**ARCHITECTURE & LEGITIMACY:
STRATEGIES FOR THE DEVELOPMENT OF
URBAN INFORMAL SETTLEMENTS**

by

Rachel D. Pressick

B.Arch.Sci., Ryerson University, 2006

A design thesis|project

presented to Ryerson University

in partial fulfillment of the

requirements for the degree of

Master of Architecture

Toronto, Ontario, Canada, 2010

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Abstract

Currently, 1 in 6 people live in slums, or informal settlements in cities throughout the developing world. They are built illegally and are characterized by lack of proper sanitation, unsafe housing, and crowded living conditions. Despite their appearance, informal settlements are legitimate communities; they are vibrant, with sophisticated social, economic and cultural networks that support the livelihoods of residents who call them

home. These communities give the urban poor a physical place within the city, giving them access to the opportunities and advantages that the current age of the 'global city' can offer to any willing participant.

As architects who see the responsibility in choosing the informal settlement as a realm for engagement, this thesis proposes that any architectural intervention be mindful of the importance of the networks contained within the streets and buildings of the informal settlement. By preserving the built-fabric of the settlement, the architect legitimizes the settlement's density and scale, while ensuring the urban poor have a physical place in the city. They have managed to develop their own communities without any investment from outside forces, any intervention should only support that autonomous development. These structures, as well as the people and activities within them, are vital to the survival of residents of informal settlements.

Acknowledgment

Project History

In 2008 I visited India with my brother. It was shocking and dizzying to walk on to the street in New Delhi for the first time, the pungent smell of sewer and garbage filling our noses, the blast of auto rickshaw horns interrupting every internal thought, and the array of colours and activities around every corner inviting us to adventure further into the country's grasp. We travelled throughout the subcontinent, and were taken aback by the endless landscapes of informal settlements within urban centres and on their outskirts. I was struck by their ingenuity in finding leftover spaces within the city to create housing and functioning communities, and by the lack of effort of city officials to integrate them with the formal fabric of the city and provide essential services. Driving in the back of a taxi through Mumbai, we could see the hint of those settlements behind tall-corrugated metal walls; there was a blatant desire to hide them from view. The following year, in Istanbul, the situation was drastically different. The informal settlement was a component of the urban fabric, and the defining element in many communities throughout the city. They were given legal tenure, services, and the ability to develop without threat to their existence.

Entering into the final year of my Masters of Architecture, my thesis began as an exploration of informal settlements throughout the developing world. Researching under the supervision of Taymoore Balbaa, Assistant Professor at Ryerson University, I studied Mumbai, Johannesburg, and Cairo. These cities represented a range of conditions within the urban environment, each with their own distinct relationship between the formal and informal city. Johannesburg had many suburban informal settlements, without a public transportation system, causing millions of people to feel isolated and stigmatized, without the economic advantages of being embedded within the city. Mumbai and Cairo were quite different; with many informal settlements within the city providing much needed affordable housing, although with many infrastructure shortcomings that put residents at risk of disease and death. It was the settlement of Dharavi, in Mumbai, that not only provided housing, but the means and opportunity for the residents to have a livelihood, with many economic opportunities in the settlement only available because of their adjacency and proximity to the city. Unfortunately, I soon discovered that Dharavi was at risk of being destroyed with a 'redevelopment' plan for the area.

Considering Dharavi's potential fate, similar to other informal settlements in the urban centres of cities in the developing world, I decided to choose it as my focus. I would study how the settlement functioned, and determine strategies for using the settlement itself as the base for future development without destroying the integrity of the fabric. I also chose Dharavi because of my own experiences within the country and the city of Mumbai, as well as my own fascination with the settlement's history. I find the growth of the settlement, from a small fishing village to an incredibly dense urban centre within the larger context of Mumbai, incredibly inspiring.

Gratitude

From the beginning, Taymoore Balbaa provided support for my research endeavours for which I am greatly appreciative.

