Table 1) stations comprised (1) infill stations and (2) greenfield peri-urban
6 stations. Our results revealed that infill stations connect to the urban environment through
7 numerous exits (eight on average) widely distributed in the neighbourhood to serve all
8 possible pedestrian destinations in the street network. In these older urban areas, the
9 maximum distance observed from the station centroid to the exit was 176.14 m, allowing
10 pedestrians to quickly reach the exit. The station exits (Fig. 4) mainly linked pedestrians
11 to open public spaces at ground level (92.19%). Quantitative findings may only partially
12 explain the nature of PE in older urban neighbourhoods.

13 On-site observations also revealed that these spaces are often places where social
14 interactions and exchanges occur. In these areas of the city, it is not unusual to observe
15 the elderly sitting in makeshift furniture or to find mobile food vendors selecting exit
16 premises for their businesses and other formal or informal on-street commercial or
17 convivial activities (Villani and Talamini 2021). The exit design consisted mainly of an
18 independent enclosed structure within the sidewalk (box structure) which covered the
19 stairs that led pedestrians to the station concourse. Our findings demonstrate that highly
20 connected PEs with a high intersection density (425.93 per km²) characterize the infill
21 station areas in Phase One. Moreover, the greenfield peri-urban stations were found to
22 have a similar exit location dispersal as the infill stations and considerable exit availability
23 (6.5) for pedestrians to connect to different routes in the New Towns (Table 1).
24 Nevertheless, 30.77% of these stations were connected to footbridge spaces and 15.38%
25 of the exits were connected to elevated pedestrian podia. The remaining exits, which

1 account for approximately half of the total exits, are connected to the street-level
2 pedestrian space. Most of the exits were integrated into the façades of the buildings
3 (92.31%). The street-level intersections were found scarce (257.01 km²) compared to the
4 infill station area, reflecting a planning approach aimed at segregating pedestrian space
5 (footbridges or podia) from street-level traffic.

6

7

< Insert Table 1 here >

8

Table 1. Exits type, structure and connected space characteristics across the
9 three SA development phases.

10 ***Phase Two—planning: ‘railways as the backbone of urban development’***

11 In Phase Two of the station-area planning, from the late 1980s to the 2000s, Hong Kong’s
12 urban and spatial configuration was shaped by globalization-driven developments and
13 constant re-imagining of the city. During this phase, the city underwent the Airport Core
14 Program, the largest infrastructure program in its history, including the construction of
15 the Airport Railway Line (Airport and Tung Chun Line) on reclaimed land. Since its
16 inception in 1999, the ‘railways as the backbone of urban development’ policy (HKSAR
17 Transport Bureau 1999) has consistently been implemented and supported by government
18 initiatives. In the development of new lines, railway-connected projects located above
19 and surrounding the station would need to provide a commercial return to the corporation,
20 according to the policy (HKSAR Transport Bureau 2000). The success of this system has
21 been related to the Hong Kong R+P financial model (Cervero and Murakami 2009; Tang
22 et al. 2004), which was aggressively implemented after the MTRC transitioned to an
23 entrepreneur-oriented mode of operation when 23% of the MTRC became private (the
24 MTR Corporation Limited succeeded the government-owned MTRC in June 2000 and
25 was listed on the Hong Kong Stock Exchange in October of the same year). The R+P

1 approach was successfully adopted in the 1990s for the Tung Chung, Airport Express,
2 and Tseung Kwan O lines. The planning for new railway station areas adopted R+P.
3 Stations such as Kowloon, Olympic, and Tsing Yi were planned on reclaimed land; thus,
4 stations were planned, designed, and constructed together with surrounding buildings,
5 megastructures, and flagship projects.

