City Space Architecture

Retrofitting Public Space.
Pathways for Adding Public Spaces in Existing Urban Fabric

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Abstract
Public space is critical for urban life to thrive. Yet, a global deficiency exists in available public space, particularly in the cities of the global south, but affecting cities in the global north as well. While much attention has been paid to upgrading existing public spaces, the thorny problem of retrofitting additional public spaces in existing urban fabrics has been under researched. Grounded in a review of the value and costs of public space, it is argued that there is no 'ideal' amount of public space that applies universally, and that public space supply should be allowed to change over time as urban and social conditions change. Public space suffers from a directionality problem in which adding public space is much harder than subtracting public space, such as through encroachment or sale of public land. Through a comparative case study approach, this paper responds to this problem by articulating the solution space to retrofit public spaces in existing neighbourhoods through five distinct pathways, namely 'acupuncture', 'superimposition', 'marketplace', 'reblocking' and 'plot subdivision'. It explores the particular characteristics of each approach in varied urban contexts and provides a cross-cutting typology that connects practices across a global north and south context. The five pathways are offered as a practice-oriented typology to empower planners and policymakers to make more informed urban planning and design *choices*.

1. Introduction

Public space, defined here broadly as the entire network of roads, streets, lanes, parks and other publicly accessible open spaces, is a fundamental urban feature that is important for walkable access, support of urban livelihoods, the social functioning of communities and the emergence of civil society. Public spaces include all places that are publicly owned or are of public use, and are accessible by all for free (Charter of Public Space, 2013). Over the last decades, research and practice have focused on making better use of the available public space, such as by reprofiling existing public spaces to make them more people-oriented and make them adaptive to the effects of climate change. However, such approaches circumvent the absolute lack of public spaces in many cities, particularly in neighbourhoods that were shaped through forms of market-driven and informal development, where public space is often sparse to save on construction, maintenance and land acquisition costs. Adding public space and increasing pedestrian connectivity is often worth it for cities in the long term, because of the ways in which a more diverse and fine-grained network of public space can accommodate higher built densities and higher degrees of functional mix, ultimately delivering more sustainable forms of urbanity. However, increasing the overall supply of public space in an existing urban fabric is a thorny problem, as it often interferes with private land holdings and established built assets. The aim of this paper is to explore this problem of retrofitting new public space in existing neighbourhoods in a practice-oriented manner. It is an exercise of synthesis, drawing on a multitude of existing cases to articulate the solution space to this problem for policy makers and urban practitioners.

The deficiency of adequate public space is a structural and persistent problem. Its shortage came under renewed scrutiny and popular attention during the Covid-19 pandemic (Mehta, 2020), but with few exceptions, this has not led to widespread action. UN-Habitat' (2013) report on *Streets as public space and drivers of urban prosperity* calculated that inadequate land is allocated to streets, varying between 15 per cent in city centres to less than 10 per cent in suburban areas. Similar rates have been documented for urban villages, where the quantity of public space varies between 15 per cent in the village old cores, up to between 25 and 50 per cent in new extensions (van Oostrum, 2021). The latest 2023 SDG11 Synthesis report found no significant progress as more than three-quarters of cities for which data on SDG indicator 11.7.1 is available have less than 20 per cent of their area dedicated to open public spaces and streets.

The Sustainable Development Goals, and the implementation framework of its urban component, the New Urban Agenda, both emphatically promote public space (Mehaffy, 2019), but neither document clearly articulates practical pathways to add public spaces. Contributions to this journal have argued for the implementation on the commitments made by countries on contents related to public space (Bravo & Guaralda, 2017; Mehaffy, 2019). This paper offers a five-fold process-oriented typology of retrofitting additional public spaces into existing urban fabrics, listed here by their shorthand, namely 'acupuncture', 'superimposition', 'marketplace', 'reblocking' and 'plot subdivision'. The focus here is on process-oriented pathways that describe transformative relations between urban design categories, such as plots, Floor-Area-Ratio (FAR), public space and the agents that act on them, rather than on the transformation of specific urban design configuration to another – such as from cul-de-sacs to grids as an illustrative example.

The analysis aims to be cross-cutting between global north and global south practices and pays particular attention to the way in which pathways can be practiced both through formal planning mechanism and through more informal means, thereby bringing into conversation different planning and urban design discourse that often remain fragmented between formal and informal planning practice. For each urban design pathway to retrofit public spaces, two examples are mapped and investigated to show the supply and distribution of public space before and after the transformation. The paper discusses the advantages and disadvantages of each pathway, using the examples as illustration. The paper concludes with articulating the contextual appropriateness for each pathway. Ultimately, the aim of this paper is to present the five-fold typology as a solution space for policy makers and urban practitioners.

2. Incremental public space supply

In this section, the concept of incremental public space supply is introduced. By bringing into focus the possible pathways to retrofitting public space, the paper explicitly recognizes that it is not always desirable or realistic for new neighbourhoods to be built with abundant public space, particularly for lower-income communities. The construction, maintenance and land acquisition costs of public spaces is expensive and can drive up residential costs. Just as the discourse on informal settlements has embraced the incremental upgrading of houses as funds become available to the residents over time, this paper argues that incrementality in the production of public spaces should be more central to the planning and urban design practice, adding public spaces retroactively as residents gain savings.