Focusing on Dharavi, I was able to take advantage of the research efforts of many organizations that are embedded within the settlement, as well as those that share a fascination with its highly sophisticated activities. Without the efforts of URBZ, an embedded architecture and urban design focused not-for-profit that documents the settlement and provides a medium for residents to report on the conditions and needs of their own community, I would not have had a genuine picture of how the settlement functioned. Their research activities and design charrettes with community members continuously expand the knowledge we have of Dharavi and set a precedent for

other settlements who share a sense of precariousness in their city. The countless community submitted photographs documenting the settlement, as well as maps that gave a more detailed account of the DNA of the settlement, were vital in my understanding of the fabric of the settlement, and the unique learning possibilities in studying the habitation of residents.

I also acknowledge the resources the department provided for my thesis year. I had the opportunity to visit Mexico City and Bogota on research trips in early January 2010. These experiences broadened my view of Latin America and provided me with unforgettable examples of large cities that are attempting to interact with their citizens who live in informal settlements. The following photographs are examples of two distinctively different informal marketplaces in the streets of their city centres; two distinct and lively uses of public space.

I also acknowledge the research that has been conducted by architects who design projects in informal settlements. I hope that I too have achieved a project that provides dignified habitation for the urban poor. Without doubt there will be errors, omissions and over-simplifications, for which I take absolute responsibility, as is customary, while hoping that the rest of the material will be enough to stimulate insights and new ideas on design work for the urban poor, which will ensure their equitable inclusion in cities throughout the world.

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1 Introduction

Currently, 1 in 6 people live in slums, or informal settlements, that are built illegally in cities throughout the developing world. They are characterized by lack of proper sanitation, unsafe housing, and crowded living conditions. Despite their appearance, informal settlements are legitimate communities that are a direct result of the sophisticated social, economic and cultural networks that support the livelihoods of all that call them home, and the requirement to meet basic needs that are not sufficiently provided by city officials. For many cities, these settlements (that are a result of their own inability to provide sufficient housing to migrant workers and the urban poor) are scars on the urban fabric. They believe these communities should be erased and the urban poor who occupy them dispersed to unknown places. The incredible rate at which they grow daily and their incredible scale make city officials unable to propose a vision for their future, let alone a vision for erasure.

For those in engaging in constructive acts within the informal settlement, this thesis proposes that any architectural intervention be a result of the preservation of the integrity of the informal fabric; a strategy that legitimizes the settlement's density and scale, ensures the urban poor's stake in the city, and maintains the settlement's underlying networks that are vital to the life of the settlement.

The 'fabric' of the informal settlement is a culmination of a number of characteristics that make them unique (especially in comparison to neighbourhoods in western cities), and the ability of the settlement to adapt and transform to internal or external forces. The fabric of the informal settlement refers to its built characteristics, like materiality, construction methods and overall appearance, as well as the way the activities within the settlement will begin to shape and transform its built environment (and the spaces in between) to meet the needs of the residents. The 'informal fabric' is different from the 'formal fabric' in that it exists illegally, without tenure on the land it occupies and without the support or investment from the government that 'controls' it. The activities that occur within the informal fabric are often in support of the formal city, although it fails to be recognized as a legitimate part because the residents do not partake in the tax collection, or the benefit of having services provided by the governing body. The informal fabric is mostly occupied by those that cannot afford to be a part of the formal city, they might be poor, working or middle-class. They are people who, without the informal settlement to give them a physical place within the city, would not have access to the opportunities that the city provides.

1.1 Global Concerns

Over the last 50 years, many countries have experienced a rapid rate of urbanization. Much of this growth has occurred in cities of the developing world, only Tokyo and New York City surpassing the likes of Mexico City (pop. 19,028,000), Mumbai (pop. 18,978,000) and Sao Paulo (pop. 18,845,000) (The United Nations, 2007). Much of this growth is from urban migration, putting strain on infrastructure and housing, and producing governments unable to cope with the daily migration of hundreds to thousands of people to the city. Many of these migrants are drawn to the city because of the degrading conditions of the rural environment, and the economic and social opportunities that they believe can be found in the city.