6 The R+P approach had a double effect on the PE. On the one hand, in the new
7 developments, grade-separated pedestrian connectivity was sought by developers as a
8 means of drawing pedestrians to commercial complexes (Interview #2). On the other hand,
9 transport infrastructure, mainly high-capacity highways, had a segregation effect on the
10 SA layout (Interview #1). In parallel development, intensity instruments (e.g. density
11 bonuses) catalyze the retrofitting of existing urban areas to integrate station facilities with
12 multilevel commercial complexes at relatively high densities (e.g. Hysan Place and
13 Pacific Place). In the market-driven environment of Hong Kong, direct three-dimensional
14 pedestrian connections to privately owned properties were produced by developers who
15 negotiated with the MTRC and several government departments to build underground or
16 overhead pedestrian connections (Interview #2).

17 ***Phase Two—spatial form: enlarged catchment and increased integration into buildings***
18 ***and indoor commercial space***

19 During Phase Two, between 1998 and 2004, 21 of the 27 stations were built as at-grade
20 or elevated stations, implementing new large-scale developments in greenfield areas or
21 low-density New Territories (the more recently urbanizing region in Hong Kong).
22 Simultaneously, some Phase One infill urban stations were retrofitted. Most properties
23 owned or managed by the MTRC were located in stations opened during Phase Two,
24 between 1998 and 2009 (Fig. 3). Specifically, 6,750,760 m² of properties were directly
25 owned or managed by MTRC, mostly directly integrated with the stations (Fig. 3).

1 Stations were planned with tower buildings clustered on and around the station, and exits
2 were directly connected to commercial complexes. Phase Two stations are distinguished
3 between (1) infill stations, including stations that underwent major redevelopment
4 through the construction of connected stations or exits; (2) greenfield urban stations
5 planned on reclaimed land in urban areas; and (3) greenfield peri-urban stations planned,
6 outside the urban core, in the New Territories.

7 The infill category includes stations in old urban neighbourhoods in prime
8 commercial and business locations, renewed and connected with the built environment to
9 shape multiple-use projects that integrate the stations with multilevel commercial or
10 office complexes at a relatively high density. These redeveloped station areas are
11 characterized by complex connections with the urban neighbourhoods surrounding the
12 station. Stations were built under pre-existing urban areas and connected to adjacent
13 buildings or stations (for example, East Tsim Sha Tsui connected to Tsim Sha Tsui and
14 Hong Kong connected to Central). The redevelopment of infill stations was supported by
15 density bonuses given to developers and results in the insertion of exits with the existing
16 urban fabric. Our findings demonstrate that exits were widely distributed in the urban
17 environment, reaching destinations up to 370 m away from the centre of the station (Table
18 1). On average, these infill stations had the highest average number of exits (10.50),
19 suggesting a very high patronage. The exit distance standard deviation for the infill
20 stations was also found to be the highest of the entire sample (93.06 m), indicating that
21 the exits were spread over a wide range of locations within the SA. This exit system
22 allowed pedestrians to reach areas of the urban neighbourhood further away from the
23 station centre. In addition, the exits were linked to a highly interconnected street network
24 (618.15 street intersections per km²). Most of the exits emerged as open spaces within the
25 street network (Fig. 4); nevertheless, some stations were directly connected to indoor

1 commercial complexes (18.75%) through redevelopment. Among the different types of
2 stations identified in this study, in Phase Two, infill stations had the highest percentage
3 of exits integrated into buildings (26.56%).

4 In greenfield urban stations, commercial and residential buildings were densely
5 clustered at and around the stations, exits were almost equidistant from the centroids of
6 the stations, and the standard deviation of the exit distance was found to be relatively low
7 (38.90 m). The data also show that exits were not well dispersed in the neighbourhood,
8 thus preventing pedestrians from reaching more distant destinations in the area through
9 station PE.