Value of public space
The value of public space to enable urban life is recognized in SDG 11.7 on providing access to safe and inclusive green and public spaces, and may be summarized as three broad uses – physical access, social-political and environmental. The importance of each of these uses will vary between places and critically, shifts in significance as places urbanize.
First, public spaces are critical to provide access within cities, particularly to those who walk and cycle. A highly permeable access network, with multiple, short routes between destinations, encourages walking, lessens dependency on motorized traffic and is thus critical for sustainable urbanity. In informal settlements, public space also affords critical access to basic services. In many cities in Africa, Asia and Latin American, the cost of private and even of public transport is high, and the urban poor rely heavily on public space to walk to their destinations (UN-Habitat, 2013). Yet, in cities in the global south, urban permeability generated by formally produced public space is often low (van Oostrum, 2024). Informally produced public space in these cities typically take up relatively less land, but adds significantly to the city's urban permeability.
Public space is also important for livelihoods, human well-being and as a place people to socialize. Many people, particularly in the global south, use public space to make a living directly, including hawkers, street performers, or by using public space as an extension of the home or business, such as for letting produce dry or ripen. Public space also supports livelihoods indirectly, such as construction workers who take their lunch break in public space (Hackenbroch, 2013). With climate change ever more pressing,

public space is also increasingly recognised for its ecosystem services to people. Through provision of pervious surfaces and plantation, public space generates significant direct health benefits for people, as well as providing the adaptive capacity to deal with changing climates.

Public space also has direct ecological functions, both as a means to mitigate greenhouse gas emissions and help adapt the urban fabric to extreme weather events, but also as a means to support the social function of public space trough providing ecological services to the people using public space (Santos, et al., 2022).

Finally public space also enables urban life through its role in shaping communities and politics. Movement, engagement and congregation in public space generates important social bonds that bind urban communities. Urban public space has long been linked to urban civic virtue and citizenship (Sennett, 1977), and to the practice of democracy (Mitchell, 2003). Public space allows people to mobilise through mere proximity, which allows them to challenge urban injustices more effectively (Bayat, 1997).

Costs of public space

Public space's essential role to urban life is not without costs. Broadly four kinds of costs are associated with public space, and collectively, they present key barriers to sufficient public space in cities.

The first major cost to public space is land acquisition. While in many contexts there are mechanisms in place to guarantee a certain amount of public space as cities expand, when such initial rates of public space are regarded as too low, private space has to be converted to public use, often through acquisition. For new city extensions, many cities have regulation in place that demands a fixed rate of land to be set aside for public space. For example, the development authorities in Bangalore and Ahmedabad set rates of 25 and 20 per cent respectively. Another mechanism is when the common or collectively held land in rural settlements is transferred to local governments when those rural villages are integrated into the city (van Oostrum & Dovey, 2024). While such practices work for new city extension, it is challenging to transfer such practices to an existing urban fabric.

The second major costs are the construction of infrastructures within public space that give it much of its value. This ranges from the pavement and furniture visible above ground, to the many underground infrastructures that are enabled by public space.

The third major source of costs related to the infrastructures is the maintenance of public space. The issue of maintenance is typically sidelined in strategies for achieving sustainable urban development – considered to be lacking the flair and appeal to feature at a high-level, or to garner political support. However, neglecting the small incremental funding needed for maintenance and repairs leads to significant loss of use and is extremely costly in the long run, as lack of maintenance inevitably leads to expensive emergency repairs and high replacement cost. Even more concerning is that failing infrastructure can lead to significant loss of human live, the risk of which is only set to rise as climate change is increasing the exposure of cities to disasters.

The fourth cost associated with public space is both a burden on, but also a generator of value at the same time, namely the effect public space has on the land value of surrounding development, and its potential to contribute to gentrification (Nevárez, 2012). The more land is used for public space, the less space is available for built development, generating scarcity that typically leads to higher prices. High-quality and

well-maintained public space will further increase land prices to surrounding development.

Balanced amount of public space
Acknowledging both the shifting uses and costs of public space, this paper is premised on the idea of a balanced supply of public space that is allowed to change over time as urban conditions change. Some of these key conditions are changes in density, changes in functional mix and changes in the economic welfare of its residents. This paper contends there is no 'ideal' amount of public space that should be available in a city, as that presumes a static and homogenous urbanity.

As public space is a public good that is associated with costs, maintaining a balanced amount of public space suffers from a directionality problem in which adding public space is much harder than removing public space. It is for this reason, that local governments are often better off maintaining excess public space for a time, as regaining public space after it is lost is much more difficult. When there is too much public space, encroachment and infill by residents and local government can help to reduce public space. In many social housing estates that were planned with excessive amounts of public space for example, residents have encroached this excess public space and giving it more productive purposes (van Oostrum, 2023).