Mike Davis in *Planet of Slums* focuses on collecting the metrics for a number of locations in the developing world. His nonfiction narrative gives a starting point for understanding the global state of rapid urbanization, where over two-thirds of the population already lives in cities, and the global mechanisms that have caused this rapid urbanization. Davis also looks at the informal housing mechanisms in the cities of the developing world, quantifying the extent of 'slum housing' to 1 billion slum dwellers across the planet (Davis, 2007). While not implicit, Davis draws connections between large overall city populations, and large slum populations, which is shown in Figure 1.1. Mexico City, for example, is the most populous city in a developing country on the planet with 19 million people; it also has one of the most populous informal settlements,

Figure 1.1 Connection between an overall city population and population of informal settlements in cities throughout the developing world (London School of Economics and Deutsche Bank's Alfred Herrhausen Society, 2007).

Nezal, with a population of 4 million (Davis). The city's Gross Domestic Product (GDP) is also the fourth highest in the world, providing many economic opportunities for urban migrants. This has caused an increase in the demand for low-cost housing; a need the city has been unable to provide. As much as 60% of the city's growth is informal, and owner-built on the periphery of the city (Davis). Although Mexico City's transportation system is quite extensive, it fails to reach the outlying communities, causing significant traffic and pollution from vehicles attempting to enter the city centre, putting stress on the environmental systems that support the city. Today, the city is struggling to get people out of their private vehicles into alternative forms of transportation, like walking and cycling.

Both Mike Davis and the work of *The Urban Age Project* begin to discuss the underlying factors that have created conditions for these drastic urban population changes. The creation of mega-cities, especially in Asia, has blurred our definitions of what is "city" and what is "not city" – especially when the perimeter of the city is in constant flux, as the built fabric continuously extends onto rural lands that surround the city (Marshall, 2004).

In many cities, global markets are now taking a physical place in the fabric, forcing traditional occupants of the city centre to move to the periphery. Climate change and resource consumption are also degrading conditions in the rural environment, causing mass migration to the city; the only option for survival.

1.1.1 Globalization

Globalization is playing a key role in the transformation of cities in the developing world. As dense urban centres are being transformed to primarily commercial and service-based, the denser and older housing that accommodated many people is being removed and replaced by financial towers and hotels instead of housing. Without an alternative, these former residents are forced to move to the periphery of the city, increasing their sense of isolation from their former, and often long time, traditional place in the city.

In *Walking Between Slums and Skyscrapers*, author Michelle Tsung-yi Huang examines the demands of corporations on space in the centre of Tokyo, revealing their desire to create copies of global centres, in order to create role models of capital accumulation and enable flows of capital into the city (Huang, 2004). These role model city centres would only contain places for commerce and services for business travellers, forcing many residents to leave the centre to find housing at the periphery. Nirmala Rao explores this in *Cities in Transition*, stating that globalization

causes many urban dwellers to lose stake in their own city (Rao, 2007). This is also discussed in *The Urbanization of the World*, as Edward Soja and Miguel Kanai begin to discuss the influence of the metropolitan region, and the slow elimination of what would conventionally be called a city. City centres have become intensely commercial in order to become a part of the networks and extensions of the global city network (Soja & Kanai, 2007). Cities like New York, Toronto and London have relatively mixed downtowns. These new global centres, especially those in Asia, are more like the visions of Le Corbusier or Ebenezer Howard, where work and home life are separated into far corners of the city and only reachable by extensive train systems or private vehicles.