10 Among all the stations considered in this study, Phase-Two greenfield urban
11 stations had the highest percentage of exits driving pedestrians directly to indoor spaces
12 in commercial (30%), residential and office buildings (10%), and service roads/parking
13 (30%; Fig. 4). Pedestrian spaces were located within all-weather-protected facilities and
14 interiorized, self-contained spaces subject to circuitous circulation layouts of commercial
15 complexes. In these stations, reaching outdoor pedestrian networks or destinations
16 (outside the station complex) requires detours through spaces that are unfriendly to
17 pedestrians. Some exits were also connected to semi-public spaces on the podia terraces
18 (10%). The pedestrian space was developed three-dimensionally with footbridge exits
19 (13.33%). This pedestrian segregation was accompanied by a street network with a lower
20 intersection density (300.53 intersections) than that in older station areas. Owing to the
21 high concentration of services, the area surrounding the urban greenfield stations was
22 characterized by high-capacity roads bordering the station block, and stations were
23 mainly accessed through railway transport. Thus, the PEs outside the station presented
24 unfavourable conditions for pedestrians. Eventually, R+P resulted in new urban
25 developments isolated from the older urban fabric of Kowloon (Interview #4).

1 Greenfield peri-urban areas were developed as new large neighbourhood units far
2 from the urban cores. Commercial and residential functions were often concentrated
3 within a 500 m buffer from the station, and underdeveloped or rural areas surrounded
4 those functions. These stations were found to be relatively small and had the lowest
5 average number of exits (4.40) and the lowest average distance of the exit from the station
6 (70.41 m; Table 1) of the whole sample. A high percentage of exits (27.27%) were
7 directly connected to commercial spaces, eventually making the shopping centre the core
8 area of activity in New Towns (Fig. 4). In addition, New Towns showed a high connection
9 between stations and podium terraces (13.64%). These spaces were disconnected from
10 ground-level streets, resulting in accessibility hindrances and heavy surveillance by
11 private management. The street network in New Towns was found to have the lowest
12 connectivity among all the studied SAs, with 277.57 intersections per km², and the small
13 number of sidewalks along traffic arteries made walking outside the station complex
14 extremely difficult. As a result, in these areas, commercial development above the station
15 and elevated pedestrian bridges were the connecting infrastructures that linked some
16 high-end residential developments surrounding the stations (Interview #1).

17 ***Phase Three—planning: with reduced land available for value capture, network***
18 ***extension is delivered through the build-operate-transfer method.***

19 In 2007, the Hong Kong government launched 10 major infrastructure projects, among
20 which the West Island Line (WIL) and Shatin to Central Link (SCL, joined with the Kai
21 Tak area development) were included in an ambitious HK\$97 billion investment project
22 (HKSAR 2007a; HKSAR 2007b) to revive the local economy. Concurrently, the MTRC
23 also initiated the integration of the Hong Kong railway system with the high-speed
24 railway network of China, developing a 26 km high-speed infrastructure within the city
25 territory. To finance these infill developments in mature urban neighbourhoods, the

1 build–operate–transfer (BOT) financial model was preferred over the R+P mechanism,
2 mainly because R+P would have required an exceptional number of land grants to meet
3 the funding investment for construction under conditions of a lack of developable land.
4 More specifically, the land parcels available for private development were relatively
5 small and scattered; thus, the construction of direct pedestrian connections to stations was
6 not deemed a viable investment for developers (Interview #2). Moreover, there was
7 growing criticism by different developer groups and the public of the R+P instrument.
8 MTRC was criticised for favouring unfair competition for land developing rights and for
9 its inability to contribute to affordable housing provision through the R+P (Musil 2019).
10 Both these new lines required a strong government financial investment of HK\$30.1
11 billion (Musil 2019). In particular, the SCL was funded through a concession approach
12 under which the government bore the infrastructure cost and construction; the local
13 government also granted a service concession to the MTRC for rail operations for 50
14 years (HKSAR Legislative Council 2008). The WIL extension, deemed a ‘financially
15 nonviable’ project (HKSAR Legislative Council 2008), received an initial cash subsidy
16 for construction. In addition to the change in the infrastructure financing mechanism,
17 different urban design and planning objectives were introduced to lower the building FAR
18 and increase the supply of open spaces and facilities, which were later supported by a new
19 long-term planning agenda (HKSAR 2016). Clear instances of this planning direction are
20 recently opened stations, such as Kai Tak, built under a park, providing a massive
21 gathering space in front of the station (Interview #4). New station projects are expected
22 to ‘inject new vitality’ into old and poor urban districts, thus affording development
23 opportunities in the communities to be served by these lines (MTRC 2021). These
24 developments capitalize on neighbourhoods with a rich historical and multicultural
25 heritage (Kowloon City and the western part of Hong Kong Island). Overall, in Phase

