

## 14. INCREMENTAL URBANISMS

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Urban informality is a self-organized mode of urbanization that encroaches, infiltrates and expands cities of the global south beyond the control of the state. This is a double process whereby the formal city becomes informalized and the informal becomes formalized. Formal and informal are not binary - there is often no clear distinction between formal and informal settlements, rather they are inextricably intertwined. Urban informality produces a range of different morphologies (as demonstrated in chapter 13). While urban informality often emerges under conditions of poverty, it is also a means of adapting to poverty. At the micro-scale informal means incremental - the scale of design, construction and adaptation is geared to micro-flows of capital. In this chapter, we zoom to this micro-scale to explore three specific incremental urbanisms.

With few exceptions, the erasure and replacement of informal settlements with formal planning and design practices is generally unsuccessful. Informal settlements are so named because they are 'settled' - they provide access to jobs for their residents and displacement generally leads to new encroachment. Informal settlements are designed and planned - not as we understand urban design and planning in the formal city but incrementally. The informal city and its access networks is an emergent outcome of an incremental adaptive process. A key distinction between formal and informal planning and design is that in the formal city the street network comes first and the architecture plugs into that network. Informal settlement, in its purest form, is one where buildings come first and access networks co-emerge with them.

We begin from the view that an understanding of the micro-morphologies of informality and its morphogenic processes are crucial for any kind of effective development process. In this chapter, we explore the morphologies of informal settlements at the micro-scale with a focus on increments of change, adaptation, access networks, density, functional mix and public/private interfaces. While there have been many studies of informal settlement patterns and upgrading programs, detailed morphological analysis is relatively rare. Those who have studied the micro-morphology include Arefi (2011), Bhatt and Rybczynski (2003) and Ribeiro (1997). Informal settlements are mostly undocumented (Patel and Baptist 2012; Robinson 2002), yet documentation is critical for any kind of integration with the formal city.

In this chapter we explore three case studies in the cities of Bangkok, Medellin and Pune using direct observation, photography and mapping at multiple scales. In each case, we zoom in from the 20km metropolitan maps produced with the same method as in chapter 13. The goal, however, is to understand the micro-morphologies and the particular density, functional mix and access networks that have emerged. The case studies have been selected based on the criteria of data availability, accessibility and to incorporate a range of different urban morphologies and topographic conditions. The detailed morphologies are mapped at a one-hectare scale for three case study sites with a focus on building footprints, height, and functional mix. An additional mapping of public/private interface types and frequency of entrances is provided for selected access routes in each case. Discussion extends to analysis of construction, increments of change, streetlife intensity and upgrading practices. Base maps of building footprints are derived from pre-existing sources (as noted) and Google Earth. The functional mix has been mapped using the analytical framework developed by Hoek (2008) and further elaborated in Chapter 2. Other data has been collected through field observation in 2014-15. Photographs are selected to show the range of morphological conditions, increments of change, materials, construction and interface types together with the emergent spatiality and sociality of the settlements.