1.1.2 Rural-Urban Relationship

The Rural-Urban relationship is also discussed by a number of the authors, as this valuable relationship, which has historical roots in how cities were developed, is slowly disappearing. In *Cities People Planet: Livable Cities for a Sustainable World*, Herbert Girardet discusses the incredible growth of cities in the Asia-Pacific region and Africa, and the continent specific factors that have increased the rural-to-urban migration, to the point where urban growth is close to 5% a year (Girardet, 2004). Girardet sees urbanization as driven by economic factors, as agriculture requires less labour and there is greater competition between small farmers and big agriculture business that receive subsidies for their crops. Rural dwellers are finding that leaving the land they have harvested for years, and venturing to the city, is the only option for survival. As pointed out by Herbert Girardet, many countries are attempting to counter rural-urban migration by improving living conditions in rural environments by providing access to services and technology only available in the city. He claims that such policies can be counterproductive because they tend to introduce urban cultural values into rural areas, increasing their fascination with urban living. People are being pushed away from rural environment, but they are also being pulled to the city (Girardet).

Many rural environments are not able to support the amount of people it was able to in the past. In countries like India, where there is still a very large rural population (70% of the 1.1 billion population still live in rural regions) it has become clear that the environmental degradation and the scarcity of vital resources have resulted in much suffering by the rural poor (D'Monte, 2007). Although many rural communities are plagued by food and water shortages, as well as extreme climate conditions, people rarely go hungry in the city, as there are many networks that support newcomers (Mehta, 2004). As the rural population migrates into urban areas, and the capacity of cities is reached and exceeded, the urban footprint is beginning to encroach onto rural

lands. In India, more than 50,000 hectares of valuable croplands is being lost every year to urbanization (Davis, 2007). In Egypt, where the Nile feeds its vital agricultural lands that have fed the city since the birth of civilization, urban development consumes up to 30,000 hectares per year (Davis). This loss of agricultural land, and the population growth of cities, has created many advocates for urban agriculture.

In *Mutations*, the article entitled *How to Build a City* outlines the basic components for a Roman city, a city that was built based on the relationship between the rural and urban environment, which is manifested in the networks and elements common to all cities of the Roman Empire (Harvard Project on the City, 2000). Agriculture and markets within the city (the forum) are important elements for food and commerce, but also the source of water for the city (aquae ductus), which would be located outside the city, and the infrastructure used to cross the city boundary and connect to the rural areas (viae). As resources are consumed by the city, access to these vital services, as well as the ability for them to be replenished and protected, will continue to be vital to the continuation of the city. For informal settlements, this might mean no access at all as 'legitimate' parts of the city might obtain priority for water and food supplies. Ensuring equitable access, but also sustainable resource use, will be essential to provide vital services to all within the city.

Urban migrants, although a vital part of the economic machine of the city, are excluded and identified as illegitimate components, pushed to remote locations and starved of the most basic facilities and infrastructure (Burdett & Rode, 2007). This creates a fragmented urban fabric, based on a culture of exclusivity, which is unable to adapt to the cycles of social and economic changes that have and will plague cities all over the world.

1.2 Universal Issues

Increasingly, urban migrants in the developing world have been left to their own resources and ingenuity to create a physical place for themselves within the city. In order to survive, the urban migrant finds shelter, or builds it hastily on any available land they can find. Initially, the hut or shanty will meet basic needs, and create the opportunity for him or her to seek employment within the city. Over time, if the urban migrant is successful at finding work, he or she might move to more 'substantial' housing, in an informal settlement. It may be rented from other settlers, or it might be migrant-built construction (Davis, 2007). This is the place where the urban migrant begins to attach him or herself to the underlying social and cultural networks of the settlement. They may save money to send back to their village (Brugmann, 2009), or

support their own family, but ultimately they grow acquaintances with fellow settlers and begin creating their own livelihood.

On the surface, in the clichéd image we can all conjure up in our minds, we believe these are simple dwellings, filthy, and unable to meet the needs of those who occupy them. This is simply not true. They house families, hardworking people, and laughing children, all looking for a better life that only the city can offer. In this, and many other ways, they are not unlike communities in the formal city, and while we never question the legitimacy of the places we live, every day informal settlements and their inhabitants are put at risk because they are not considered an equal part of the city.