1 Three, the downsizing of property development (see also Fig. 3) contributed to a shift in
2 the MTRC business model, whereby it concentrated mainly on transit operations and
3 turned to asset management (Aveline-Dubach and Blandeau 2019). Part of this shift
4 involved increasing income through retail, advertising, and other services inside the
5 stations' premises as well as through the management of rental properties, shopping malls,
6 and offices outside the stations.

7 ***Phase Three—spatial form: extending the reach of exits three-dimensionally and***
8 ***functioning as an integrated pedestrian infrastructure***

9 The latest MTR development phase, ranging from 2014 to the present, involves the
10 implementation of infill projects, where stations have been constructed underground (10
11 of 12 stations) and connected to mature mixed-use urban areas with old building stocks
12 previously not connected to the MTR network. To date, Phase Three has only included
13 infill stations. Our findings demonstrated that the exits (limited in number, 3.75 on
14 average) spanned highly distant areas of the neighbourhoods; Phase Three stations had
15 exits located at the highest average distance (185.45 m) from their centroids (Table 1).
16 Further, Phase Three SAPE connected extensively distant and multilevel destinations in
17 the neighbourhoods. Almost all exits were found to be connected to the open space at
18 ground level (94.44%), with a structure built using independent boxes or integrated into
19 buildings. The recently completed exits are standalone structures with a wide entrance to
20 the station. Located in old neighbourhoods, these stations connect topologically separated
21 and topographically diverse urban areas. Some pedestrian connections reached elevated
22 podiums approximately 40 m above the station level. Owing to the hilly topography of
23 some station areas, the street network density was lower than that of Phase-One infill
24 stations. Subsequently, the station exit system has been widely used as a supplementary
25 or alternative pedestrian street network in a station area. Although the newest projects on

1 the SCL were set to redevelop large urban areas, the exit system was also planned to
2 interconnect the surrounding older urban neighbourhoods.

3 *From planning visions to produced space*

4 < Insert Fig. 5 here >

5 Figure 5. Axonometric views of the six spatial forms corresponding to the three
6 phases of MTR station-area

7 The evolution of SAPE shows how planning goals have influenced the production of SA
8 pedestrian spaces (Fig. 5). In Phase One, the embryonic development of the MTR aimed
9 to overcome surface transportation limitations, serving an expanding population with an
10 efficient rapid transit system. In this phase, stations link pedestrians to a highly connected
11 street-level network through exits that are widely distributed in the neighbourhoods.
12 Subsequently, stations in Phase One ‘tend[ed] to be built underneath [a consolidated
13 urban environment]. There might be a corner of a building with a station entrance, but the
14 rest of the building interacts well at street level [and these stations] are in a well-connected
15 grid’ (Interview #4). PE connected to infill stations mainly consists of outdoor public
16 spaces in the form of narrow sidewalks with high pedestrian activity in consolidated urban
17 areas. In such PE, commuters directly ‘come out from the station, [and] walk across the
18 road’ (Interview #2). In contrast, elevated pedestrian corridors seclude pedestrians in New
19 Towns in peri-urban areas.

20 Phase Two marked a shift in transport planning, shaping the city itself through the
21 R+P financial model. SAPE was significantly more indoor-oriented and volumetrically
22 unfolded in commercial flagship developments. In prime commercial locations, stations
23 were redeveloped; thus, the PE was partially rerouted inside new commercial complexes
24 resulting in ‘genuine vertical urbanism’ (Interview #3). ‘Developers are more than willing

1 to pay the money to connect to the MTR [aiming to] draw many people into the shopping
2 mall' (Interview #2), thus producing a privately owned public space that is perceived as
3 being 'not that public' (Interview #4). In the infill commercial redevelopments, 'there is
4 no seating in the public area [which] is part of the commercial complex' (Interview #4).