## Khlong Toei, Bangkok

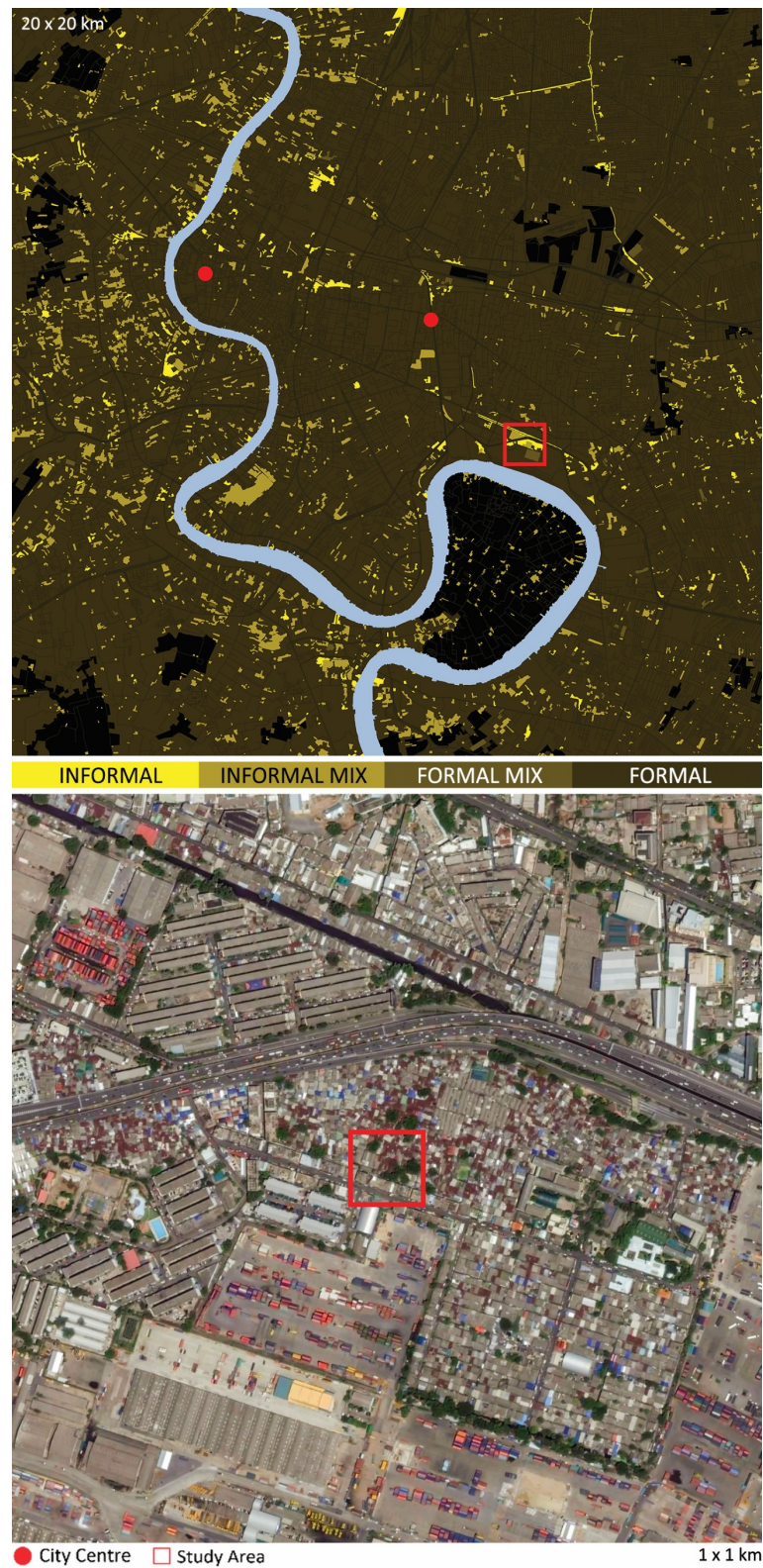


Figure 14.1 Bangkok and Khlong Toei at 20km and 1km  
(Satellite image: Google Earth)

Bangkok is a flat water-based city that was established in the late 18<sup>th</sup> century within the Eastern delta of the Chao Phraya River. The city was developed along a network of *khlongs* (canals) as a water-based access network.

Bangkok has long been transformed from a city of *khlongs* to a highly congested and internationalized city with a large informal sector (Dick and Rimmer 2003; King 2011). The city has a population of more than 6.5 million people with more than one million living in informal settlements (Kramer 2006; Yap and De Wandeler 2010). Informal settlements are generally fragmented in small patches, and most are mixed (Figure 14.1), often along the *khlongs* and around the temples (Wattanawanyoo 2012). Khlong Toei is one of the largest patches of informal settlement that emerged in the 1960s when the port authority provided employment in proximity to swampy land that was at the time far from the city centre (Berner and Korff 1995). The settlement accommodates more than 25,000 people on about 130 hectares (Askew 2002). Most of the informal settlements within the Khlong Toei district have been developed on land that formally belongs to the Port Authority of Thailand. The part of Khlong Toei under consideration here has a formal grid laid out initially as a result of a semi-formal 'land-sharing' scheme developed in the 1980s (Angel and Boonyabancha 1988). This is a mix of a formal access network with a fully informal architecture. Other parts of Khlong Toei have developed with a much less formal access network.