For cities that are urbanizing fast and with few resources, it can be undesirable to have high levels of public space, as this would price out many residents, and leave the vast public space ill-maintained and without enough people to make that public space socially conducive. In such cases, it can be better to have few, well-functioning public spaces, and then incrementally add public spaces as conditions change. The remainder of this paper articulates five pathways for those incremental additions.

3. Methodology
Urban forms are always being evolved and adapted to changing circumstances. To map and document retrofitted public spaces in existing urban fabrics thus presupposes an ontology that distinguishes between an earlier, 'finished' urban form, from later alterations. Particularly in the informal settlement of land, where the degree of co-evolution between urban design and architecture is high, it can often be arbitrary to distinguish between the initial growth of the public space network, and the subsequent adaptation or addition of that public space. Indeed, processes of incremental infill are also common in the global north, such as when formerly inaccessible industrial areas are transformed into spatially integrated neighbourhoods. Nevertheless, this paper defines the retrofitting of public spaces as the addition of new public space through a mode of production that is fundamentally different than the mode which generated the erstwhile layout. Conversion of uses within existing public spaces are not considered in this study. The five-fold typology and illustrative cases in this paper draw upon long-term engagement with urban design and urban planning practices. The cases presented in this paper do not constitute a project evaluation – rather they are explored to provide insights into the plurality of approaches to inform a more generalized typology that can serve as a tool for transfer of practices. They constitute a bottom-up typology in the sense that they draw very specifically from existing practices, rather than through the application of an a priori framework. The typology is not exhaustive, but the five modes

of retrofitting public spaces have aimed to capture the most significant practices observed globally. Practices of road widening, which also add public space, have generally been excluded from this scoping, in part because they are so commonplace, and seldom add to the diversity and connectivity of the public space network. The analysis of cases across varied geographic context is part of a tradition of comparative urbanism, in which the particularities of each place emerge from the differences observed to other places.

The public space mapped for each case captures an area analogous to a neighbourhood. However, depending on the local context and the approach, retrofitting public spaces can be applied at different scales, and to account for these differences, two scales were employed, namely a case study area of 1000 by 700 metre and 700 by 400 metre. Unless otherwise mentioned, the public space was mapped by the author using satellite imagery. The mapping methodology is simplified to the extent that is shows a before and after, leaving out the sequence of changes that may have occurred in-between, but this does not mean the transformation was a singular process. Public spaces may have been added in between, before they were removed again. Where relevant, other urban design components relevant for the retrofitting of public space, where added to the maps.

4. Pathways to retrofit public spaces

Acupuncture

The first urban design pathway to increase public space can be understood as a form of acupuncture urbanism – the piecemeal acquisition or temporary use of underutilized or vacant land for public space. The term acupuncture urbanism was first used in the work and writings of Manuel de Solà-Morales (2008), and has been subsequently popularized by Jaime Lerner, urban planner and the former mayor of Curitiba in Brazil in his book Urban Acupuncture (2014). The concept of acupuncture urbanism can be applied to a broad range of urban design and architectural interventions that are individually small in scope but are leveraged for impact as part of a network of interventions, and are designed explicitly with the aim of catalysing further transformations in-between and beyond the network. Acupuncture urbanism is most often employed as an approach for upgrading existing public spaces, but in the context of this paper, the concept is employed as an approach to retrofit new public spaces into existing urban fabrics.

The first case that illustrates the acupuncture approach is Medellin, Columbia. Here, concurrently with developments in Curitiba, an acupuncture approach was developed as a way to add public spaces in a largely informally developed urban fabric across Medellin's hill sides. Figure 1 shows the neighbourhood of *Comuna Nororiental*, which was part of an "Integrated Urban Project" (PUI) initiated in the late 2000s to structurally address the neglect these neighbourhoods faced in the past (Dávila & Daste, 2011). Based on a pro-poor participatory approach that linked new public space to strategies for increased job opportunities and improved housing, the acupuncture in Medellin was specific in the way each public space retrofit was linked to existing or future public facilities, including new libraries, new cable car stations, and existing water management facilities (Capillé, 2018; Calderon, 2008). The PUI was conceived on a low budget in such a way that the strategic acupuncture interventions in *Comuna Nororiental* were intended to lead to a self-reenforcing process of incremental investments in the

neighbourhood that would help to regenerate and integrate these segregated areas (Calderon, 2008). Through workshops and other means of engagement, the community was significantly involved in both the design and construction process. In the case of *Comuna Nororiental*, as the initial settlement was dense, the retrofitting of public space required the selective demolition of existing houses, a task that was also delegated to the community to be carried out (Calderon, 2008).

Figure 1. Retrofitted public space through acupuncture in Comuna Nororiental, Medellin.