5 The urban blocks in greenfield station areas are larger with lower street
6 intersection density, and high-capacity car-oriented infrastructure characterizes PE in
7 these SAs. Inevitably, 'all the lives of the conventional city are internalized into the
8 shopping malls; therefore you cannot have a wide diversity of retail and eating facilities
9 because all the tenants in a shopping mall are strategically selected by the shopping mall
10 owners, the anchor tenants' (Interview #1). From Phase One to Phase Two, the destination
11 of SAPE shifted from the outdoor public space to a station-integrated commercial
12 complex. 'So the building is really sitting on an island. And it only becomes nice once
13 you get onto the roof of the podium level. And then you're into somebody else's land.
14 Basically, it's no longer part of the public realm. It's a secluded public realm or privatized
15 public realm, more a private space, wherever you want to call it, it's a private space, really.
16 So quite separate' (Interview #4). Sometimes, semi-private outdoor spaces are gated for
17 exclusive residents' use; therefore, 'the wider benefit' remains unclear (Interview #2).
18 'Not just for the residents, but also for the public' (Interview #2).

19 Phase-Two PE was confined to what was defined as an indoor 'station-based real
20 estate ideal' (Li 2013), 'where the station becomes an island' (interview 4). The overall
21 directness of the SA route within Phase Two is limited by the rationale for channelling
22 pedestrians inside the circulation plans of commercial spaces, which are considered
23 'premium networked spaces'(Graham 2000, 185; Graham and Marvin 2001).
24 Nevertheless, in these SA, the local connectivity is low, whereas the connection to the
25 MTR network, high-capacity vehicular roads, and global flows (e.g. airports and high-

1 speed rail) is high. The vehicular transport infrastructure has a ‘segregative effect’ on the
2 layout of these SAs (Interview #1), where pedestrians can only rely on the elevated
3 pedestrian network to reach the waterfront or cross the station from North to South
4 (Interview #4). In these cases, the equitable use of pedestrian infrastructure has become
5 a concern, especially when facilities for disabled people are not adequately provided
6 (Interview #3).

7 A change in the infrastructure financial mechanism and the need to redevelop and
8 connect mature urban neighbourhoods triggered Phase Three. The station exit system has
9 become a means for pedestrians to navigate and reach destinations further apart in
10 neighbourhoods on different topographical levels. The PE connected to the station mainly
11 consists of a street-level open space integrating some outdoor playgrounds and larger
12 gathering spaces, potentially creating ‘opportunities for a community to wait for friends
13 in front of the station [...] To have a better environment for pedestrians and the
14 community’ (Interview #4). However, the construction of new lines and stations in Phase
15 Three improved local accessibility and lifted housing market prices in neighbourhoods
16 newly connected to the MTR network (Higgins 2019; He et al. 2021). In Phase Three,
17 there was less ‘room for a large-scale commercial redevelopment on top of the stations’
18 (Interview #2). Nevertheless, as ageing blocks are undergoing complete redevelopment,
19 future station-connected PEs and street networks might radically change under the
20 pressure of a rampant gentrification process (e.g. block-scale redevelopment might occur).

21 **Discussion**

22 Collectively, the phases of the historical evolution of the Hong Kong SAPE show
23 how strategic planning has changed over four decades, moving from a utilitarian
24 infrastructural construction to a public financing approach through a phase of value-
25 capture-driven development. Noticeably, Phase One entailed a dual-mode approach

1 which was evident in the analysis of the built PE. On the one hand, the paper illustrated
2 the retrofitting of existing built-up areas connecting underground stations to their public
3 open spaces via free-standing exits (92.19% of the total). By contrast, the study described
4 the materialization of overseas (primarily European) theoretical urban models based on
5 grade separation (46.15% of greenfield peri-urban exits connected to podia and
6 footbridges). The theoretical underpinning of Phase Two may be ascribed to the impact
7 of the increasing global financialization that resulted in the partial privatization of the
8 rapid transit service provider and consumerism-driven production of space. In Phase Two,
9 exits connected to an indoor commercial space ranged from a minimum of 18.75% in the
10 infill stations to 30% in the greenfield urban stations. Eventually, the third ongoing phase
11 witnessed a resurgence of the hegemony of volitional spatial planning (Cupers 2016) over
12 profit-driven public investment (Fig. 3). Concurrently, station exits increased their reach;
13 the average distance from the station centroid ranged from 82.17 m in Phase One to
14 185.45 m in Phase Three. Moreover, the Phase Three SAPE functions as a network
15 interconnecting topographically diverse neighbourhoods, thus completing its
16 transformation from a station connecting structure to an SA interconnecting infrastructure.