While these are complex communities, many lack essential and basic services like proper sanitation, a safe food and water supply, and proper solid waste management (The United Nations, 2003). This puts the urban migrant at risk of disease, as the settlement may be teeming with mosquitoes that are infected with malaria or the piles of garbage infested with rats.

Legal tenure is also an issue for urban migrants. Vacant land in the city does not exist by accident; it is mostly likely not developed because the land has no value. The land may be located on steep terrain, near railroad tracks, have contaminated soil on site or be located adjacent to toxic land uses. No competition for the development of land gives a sense of security for the urban migrant, as risk of eviction is considerably less on this land, but puts the urban migrant at risk of toxicity, birth defects, and death (Davis, 2007). With critical mass and being built out of sight, many settlements are able to exist undisturbed for generations.

If urban migrants are pushed to the fringe of the urban landscape, this increases the distance between the disadvantaged and their own city. Toronto is an example of this, it has become so out of reach that many of the city's disadvantaged have lost their voice in the city as they are left to the periphery, stigmatized and isolated. In the documentary *High Rise*, where social conditions in some of Toronto's low-income high rise towers at the periphery of the city are documented, their distance from city hall has left them with no representation. Without this representation, they have the difficult task of dealing with absent landowners, crumbling infrastructure and unsafe buildings on their own, without the same safety nets that inner-city dwellers can take advantage of (Cizek, 2010). As renters, the city also fails to invest in public transportation, as well as open space, as being able to use public space apparently creates crime. The search for affordable housing, adjacent to a vibrant, urban centre, has ultimately negatively affected the quality of life for residents.

In Lagos, Nigeria, commutes can last up to 2 hours, creating havoc and incredible congestion on roads leading to the centre, a result of the lack of investment by as the government has not invested in infrastructure on any level (Harvard Project on the City, 2000). This reduces the amount of time the urban migrant has with his or her family, and the ability for them to transform their own life.

1.3 A Vision

The urban poor should have equal right to the city. If government officials are unable or unwilling to provide sufficient housing and services to allow them to stay in the city, informal settlements should be recognized as legitimate and as an equal part. Left to their own devices, without government support, they have severe deficiencies that put the occupants at risk of disease, injury or death. They require the time and resources to support their in-situ development. The current condition of the informal settlement is not their future reality. Given the appropriate time and resources, they have the potential and ability to eventually obtain a level of permanence and complexity that will parallel if not surpass the current condition of the formal city.

These are incredible claims, but considering the density and scale of the informal settlement, their lack of reliance on the automobile, the diversity of activities that occur within them, and resiliency of the urban form to adapt and evolve as time and resources are acquired, this evolution is inevitable.

Although there are universal issues that face all informal settlements, the local social, economic, cultural and political networks support and sustain the livelihoods of residents in informal settlements. To explore the local conditions of a particular settlement, this thesis explores Dharavi, an informal settlement in Mumbai, India.

1.4 Context: Dharavi, Mumbai, India

Dharavi has developed as an informal settlement for over 50 years. Initially it was located on the periphery of the city, bordered by the Mithi River to the north, and the rest of the city to the south, the colonial centre of the city called Colaba, see Figure 1.2. In the early part of the 19th century, the area of Dharavi was a mangrove swamp inhabited by Koli fisherman, and immigrants from other parts of India; the Kumbhars from Gujarat established a potters' colony and Tamils from the south opened tanneries. This was the beginnings of an industrial economy (Jacobson, 2007). Over time, as the city sprawled in size and increased in population, Dharavi was consumed by the formal city of Mumbai, and the small villages were transformed into a hub for urban

Figure 1.2 Maps of Mumbai showing ground, air and sea transportation, financial and diplomatic centres, the original landmasses, and its relationship to Dharavi.