Long before the phrase acupuncture urbanism was coined, this approach was already demonstrated in Amsterdam. Specifically, the neighbourhood of Jordaan is examined here, which was built in the early 17th century to house working class people, laid out in simple urban blocks with narrow streets that followed the agricultural structure of ditches, with very few larger public open spaces. By the mid-20th century, the neighbourhood had decayed, faced a shortage of affordable housing, and in part because of damages sustained during the Second World War had a considerable number of vacant lots. The architect Aldo van Eyck, who initially worked in the town planning section of the Amsterdam public works department, reimagined these vacant lots for temporary use as he developed hundreds of playgrounds across Amsterdam by repurposing underutilized parcels in the post war period (Withagen & Caljouw, 2017). Figure 2 shows both the public spaces that are still present today, as well as temporary public spaces that have since been developed for other private uses. These public spaces

demonstrate acupuncture urbanism, as they constitute an entire constellation of playgrounds, each within walking distance of the other, and to generate spill-over effects to the surrounding neighbourhood, particularly as they were not fenced and did not require membership or entrance fee, like most other playgrounds at that time (Withagen & Caljouw, 2017).

Figure 2. Retrofitted public spaces through acupuncture in Jordaan, Amsterdam. Drawn by author based on satellite imagery and historical maps from the Collectie Stadsarchief Amsterdam: Map of Amsterdam, Page G3-G4 and H3-H4, Scale 1:1.000, produced by the Dienst Publieke Werken, available at https://archief.amsterdam/beeldbank/

The two examples of acupuncture urbanism as an urban design pathway to increase public space reveal the context in which such an approach works well, namely in relatively high dense urban areas where demolition and/or reallocation is costly or difficult. Here, acupuncture can provide relatively easy and inexpensive new public space, especially when vacant lots are utilized. However, this approach also has potential to result in a more incoherent network of public space. Moreover, this approach relies on an already relatively fine-grained public space network, that can provide the connections between the acupuncture interventions. Without such a pre-existing network, acupuncture may not be effective, especially in its capacity to create through-connections that enhance permeability.

Superimposition
The second urban design pathway to increase public space is the superimposition of a network of streets and public spaces onto the existing urban fabric. This strategy has a long tradition, in which the examples of Paris, Bucharest, Istanbul come to mind. These

urban design interventions typically relied on an authoritative state that was able expropriate land using eminent domain and built assets in a way that has not resonated well with contemporary participatory design approaches. Indeed, Jane Jacobs, who argued so eloquently for adequate public space and small blocks, lived in a neighbourhood that was bifurcated by two avenues (7th and 8th avenue) that had been superimposed on Greenwich villages in the early 20th century, and resisted vehemently against a new urban highway that would have further bisected the urban fabric. Yet, such planning practices of superimposition are still common, particularly in the global south, and thus an urban reality that needs to be reckoned with.

Figure 3. Retrofitted public spaces through superimposition in Tainan. Drawn by author based on satellite imagery and historical map at Taiwan Governor's Office Archives, Taiwan Archives, National History Museum, Collection number: 00005343015s Tainan City Street House Building Regulations Implementation and Approval" (台南市街ニ家屋建築規則施行認可) (November 1, 1911), "Volume 4 preserved in the 15th year of Meiji 44",

The first case that illustrates the approach to superimpose a new network of public spaces onto an existing urban fabric, is the case of Tainan, which directly drew inspiration from such practices in Paris. After Taiwan was incorporated into the Japanese empire in 1895, the Japanese planning authorities initiated *shikukaisei* (市區改正) in Tainan, roughly translated as 'urban revision' which was intended to improve

hygiene, fire safety and military control (Chaoqing, 2018; Chen & Lee, 2019). A newly established city planning committee was charged with its implementation, which commenced in 1911 (Chaoqing, 2018). Acquainted with, and inspired by, the example of the superimposition of boulevards in Paris, the planning authorities planned a series of intersecting boulevards to form blocks between 150 and 250 metre in length superimposed onto the original fabric of Tainan, which consisted for the majority of narrow alleyways that had formed incrementally. *Shikukaisei* was accompanied by new building codes which authorized the government to demolish buildings that were considered a safety hazard and the installation of a sewer system (Chaoqing, 2018; Lin & Cheng, 2008). The resultant urban fabric has two distinct characters – one of primarily residential buildings along the older, narrower lanes, and one of mixed-use buildings along the newer, wider boulevards – which together form a diverse network of public spaces. Till recently, the public space of the superimposed blocks was considered superior over the old lanes, of which it was said that they were too narrow for lighting and ventilation and did not allow car access (Lin & Cheng, 2008). However, these erstwhile public spaces have recently been reevaluated for their intimate scale and higher level of pedestrian quality.

A more contemporary application of the superimposition approach can be found in Kibera, one of Nairobi's largest informal settlements. Here, in 2018 a series of infrastructures were superimposed on the informally developed public space network. The superimposition here is the result of three different concurrent projects, namely the Nairobi integrated Urban Development Master Plan, the Kibera Slum Upgrade Initiative, and the Nairobi Railway Relocation Action Plan (Mitra et al., 2017). The latter two enjoyed significant community support and had a relative degree of success as these involved participation and consultation achieved with residents (KDI, 2018). Although the Kibera Slum Upgrade Initiative required owners to remove structures adjacent to the new construction, it was broadly supported by residents as they recognized the improved access and the emergent opportunities for business and enhanced security (Mitra et al., 2017). The Nairobi integrated Urban Development Master Plan however was primarily intended to elevate traffic congestion through the identification of missing links. To construct 'Missing Link #12', eviction notices were issued to all structures within the alignment of the new road, leading to the displacement of an estimated 11,500 people (KDI, 2018). This new urban highway, despite its inclusion of sidewalks (KDI, 2018), has not been well integrated with the neighbourhood and adds little benefit to the residents.