17 The transnational building of urban design (Orillard 2014) profoundly influenced
18 Hong Kong's urban space production and pedestrian access to transit. In Phase One,
19 utilitarian modernist principles drove the design of PE within sizeable public housing
20 estates in New Towns. The influence of Colin Buchanan's seminal work *Traffic in Towns*
21 (Buchanan 1963) is found in a three-dimensional grade-separated pedestrian network that
22 extends over new urban expansions (Fig. 5). In this phase, owing to the pressure of rapid
23 population growth, MTR construction and urban development had to proceed quickly,
24 leading to a lack of integration between rural areas and self-sufficient peri-urban

1 developments made of few offices scattered around the SAs, residential buildings, and
2 shopping malls (Interview #2).

3 In Phase Two, the adaptation of postmodern precepts to high density produced
4 peculiar hybrid urban design ensembles made of large commercial containers surrounded
5 and surmounted by cruciform plan residential skyscrapers or prismatic office towers (Fig.
6 5). Phase Two was also characterized by purely residential peri-urban SAs (Interview #2).
7 In this phase, the failure to integrate the SAPE with the surrounding areas was partially
8 due to site conditions – new developments on reclaimed land were often physically
9 separated from old urban areas by existing traffic arteries or geographical features – and
10 the need to subject PE to the logic of commercialism-driven profit.

11 Eventually, Phase Three focused on boosting the process of mixed-use urban
12 renewal by providing rapid transit accessibility and interconnected pedestrian
13 infrastructure. Thus, the infill development of Phase Three, beyond the commonalities
14 with Phase One, constitutes an evident attempt to build a three-dimensional
15 interconnecting network diffusely linked with the existing open public space to cater to
16 the synergetic amelioration of the urban environment. Despite the recent (Phase Three)
17 apparently genuine attempt to operate towards the interests of the whole society, in Hong
18 Kong, the urban development process still lacks community involvement (Interview #3),
19 being profit-driven and favoured by the local government as the primary source of income
20 since the colonial age (Interview #3).

21 Beyond the evolution of pedestrian access to transit and all its possible coherent
22 narratives lies a complex dynamic and conglomerate of contrasting economic interests,
23 technical questions, and societal demands, represented by various stakeholders, as
24 emerged in Interview #2: '[T]his is really complex. They need to consider whether we
25 can acquire the land, whether there are technical challenges, what is the ground

1 situation..., and many different aspects are to put in, not just technical, but also social,
2 land availability, etc.’ Disentangling such a complex net of power relationships and
3 identifying the reasons for ‘meaningless’ public consultation (Interview #3) will require
4 further research. Such a scholarly effort should align with this study in interpreting the
5 SAPE not as a coherent model or a consistent approach to be emulated but rather as a
6 system in evolution. As emerged from the analysis, each historic phase accounts for
7 different hegemonic visions, technological progress, and balance of power between
8 stakeholders.

9 A significant contribution of this study is its research design: the employment of
10 an analytical method aimed at systems thinking enables the universal transferability of
11 the approach. The quantitative analysis of the produced space is easily reproducible on
12 rigorous methodological grounds, while primary data collection and interpretation of
13 qualitative findings depend on contextual factors and scholars’ positionality. Furthermore,
14 the findings will necessarily be context dependent. Finally, the transnational spatialization
15 of hegemonic ideas into the production of space is necessarily filtered by local societal
16 values, structures, and practices, as revealed by this analysis of the case of Hong Kong.