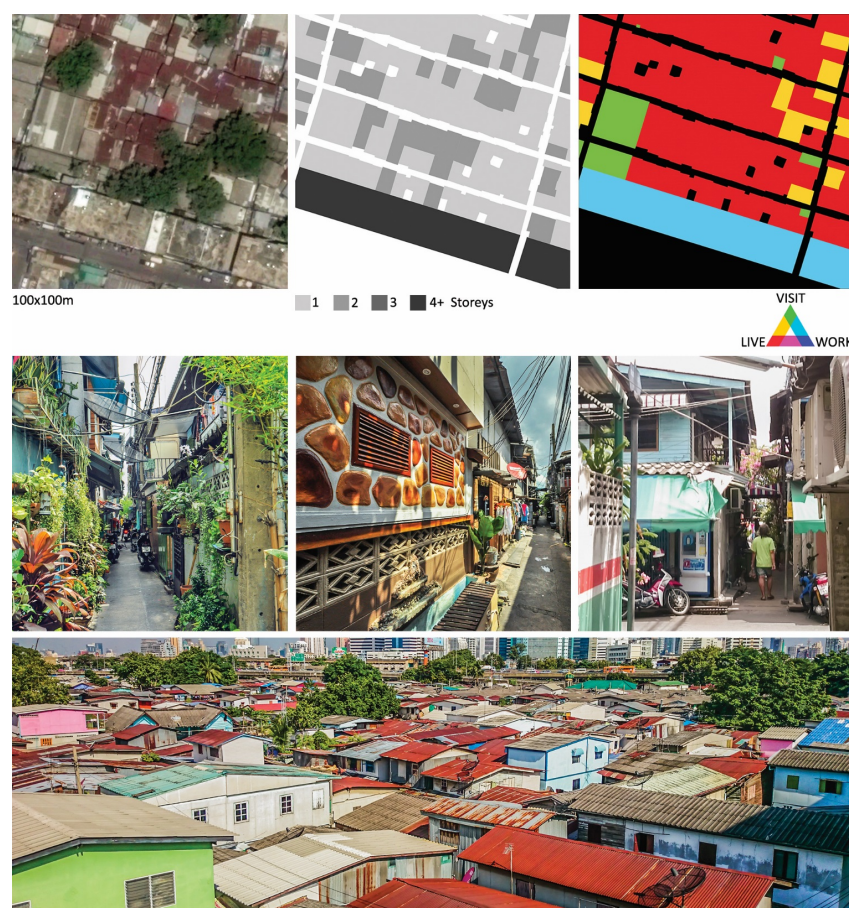


Figure 14.2 Khlong Toei at 100m  
(Satellite image: Google Earth; Centre-left and central photos: Kim Dovey)

The laneway network is a formal grid of 80 x 20m blocks with lanes of about 1.2 metres width (Figure 14.2). There have been some minor encroachments onto this formal access network which is the only public space within the settlement. Lot sizes range from about 20 to 60 square metres. The primary increment of construction is the single room, although occasionally multiple rooms are added at one time when resources are available. Houses are also adapted by adding verandas and changing public/private interfaces. Materials used for construction range from timber frame with fibro or sheet metal cladding to rendered brick and concrete block. Replacement of materials (from timber or sheet metal to brick and concrete block) is a common practice to

improve the construction quality and image of an existing building. Building height ranges from 1-2 storeys with several 5-storey formal buildings defining the southern boundary. Most lots are developed to what appears as 100% site coverage, yet there are generally small gaps between houses that allow some light and ventilation. The gross coverage is about 80% of the land area. The area is predominantly residential with a few community facilities and some residential/retail mix (Figure 14.2 top right). Local shops are concentrated along the north-south laneways that are directly connected to the main local street in the southern part of the neighbourhood. The adjacent formal buildings (that show as light blue in Fig 14.2) are used primarily for employment with retail at ground level.



Figure 14.3 Khlong Toei at 10m

Figure 14.3 shows a typical segment of laneway mapped for interface type and frequency of entrances. The interface typology introduced in chapter 9 has been adapted to this micro-morphology based on criteria of permeability and setback. The public/private interface is overwhelmingly permeable (red) with impermeable (blue) interfaces only occurring on corners. About a quarter of the interface length has over a half metre setback (lighter colours). Such minor setbacks can have a significant impact by allowing for food stalls, seating, storage of domestic materials and motorcycle parking (Figs 14.2 and 14.3). Most of the streetlife occurs within a metre or so of the dwelling entrances - especially where minor setbacks enable such activity without disrupting pedestrian flows. Figure 14.3 shows a total of 33 entrances along 100 metres of laneway. Some parts of the laneways are covered with tarpaulins for relief from rain and the sun (Fig 14.3). Many houses have security screens, but the entrances are also highly personalized with ornate doorways and lined with small gardens. While Khlong Toei was originally settled at a time when this land was of low value, the rapid development of the Sukhumvit district within walking distance to the north has created considerable pressure for redevelopment including removal of these settlements. While some sections of the larger settlement have been demolished, this part of Khlong Toei remains highly resilient to eviction (Askew 2002; King 2011).