The two examples of superimposition as an urban design pathway to increase public space reveal that while it is easy to dismiss this approach on account of its use of demolition, the examples demonstrate both the enduring appeal of this approach, and its potential to add significant amounts of public space in a short period of time. Moreover, the two examples also reveal that the juxtaposition of new public spaces on an existing network can significantly add to the diversity of the public space network. The new types of added public spaces have the potential to also generate changes in the type and orientation of functional mix, as plots along the new public space reorient to the new public space and its generated traffic. It is not accidental that both superimpositions are onto informally generated urban fabrics, which reveals a secondary motive for superimposition as a tool to make such informal spaces more legible to the state.

Figure 4. Retrofitted public spaces through superimposition in Kibera, Nairobi. Only the lanes with high degree of confidence were mapped.

As this approach relies on expropriation of land, it is potentially very expensive if loss of land, livelihoods and buildings are fully compensated to the residents. This approach may therefore work best in a context where land is not fully developed, to lower the negative impact on existing communities.

Marketplace
The third urban design pathway to increase public space is to generate a marketplace for public space. The most common market mechanism, known also as incentive zoning, is exchange of additional floor space (expressed in FAR) to landowners who provide additional public spaces, but it is equally imageable that public space is traded for other forms of compensation, such as through carbon trading schemes. The best-known application of this approach may be the programme in New York, which generated many privately owned, publicly accessible spaces next to new high-rise development, but has since been applied in many other contexts. For example, FAR incentive policy to generate additional public spaces was already introduced in South Korea in the early 1980s (Jung, 2019).
In the 1961 zoning resolution, New York introduced an incentive program, whereby the base FAR available to real estate developers was lowered, but were additional FAR up to 20 per cent of the total floor area of the building could be granted, if publicly

accessible space was created (Németh, 2009). It is estimated that 70 per cent of developments between 1961 and 1975 made use of the zoning provision and that by 2000 the city had more than 530 privately owned publicly accessible spaces (Kayden, 2000). Whyte's (1980) famous assessment of these spaces found that the results were mixed, with many spaces that were ill designed and failed to attract many people and engender active street life. The public spaces generated through FAR trading were found to often exclude certain types of people and activities (Németh, 2009). Figure 5 also shows privately owned public spaces that were created through philanthropic donations, including the well-known Rockefeller centre, Paley Park and Greenacre Park, which provide higher quality public space than most of the spaces generated through FAR trading. This case shows that a marketplace for public space heavily depends on the functioning of the regulations that are set on that market. Indeed, new design standards were introduced for the privately owned public spaces based on the results from Whyte's study.

Figure 5. Retrofitted public spaces through FAR trading in mid-town New York. Drawn by author based on satellite imagery and database of Privately Owned Public Spaces by apops and MASNYC available at https://apops.mas.org/find-a-pops/ using data collection by Kayden, 2000.

The second case to illustrate this approach is in Ahmedabad, where a formal process exists to carve out public space connections through an FAR mechanism, which emphasizes connectivity to new metro stations (Maheshwari et al., 2022). Upon

initiating Ahmedabad's first metro line, a transit-oriented zone was conceived along the route, in which higher FAR was offered than the surrounding neighbourhoods. However, to access this additional FAR, plot owners would have to comply with a new local area plan that mandated the addition of certain lanes and streets to the public domain that were intended to lower the block size and improve pedestrian connectivity to the stations. The newly mandated public spaces typically follow pre-existing private access networks, are on vacant lots, or are along plot edges to make use of existing setbacks that are mandated in Ahmedabad's urban design regulations. The Ahmedabad practice evolved from existing land-readjustment practice that had been employed in the layout of the city's new urban extensions (AUDA, 2015), which generated confidence among the city's planners that this FAR-based approach was achievable. While the plan is still in execution, some new roads have already been created through this mechanism and figure 6 shows the prospective new network.

Figure 6. Prospective retrofitted public spaces achieved through FAR trading in Ahmedabad. Based on author's documentation with the local development authority.

The two examples of using a marketplace as an urban design pathway to increase public space reveal the potential to generate additional public spaces at very low cost to the government in an urban fabric that is already very dense. However, as this approach relies on the discretion of the landowner to redevelop their plot and use the additional

FAR, the additional public spaces can be fragmentary and may take a long time to realize in practice. Both cases also demonstrate that for this approach to work, it is critical that local government has a functioning land registration mechanism to keep track of the traded FAR, which may limit its application in a more informal context.