17 **Conclusion**

18 This study aimed to disentangle the dynamic interweaving of hegemonic forces, planning
19 strategies, and financial instruments that shape SAPE production. A focus on the extreme
20 conditions of Hong Kong – an early operator of underground rail in Asia and a city with
21 a mature and continually evolving rapid transit system in which five out of seven million
22 inhabitants use the metro daily – can provide crucial lessons for many cities worldwide.

23 Undoubtedly, the Hong Kong transit-supportive and high-density nodes above
24 and around many stations have advanced the city’s three-dimensional spatial rationale
25 and urge the examination of PE characteristics that promote user-centered urban design.

1 Through a review of documentary material, first-hand spatial data, and in-depth
2 interviews, this study retraces the evolution of PEs connected to stations, advancing a
3 nuanced understanding of the spatial features of the ‘seamless pedestrian integration’
4 (Suzuki, Cervero, and Iuchi 2013, 179). This study identified three SA development types
5 across three phases, illustrating how PE evolved from a station-connecting structure to an
6 SA interconnecting infrastructure (Figs. 4, 5).

7 Hegemonic planning visions promoting traffic-free town centres influenced a
8 demographic-concerned Phase One (1970s–80s), resulting in new metro lines retrofitting
9 existing urban areas or expanding into greenfield developments to ease the pressure of
10 population explosion and industrial upgrading. Our findings demonstrate how transit
11 stops in this first phase connect directly to the open space at the ground level of existing
12 urban areas or elevated podia in greenfield developments (Figs. 1–5). The need to boost
13 international investment and global city status ultimately coincided with the partial
14 privatization of the MTR, resulting in the financially shaped Phase-Two consumerism-
15 driven railway-cum-property construction (1990s–2000s). All-encompassing hyper-
16 capitalism then subjected the production of space to the logic of profit, seeking land
17 appreciation through transit-connected real-estate developments and encapsulating access
18 to transit within shopping malls (Fig. 3). In the 21st century (2010s–), an economy-
19 concerned Phase Three resulted from the contraction of demographic pressure and the
20 property sector. The subsequent crucial role of the central government in boosting urban
21 (re)development entails shaping the volitional geography. In this phase, planning
22 strategies follow international practices to propose loose and protean concepts of
23 sustainability and quality of life (HKSAR 2016). Such practices capitalize on rich urban
24 cultural capital and promulgate SAPE as an interconnection between disconnected old
25 neighbourhoods (Figs. 1–5).

1 Today, Hong Kong’s seamless pedestrian integration and three-dimensional space
2 development, as well as the recent intensive use of underground spaces, continue to
3 progress. As the Hong Kong SA has undergone multiple phases of development with
4 different spatial and programmatic characteristics of the PE, policymakers, planners, and
5 urban designers are confronted with a legacy of diverse approaches and the resulting
6 spatial configurations. With this caveat in mind, the PE characteristics and limitations
7 highlighted in each Hong Kong SA development phase can be relevant both locally and
8 internationally. Nevertheless, benchmarking of SA development against Hong Kong by
9 mainland Chinese and Asian cities (Aveline-Dubach and Blandeau 2019; Bon 2015) may
10 reinforce the global hegemonic forces with which Hong Kong is aligned. Context-
11 dependent responses to local geographic specificities are necessary to avoid producing
12 generic spaces. This study argues against the uncritical adoption of international urban
13 design models. From this standing, it demonstrates that there is no one ‘Hong Kong model’
14 but a series of visions, concepts, and approaches that contributed to the production and
15 superimposition of various spatial forms across locational and temporal dimensions.

16 This paper illustrates how the SAPE recently stepped away from a business-led
17 urban regime that not only engulfs pedestrians into a consumerist apparatus but also
18 compromises users’ freedom of movement and choice. Although strategic planning
19 currently points in a promising direction, much remains to be done to reduce the excessive
20 reliance and dependency on the private sector in urban design. This paper advocates a
21 pedestrian-centered set of prescriptive policies that prioritize making SAPE a place for
22 public life.

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