## Santo Domingo, Medellin

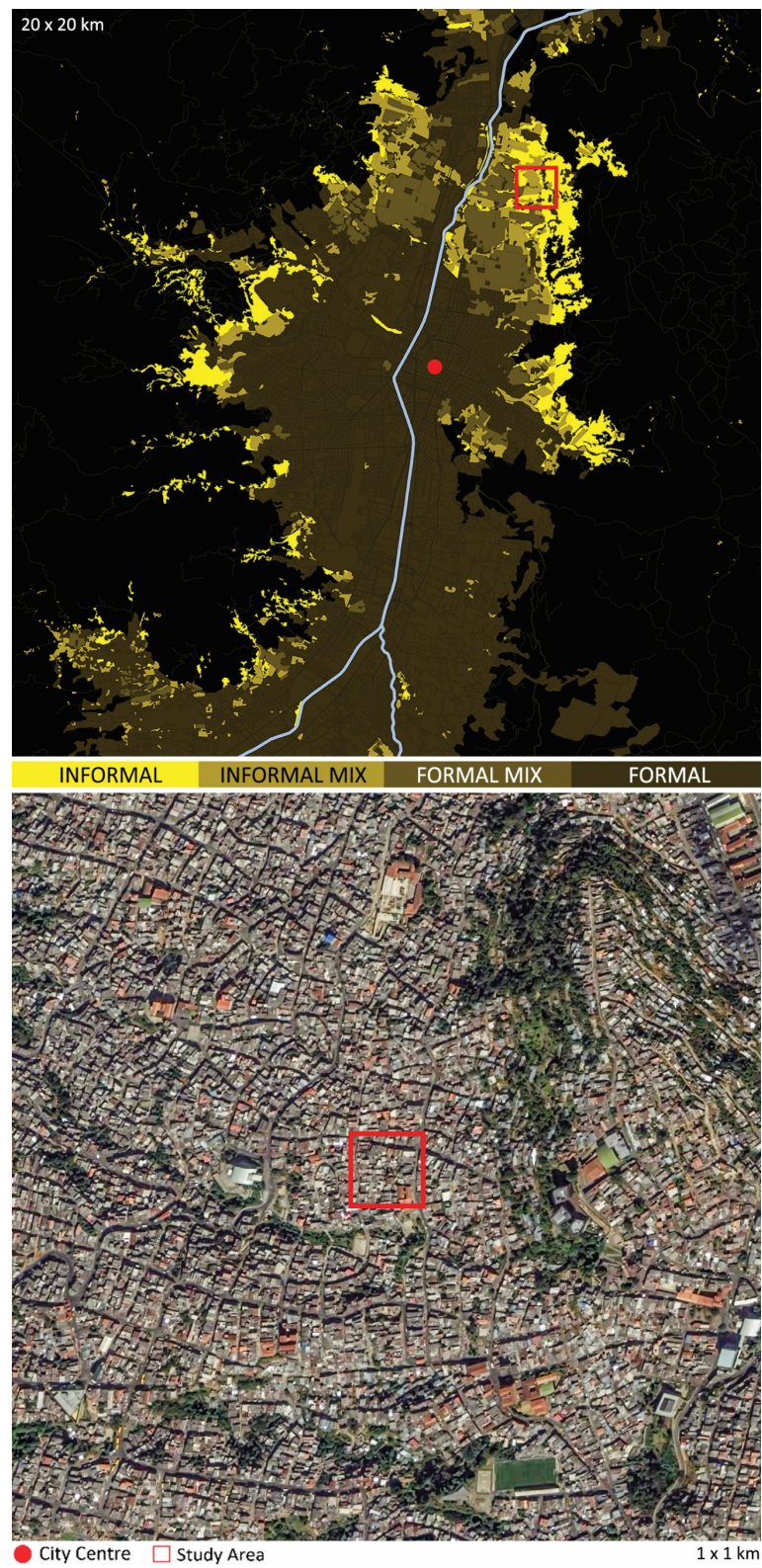


Figure 14.4 Medellin and Santo Domingo at 20km and 1km  
(Satellite image: Google Earth)

Located in an upland valley, Medellin is the capital of the mountainous province of Antioquia and the second largest city in Colombia. Founded as a gold-mining town in the late 17<sup>th</sup> century, Medellin became the trading capital of the region in less than a century (Hylton 2007). It was the centre of a coffee boom in the late 19<sup>th</sup> century, followed by industrial growth and urban expansion in the early 20<sup>th</sup> century (Hylton 2007). Depending on the urban boundaries, the population of Medellin ranges from 2 to 4 million people (Samper Escobar 2010). Informal settlements accommodate about 50 percent of the population (PRIMED 1996, cited in Echeverri and Orsini 2012). As figures 14.4 shows, most of the informal morphologies are located on the escarpments of the urban fringe and become increasingly formalized with proximity to the formal city. The case study of Santo Domingo is located within one of the largest pockets of informal settlements in the north-east. Santo Domingo was originally settled in the 1950s through a semi-organized invasion (Naranjo 1992, cited in Echeverri and Orsini 2012) - the quasi-formal main streets were laid out in a loose grid pattern that was adapted to the steep topography.



Figure 14.5 Santo Domingo at 100m  
(Satellite image: Google Earth; Lowest two photos: Kim Dovey)

The maps in Figure 14.5 show the one-hectare case study area, which is located on a steep escarpment within the area of a major upgrading project incorporating cable metro and public facilities. The footprint map derives from this project (known as “PUI”) (Alcaldia de Medellin et al. 2014). As is evident in the photos the escarpment also rises steeply from west to east. Since this area was developed through a semi-organised invasion, the main

streets are about 6 to 8 metres wide and are formed in an irregular 100-metre grid pattern. The main streets are sealed in concrete and accommodate cars; the informal infill has produced a network of smaller lanes within each block. The lot sizes vary from about 30 to 70 sq metres with one much larger redevelopment on the site.