Reblocking

The fourth urban design pathway to increase public space is to pool the available land in a neighbourhood and redistribute the plots to allow for larger and more interconnected public spaces, a practice referred to in this paper as reblocking. In practice, reblocking tends to be accompanied by a regularization of land titles, and upgrading of the newly generated public space. But even just the spatial reorganization through reblocking can make the new layout more amenable to the introduction of permanent services. The practice of reblocking also tends to be very participatory, with significant involvement of the local community in designing the new layout (Adegun, 2018; Heyer, 2015; SACN, 2021), and with documented peer-to-peer exchange between informal settlement communities (Cash, 2021). As a codified approach, the practice can be retraced to the redevelopment of the Tondo district in Manila in the late 70's (Struyk & Lynn, 1983), with broad application in many other contexts since. For example, in just a 2-year period from 2003-2004, the *Baan Mankong* program in Thailand included 18 reblocking projects impacting 3,125 people (Boonyabancha, 2005). The broad definition of reblocking used here also captures other regularization and land-readjustment processes, such as those practiced in Mexico and Burkina Faso. This pathway has also proven to be a practical approach to reorganizing public spaces after a major disaster. The first case that illustrates the reblocking approach to retrofit public space draws from another case Manila, in a neighbourhood of eastern Commonwealth in Quezon city. Initiated several decades after Tondo, this case demonstrates the institutionalization of the reblocking approach. In 2003, after land that was originally intended for government purposes was officially ceded to the community that had settled it since the 1970's, a reblocking approach was initiated to generate more public space. The reblocking involved community members paying for the land they had initially squatted as well as the costs of surveying and designing the new settlement layout (Galuszka, 2014). By 2011, the design and planning phase of the process was concluded and figure 7 shows the transformation of the public space network which was completed in 2013. A key structuring element in the redesign were government regulations on street width and plot sizes and other standards for social housing, compliance of which was a precondition for the delivery of infrastructure services (Galuszka, 2014). All the main lanes and a significant number of the minor lanes were incorporated into the new design, widened to conform with the new design standards.

Figure 7. Retrofitted public spaces through reblocking in Commonwealth, Manila. Only the lanes with high degree of confidence were mapped, therefor the laneway network prior to reblocking may have been more fine-grained.

Outside the Philippines, the practice of reblocking has been widely embraced by local governments within South Africa. Among the first reblocking project in the country was the well documented Joe Slovo community in Cape Town, following a shack fire in 2009 (Bolnick, 2012), and the practice has been adopted elsewhere since. Cape Town alone has more than 20 reblocking projects in various stages of implementation (Heyer, 2015). The case mapped in this paper is called *eMandleni* and lies on the eastern outskirts of Johannesburg, in the municipality of Benoni. Reblocking in South Africa's informal settlements is enabled by the highly transient nature of the shacks, which are lightweight in construction and can be easily dismantled and moved. In the context of South Africa, the public space design in reblocking projects is typically co-produced between architects, planners and the local community. Reblocking in eMandleni was even envisioned as a "tool to galvanise community participation around a shared goal" and as "a catalyst to create vibrant communities", but critically also as a strategy to integrate the settlement and enhance revenue to city authorities (SACN, 2021). Through this engagement with the community, people who preferred to live next to each other, can be allocated adjacent plots (Heyer, 2015). Figure 8 shows that the transient character of the shacks has allowed a significant overhaul of the public space network, much more drastic than in Manila, with very few of the original lanes incorporated into the new layout.

Figure 8. Retrofitted public spaces through reblocking in Benoni, Johannesburg.

The two reblocking examples in Manila and Johannesburg show the potential of this approach to retrofit public spaces even in neighbourhoods that have relatively little public space to begin with. As this approach is primarily about reorganizing existing and left-over public spaces, relatively few funds are needed. Indeed, in both cases, the local government was seeking to recoup a share of the costs from the community. Both cases involve relatively small sites, in part because of the participatory nature of reblocking and the agreements that have to be reached among the whole community, which makes the process more difficult when the sites is bigger. When plot sizes differ significantly within the neighbourhood, conflict can arise on deciding new standardized plot sizes, as residents with large plots feel disadvantaged (Galuszka, 2014). This approach may therefore be more difficult to achieve in more heterogenous communities. The reblocking approach is testimony to the value that public space generates, as residents are documented to invest in upgrading and expanding their houses after reblocking (Varley, 1987). Data is available for the Tondo area of Manila, where households increased the average floor area by 34 per cent to $54m^2$ within the first 3 months after reblocking (Keare, 1987). The cases also demonstrate that a successful reblocking project requires appropriate urban design controls, that allow for streets, lanes and plots of adequate size that fit the community and helps prevent re-encroachment (Adegun, 2018; Cash, 2021).

Plot subdivision
The fifth urban design pathway to increase public space is through the subdivision of existing plots, in which public space is set aside to provide physical access to the new subplots. This subdivision often happens informally in the sense that the process tends to

be unplanned and access to these new public spaces often mediated by the discretion of the owner. While this approach relies on the subdivision of plots, it does not necessarily require formally registered landholdings. As a process that is privately led from the bottom-up, and rarely comprehensively documented, it may be the most common pathway towards retrofitting public spaces in existing fabrics globally.