The most common increments of change are single or multiple-room additions (Fig 14.5 centre right). Upper floors often have an external access to enable multiple households on the same lot; roof terraces and balconies are common. Nearly all buildings are 2-3 storeys in height, and gross land coverage is about 60%. The steep topography provides the possibility of accommodating several entrances and urban interfaces at different levels (centre and lower left). Most of the study area is residential with some shops located on the main streets, creating a vertical mix of residential and retail. Some buildings accommodate a shop at ground level and up to two residential units above. Primary construction materials are lightweight terracotta brickwork and concrete with sheet metal or occasionally tile roofing. All buildings are relatively durable, and there is a great deal of upgrading from raw brick and concrete to rendered, tiled or painted surfaces. While the much more temporary constructions along nearby creek beds have mostly been replaced (Alcaldia de Medellin et al. 2014), all of the upgrading on this site is self-organized.



Figure 14.6 Santo Domingo at 10m

Figure 14.6 maps one of the main streets along the western edge of the site and shows 25 entrances along this 100m portion. Most houses follow a setback pattern with an entry transition (stoop, veranda) of 0.5 to 3 metres. The streetscapes are thus highly social spaces with a great deal of overlooking. This neighbourhood was formerly controlled by drug gangs and there is a considerable amount of security screening. Some houses are fenced off from the street, and some external staircases are gated. The interface photographs show that many buildings

are accessed from multiple levels - even a shop on an upper level. There are some encroachments onto public space, but informal codes ensure that traffic is not blocked.