The first case illustrating the approach to retrofit public space through informal subdivision, is Mahipalpur, an urban village on the southern outskirts of Delhi, India. Mahipalpur is a 600-year-old village that urbanized in response to envelopment by Delhi's urban growth (van Oostrum, 2021). With an increasing influx of migrants, available land became less abundant, and plot owners started to informally subdivided their own plots into smaller lots, often without formal government consent, but typically abiding by formal development control regulations. To access these smaller plots, new public spaces were retrofitted into the existing urban fabric. Figure 9 shows these new public spaces in relation to the original plots that they were originally part of, typically between 300 and 3000m^2, subdivided to lots of 50 to 200m^2. Many new public spaces took shape as dead-end lanes, but the process also generated lanes that connect between pre-existing public spaces. As the laneways are formed informally, the local government refrains from taking ownership of these new public space and leaves the burden of paving and maintenance to the local community, whom, without municipal funding, typically lack the resources to enhance the quality of these laneways.

Figure 9. Retrofitted public space through plot subdivision in Mahipalpur, Delhi

The informal subdivision of plots is not exclusive to informally settled neighbourhoods, but can occur in planned urban environments too. Melbourne's downtown grid, named after its surveyor Robert Hoddle, was laid down in 1837 and had characteristically large

blocks of 200 by 100 metre and relatively large plots which are mapped in figure 10. Over time, landowners subdivided their plots to provide access deeper into the plot, ultimately adding an additional 3,7 kilometre of public space (Gehl, 1994). Figure 10 shows how most of the new laneways are either through the centre or on the edge of the erstwhile plots. Some landowners had commercial motives and added arcades between the streets that were lined with shops, benefitting from the appeal they offered as short-cuts between the main public spaces of the Hoddle grid. The laneways are the product of nineteenth century private property development and the local government spend no funds, nor initiated specific policy for their creation (Dovey et al., 2018). In the 20th century, the laneways had been largely reduced to utility corridors and places for garbage bins and delivery vehicles, and when Jan Gehl was invited to study Melbourne's street life in 1993, he observed that only 8 per cent of the city's laneways were accessible and actively used (Gehl, 1994). While the laneways were created through private unplanned subdivision, a combination of local government action and an influx of creative industries to has transformed the utility-oriented laneways into people-oriented public spaces, which have now become one of the city's most distinct and valued public spaces (McNeill, 2011).

Figure 10. Retrofitted public spaces through plot subdivision in Melbourne.

The two examples of plot subdivision as an urban design pathway to increase public space reveal the way in which this process cuts across formal and informal context. As this approach relies on owners capitalizing the intrinsic benefits of public space, few or no additional funding from governments is required. Simultaneously, because of the way this approach relies on private actors, it can potentially result in a disjunct public space network, for example with dead-end lanes that do not connect to each other or the pre-existing public space network. The two examples also reveal the complicated dynamic of ownership and responsibility of the new public spaces, as the original plot owners may wish to retain control of access, but will try to offload maintenance costs.

5. Contextual appropriateness

The five-fold typology presented in this paper serves as a pallet for policy makers and urban practitioners wishing to increase the share of public space. Each approach is premised on an urban design process that local governments can emulate. While the cases have been presented as illustrative of a specific type that was dominant in that neighbourhood, the five types can of course occur simultaneously within the same urban fabric, and may indeed be most powerful when combined in an innovative way within the same neighbourhood. For example, while New York has a FAR trading mechanism, it has also applied urban acupuncture, while in Ahmedabad many public spaces were generated through informal plot subdivision. This concluding section addresses the transferability of approaches, whether and how some approaches may be more fitting to a specific context, and the extent to which enabling policies can enhance the effectiveness of each approach. The factors that impact which approach to retrofitting public space is most appropriate for a given urban context are multi-fold. First and foremost is to consider the scale of the public space deficiency, and to consider whether there are specific types of public spaces missing that can add to the diversity and functioning of the public space network. The graph in figure 11 compares the amount of public space that was retrofitted as a percentage of the total case study area. It shows superimposition has the highest quantitative potential, followed by plot subdivision and reblocking, and finally acupuncture and marketplace which had the lowest impact expressed as an area figure. What this graph does not capture is the quality of those generated public spaces, their interconnectivity, and the degree to which the new public spaces complement the existing network, all of which are at least as important as the absolute amount of public space. For example, a public space network with only large boulevards can benefit from smaller, more intimate public spaces that enrich the experiential value of the urban environment. From a qualitative perspective, it is notable that only three of the cases public spaces were added as public plazas with a dedicated role for leisure and social engagement (both acupuncture cases and New York), while in all other cases the primary purpose of the new public space was to provide access and services. The quality of those public spaces built for dedicated leisure purposes could be considered higher from a design-oriented perspective only, but this is to underappreciate that public space has different roles to play, and what kind of public space may be needed most differs by context.
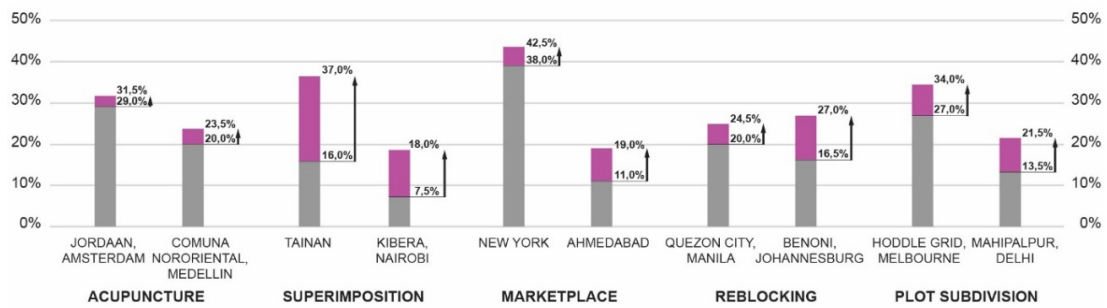
Figure 11. The increase of public space as a percentage of the total case study area