#### Yerawada, Pune

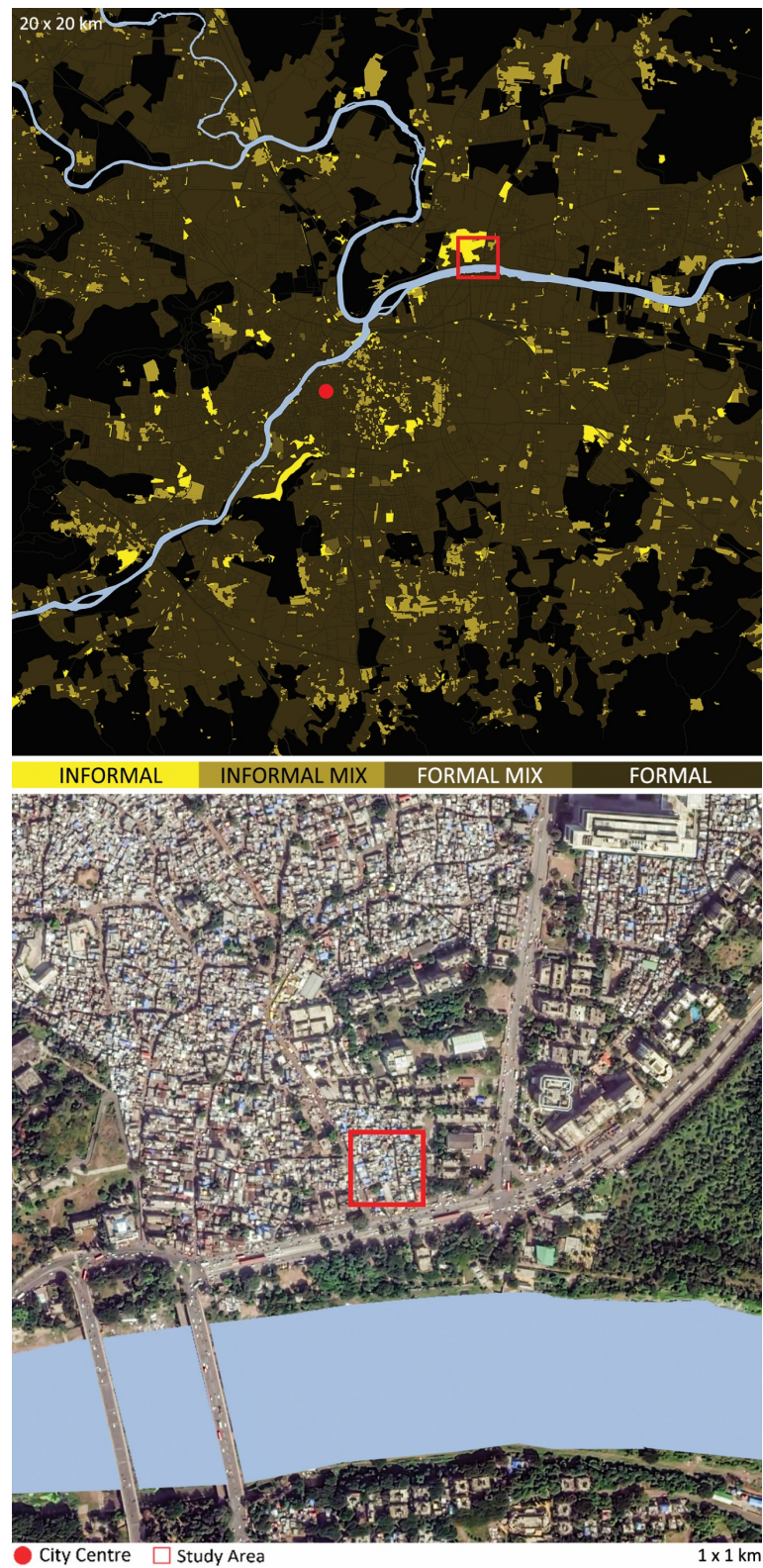


Figure 14.7 Pune and Yerawada at 20km and 1km  
(Satellite image: Google Earth)

Pune is a city that has developed since the 16<sup>th</sup> century at the junction of two rivers (Mulla and Mutha) about 100 km southeast of Mumbai. It now has a population of about 3 million people with more than 40 percent living in informal settlements (Sen et al. 2003). Figure 14.7 shows a mix of small and large patches of informal morphology distributed across the city. Yerawada is one of the largest pockets of informal settlement, located on the northern bank of the Mutha River. This district contains more than 15,000 informal structures where land ownership is a mix of private and public (MASHAL 2011). Yerawada emerged as a squatter settlement on state-owned land in the 1960s when growing industries attracted flows of workers (Bapat 1981). It has been the focus of some of the most substantial and successful upgrading programs using a participative process of upgrading incrementally *in-situ* (Desai 2010; Desai and Patel 2010). Mapping has been a key part of this process, and this community mapping is the source of our base footprint maps here.

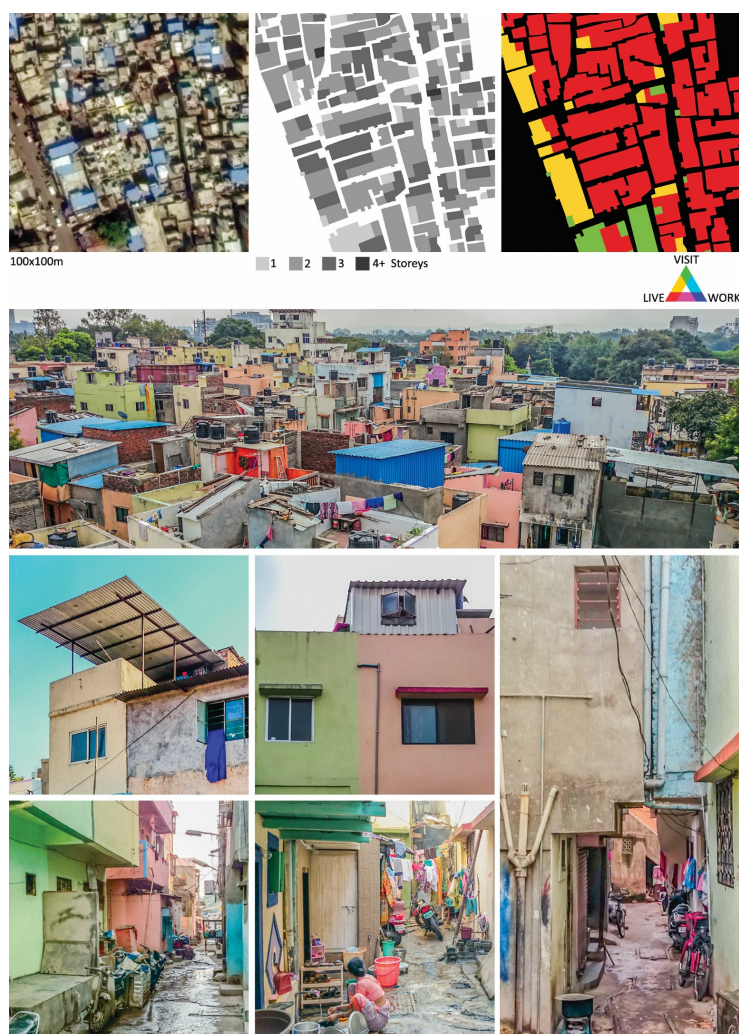


Figure 14.8 Yerawada at 100m

(Satellite image: Google Earth)

The morphogenic process in Yerawada was highly informal. Buildings were constructed with footprints ranging from about 15 to 45 sq metres. This led to the emergence of an intricate and labyrinthine network of lanes that varies from 1 to 3 metres width (Figure 14.8); it is highly permeable but illegible and relatively impenetrable for strangers. As in most of India, construction is classified into *kutcha* (temporary: generally timber, sheet metal or plastic) and *pucca* (permanent: generally, brick or concrete) structures. Many of the *kutcha* structures that once dominated this study area have been replaced or upgraded to *pucca* (Desai 2010). Upgraded houses can become

the basis for informal additions (central photo). Common increments of change involve adding a *kutchra* room and turning *kutchra* into *pucca* structures. When resources allow, more than a single room may be added at one time and with *pucca* construction from the beginning. Adding extensions such as roof terraces and verandas is also common, and such spaces accommodate activities including clothes drying, cooking, washing and storing (centre left). Buildings range from 1-4 storeys but are mostly 2-3 storeys (central map). The gross coverage (excluding the main street) is about 70%, but this can be misleading because cantilevered upper floors often almost meet to block the natural light and ventilation of the laneway below (Figure 14.8 lower right). The study area extends back from a main street frontage (with car access) where most ground floor frontages are retail functions with housing above. There are some small shops located more deeply within the settlement, generally along the main laneway where pedestrian flows are greater (Figure 14.9).



Figure 14.9 Yerawada at 10m

Figure 14.9 shows a typical section of laneway mapped for interface type and frequency of entrance. It shows a total of 46 dwelling or shop entrances opening onto this 100m stretch of laneway or an entry roughly every 4 metres. The laneway shape is highly irregular with a mix of interface types. Impermeable interfaces (blue) are generally located on the narrower laneways of corner sites. Small setbacks (lighter colours) often have plinths that serve as seats and storage, located under the cantilevered upper floors (Figure 14.8 lower left). Whether setback or not, the lanes are widely used for storage, motorcycle parking, clothes drying, cooking, washing and social activity. Public space is scarce and is widely used as an overflow from the over-crowded domestic interiors. While these photographs are taken with little streetlife to avoid intrusion, the intensity of activity and loose parts in public space produces congestion.

### Informal Morphologies

We now discuss some of the questions that this work opens up. What are the similarities and differences between these cases? What are the morphological interrelations between density, lot size, and access networks? How do formal and informal processes intersect? Figure 14.10 compares the 100-metre maps from

all three case, together with overall measures. Informal settlements are deeply complex, and we cannot claim a comprehensive understanding of these selected cases. Nor do we claim that the morphologies studied here are typical of all informal settlements; there are many different forms of informality as shown in chapter 13. The morphological similarities lie primarily in the incrementalism of the architecture while the primary differences are those of the street network. The Khlong Toei case study area developed within a formally imposed (and semi-formally authorized) grid of laneways - there has been no scope for the emergence of informal laneways. Santo Domingo was a semi-organized invasion that established a quasi-formal grid of wider streets within which an informal laneway network emerged. Yerawada is a fully emergent morphology where both the architecture and urban design are informal.



Figure 14.10: Comparative Morphologies  
(Satellite image: Google Earth)

Incremental urbanism of this kind is based on a relative consistency of grain size - the single room increment or roughly 15-20 square metres. This is the lot size that dominates Khlong Toei and Yerawada while Santo Domingo is a roughly double-room module of about 30 square metres. Settlements are subject to informal processes of both amalgamation and subdivision to produce larger and smaller lots. A base increment of about 15 square metres is common because it is the average size of a room that can be built quickly with structural elements that are easily carried by hand. The construction process in informal settlements is geared to both capacity for expansion and to flows of resources. Building materials accumulate in the crevices of the settlement long before they are used. Even when a larger multi-room extension is planned, the process of construction can be incremental - a rooftop becomes a terrace which becomes a shelter that is eventually enclosed.

The average height of buildings is 1.3 storeys in Khlong Toei compared with 2.7 in Santo Domingo and 2.5 in Yerawada. The gross Floor Area Ratio (the ratio of floor area to land area = coverage x average height) across the three cases ranges from 1 to 1.8 (calculated only on the informal parts of these sites). We do not have residential population figures for these settlements, but the streetlife densities are higher in Yerawada and Khlong Toei - Santo Domingo is more distant from the intensive activities of the formal city. There are examples of informal settlements where densities are higher or lower than in these cases - however, incremental urbanism embodies some crucial limits to building density. While single-room increments can accumulate up to about 6 storeys they often produce the most dysfunctional of slums (Dovey and King 2011). Informal settlements can only become high-rise by inhabiting a formal structure (Brillembourg and Klumpner 2013).