The financial implication of each approach is evidently an important consideration as well, although it only makes sense here to consider the variation in the cost of land acquisition, as the other costs related to construction and maintenance are largely independent of the approach taken. This paper is not a project evaluation and there is no comparative data on the costs of each of the 10 interventions, but it is evident that the marketplace and plot subdivision approaches pose the least direct acquisition cost on local governments as these approaches rely on the action of private parties to generate the extra public space. Superimposition present the highest direct costs on local governments, as the fair compensation to landowners and users will amount to significant budget implications. Realistically though, this approach has often been undertaken through forced expropriation and cases of full and fair compensation are rare, which is reason to consider the application of this approach extremely carefully. A recurring feature in many of the illustrative cases is that the most significant budget implications often lie in the upgrading and maintenance of public space *after* the public space has been retrofitted into the urban fabric. Reblocking is a poignant illustration of this dynamic, as this approach to retrofitting public space is in practice often part of an integrated approach inclusive of upgrading of public space and installation of basic services, both of which take up significant resources. In both reblocking cases, at least part of the costs was intended to be recouped through up-front payment or long-term revenue generation by the community.

The cost of each approach cannot be evaluated independently from the urban density of the fabric in which the new public space is added – the higher the density, the higher the land prices and potential cost of adding new public spaces. Reblocking and superimposition work better at lower urban densities as this would reduce the removal of buildings that is associated with these approaches, while acupuncture and marketplace thrive in higher density urban environments.

The cases presented here explicitly drew from both formal and informal urban context and it is therefore possible to ask if there are approaches which are more suited for informally settled areas. Reblocking is already a specific form of land readjustment that has been adapted for informal environments. A marketplace for public spaces relies on registered forms of land ownership and a government capable of issuing and enforcing regulations, and so this approach may be better suited to more formal context. However, the other three approaches cut across the formal-informal divide in a way that shows that process-oriented practices can transcend geographic boundaries and be transferred

between contexts.

Indeed, the cases discussed in the paper already demonstrate transfer of typologies between context – reblocking originating from Manila has been transferred to many other contexts in the global south; an FAR marketplace which was popularized in New York and now applied broadly in urban planning practice; disparate practices of acupuncture were synthesised as an specific approach by Manuel de Solà-Morales and Jaime Lerner and subsequently transferred to many other context; and superimposition has, in various places, including Tainan, drawn inspiration from its application in Paris.

The cases illustrative of the five-fold typology demonstrate that the merely adding new public space is not sufficient for a successful public space network, and that approaches to retrofitting public spaces need to be accompanied by design, enabling and upgrading strategies to leverage the newly created public space. Four distinct enabling strategies were observed in this regard that would facilitate the successful transfer of approaches to another context.

The first strategy that was observed in the cases was the role of the local government in setting the rules and regulations that enable more conducive urban life. For the marketplace approach this is most evident, as local government regulations on FAR constitute the basis of this approach, but rules emerge in other ways too. In Amsterdam and New York, urban design rules were set as a framework for the design of new public spaces. In Melbourne, a concerted government effort over many decades led to the incremental upgrading of laneways, while in Manila, rules on plot sizes accompanied the reblocking to support further upgrading.

The second commonly observed strategy to increase the functioning of new public spaces, is the way in which public buildings were added to reenforce the impact the impact of the new public space. For example, the superimposition of public space in Tainan was connected to new public buildings as significant places along the new boulevards, while the acupuncture approach in Medellin was connected to new public buildings to draw people into these new spaces.

The third enabling strategy is the involvement of people in participatory processes, particularly evident in reblocking and acupuncture approaches that rely more strongly on community involvement.

The final way in which the newly created public space can be leveraged, is through the way in which one mode of retrofitting public spaces can open up opportunities for further retrofits. For example, superimposition can lead to small, or oddly shaped plots, that may be considered undevelopable by the owners or local planning authorities and therefor lead to acupuncture urbanism on those plots. Likewise, reblocking tends to produce a standardization of lanes and plot sizes, which makes the area more amendable to future FAR trading schemes.

This paper has been comparative in a double sense – comparing the urban fabric before and after retrofitting of public space, and comparing cases from a broad range of geographies. Deficiency of public space is a challenge that confronts cities around the world, and the lens offered in this paper encourages cities to engage in peer-to-peer learning and sharing of practices, particularly across the formal-informal divide that persist in much proscriptive and normative planning and design literature.

Author statement
The views expressed in this paper are those of the author only and do not reflect those of the United Nations Human Settlements Programme.

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