A key characteristic of informal morphologies is high land coverage - here ranging from about 60-80%; the formal city by contrast ranges from about 25% in the suburbs to about 55% in the central city (see Chapter 4: Figure 4.3). Coverage is high in those settlements (such as Yerawada) where the architecture comes first and claims most of the land without initial provision for access and open space. Another characteristic that distinguishes Yerawada from the other two cases lies in the proliferation of public/private interfaces. The fully informalized morphology of Yerawada produces a total length of public/private interface (per hectare) that is roughly twice that of Santo Domingo or Khlong Toei (listed in Figure 14.10). The more organized street networks produce less street frontage per site. The irregularity of the Yerawada morphology allows for a multiplicity of small entry setbacks; and these tiny spaces are the most productive, useful and socially intensive spaces within the network. These transition spaces are even more apparent and more generous in Santo Domingo where they perform similar functions. The importance of street interfaces is also linked to the practice of adding an upstairs room for rent with external access. These interface conditions are geared to one of the key challenges for effective redevelopment - the public/private interface enables residents to use the space immediately outside the front door for various forms of production and sociality. The interface also enables external access to upper floor rooms - residents can use the 'air rights' above their house to build an extra room that generates rental income. Without an understanding of how such morphologies work residents are likely to resist any move into replacement housing such as an apartment without 'air-rights' nor public interface.

All three sites have a similar functional mix of shops and houses with shops mostly located adjacent to primary pedestrian flows. The capacity to open a shop is geared to both the availability of a public/private interface and its location on the access network. These maps, however, do not show the mix of domestic space with informal industry that is common in informal settlements and is rarely visible from public space (Kellett and Tipple 2000).

## Formalization and Incrementalism

It is well beyond the scope of this chapter to consider the important issues of upgrading, but we note that formalization and upgrading processes are continuous within these settlements. Such upgrading includes the work done by the state and NGOs, generally with the involvement of residents, but also the upgrading that is self-organized by residents. Formalizations include incremental legalization of land tenure and provision of sanitation and services as well as the upgrading and replacement of buildings. In the case of Yerawada, this also includes the incremental widening of laneways when buildings are replaced. This is not a study of formalization and we present no evaluation of these processes here. However, it is important to note that the morphologies are dynamic and are subject to both formal and informal development. The upgrading of buildings in Santo Domingo are largely self-organized - state and NGO agencies have focused mostly on improving public space, facilities and public transport. The cases of Khlong Toei and Yerawada, where building footprints are smaller and land coverage is higher, are more problematic.

Each of the informal settlements analysed in this chapter is characterized by a multiplicity of informal incremental changes. A room, a rooftop, a veranda or balcony is added; new materials are layered on, and modes of access are created or blocked. Through small investments over time, incremental adaptations provide more private space or generate income while improving the construction quality and appearance of the architecture. Incremental change is a form of capacity that is embodied in the urban morphology; it is a resource that enables inhabitants to manage the condition of poverty by doing more with less. Beyond the height limits noted above, incremental change has no natural stopping rule. However, an informal code often emerges to constrain further increments that are seen to initiate the 'tragedy of the commons'. In Khlong Toei the increments have not proceeded beyond two storeys nor encroached on or over the grid of public pathways. In Santo Domingo, the 6-8-metre-wide main streets have generally been respected. These codes are social more than bureaucratic, a matter of 'doing the right thing' however poorly defined or frequently transgressed.

Incrementalism is a two-sided coin. On one hand it enables the self-organized upgrading that has produced these settlements. On the other hand, it can also give rise to an escalation of private interests that may result in the production of slum conditions. This is the case in Yerawada where the incremental architecture has escalated to a level where some of the public space network has become dysfunctional. Upgrading processes include strategies to demolish some buildings and to expand access to open space. Incremental development, however, is not easily contained and it remains to be seen whether effective codes can be enforced to stop a re-escalation into slum conditions. Any form of upgrading in informal settlements needs to be done in anticipation of further informal encroachment (Figure 14.8 central photo). However, formal frameworks protecting public space are often respected once established, even if minor encroachments are tolerated.

We conclude by pointing out some limitations to this work. While the detailed documentation of informal settlements can be crucial to any upgrading efforts, it can also be problematic and is often resisted by residents. Informality flourishes most when invisible to the state; base maps are rarely available and generally only accurate when developed with agreement from residents (Patel and Baptist 2012). Mapping of existing morphologies is also challenging as informal settlements are subject to constant change - incremental construction is always underway on multiple sites. Access to these settlements is a sensitive issue; while the laneways are publicly accessible, they are often semi-private with domestic activities spilling into public space. Photography can be intrusive, and the photographs reproduced here do not reflect the profusion of streetlife that is common. We would argue, however, that this kind of research into the micro-morphologies of urban informality is both rare and much needed. If these settlements are not to be demolished and replaced, then a better understanding of how they work in terms of urban morphology is required.

## Acknowledgement

All figures in this chapter are by Hesam Kamalipour, except where otherwise stated. GIS data sourced from OpenStreetMap.

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