Figure 1.3 Image of a street in Dharavi with open sewers (Jacobson, 2007).

migrants from all over India, creating a settlement that now contains 80 different chawls or neighbourhoods and an estimated 1 million people (Nagars & Neighbourhoods of Dharavi, 2009; Jacobson, 2007). Industry still contains the traditional potters and leather tanners, but time has brought new dimensions, like a well-established recycling industry, electronics manufacturing, and the garment industry (Brugmann, 2009). These industries create economic connections to the city of Mumbai itself, but also to other global cities, as trade and off-shore manufacturing for global corporations is also occurring in Dharavi.

This concentration of people and industry has had significant impact on the environment in and around Dharavi. The destruction of flood-preventing and air-cleansing mangroves adjacent to the settlement puts it at risk of flooding during the monsoon season, potentially destroying hastily-built structures and creating pockets of disease in standing water. The river also receives waste from the settlement itself, as well as toxic run-off from industries up-river, destroying a potential source of fresh-water for the settlement or a place to fish for fresh protein. Lack of infrastructure in the settlement means that up to 100 families can share 1 tap for fresh water, and 1400 people can share one toilet seat (Jacobson, 2007). Open sewers run throughout the settlement as well as piles of rubbish that can block waterways and fill public space, as depicted in

Figure 1.3. Despite this, Dharavi has been home to many urban migrants for more than four generations.

Mumbai has explicitly expressed its desire to become a Global city, and private developers are all but too willing to implement this desire. Saskia Sassen's describes this as producing and reproducing the organization and management of a global production system in a condition of concentration (Sassen, 2000). Dharavi's current position, in close proximity to transportation hubs and the city's centre, increases the potential value of the land that Dharavi occupies. This makes it a prime location for commercial property, financial institutions and high-end residential required to create the 'global' image that the city of Mumbai is striving for. The city of Mumbai (and potential developers) are attempting to do this under the guise of creating a 'Slum-Free Dharavi,' a redevelopment plan has been proposed that will involve the complete removal of all existing informal buildings that currently make up the settlement of Dharavi, and the construction of new commercial and residential towers. The settlers who 'qualify' for new housing will be pigeonholed and stacked in 225 square foot apartments in high-rise towers, although the amount of space that is being allocated to existing residents is slowly being removed from the project. The businesses that have been established for generations, and provide livelihoods for many of the occupants, will not be provided space in the new scheme.

Despite Dharavi's deep social and cultural networks, and economic ties to the formal city of Mumbai and other global cities, this redevelopment scheme proposes to erase the settlement and uproot the entire community. Housing is proposed for current residents, however the regulations for who gets a place in the new housing eliminates many of the residents renting housing or those that have newly arrived. This puts many at risk of isolation by forcing them to other slums in the city or ones at the periphery. The profit of a few will be put ahead of the livelihood of the hundreds of thousands who call Dharavi home.

1.5 The Future for Dharavi?

Today, the future of Dharavi is threatened. Instead of allowing the settlement of Dharavi to exist as it has for generations without any support, the government along with private developers are proposing it be erased. The small-scale residential buildings (hand-crafted by their occupants) and the micro-industries that support the livelihoods of many residents of the community will be replaced by high-rise towers. The vernacular nature of the buildings will disappear, and the new buildings constructed will have a style similar to ones that can be seen in any city around the world, in line with Western

tastes that have been associated with wealth. The new community will be un-Indian, non-Mumbaikan, and especially not suitable to the specific needs of the Dharavian community members.

In 2004, Dharavi became the focus of a multi-billion dollar redevelopment plan initiated by the government. They proposed that the whole settlement be broken up into 5 pieces and given to developers for redevelopment, offering the current residents of Dharavi, who qualify, free housing in the new scheme (Patel, Arputham, Burra, & Savchuk, 2009). Although proposals promised free housing for all current residents, planners failed to make contact with the residents to determine who was eligible for redevelopment and what their needs were. This resulted in a huge proportion of the dwellers starting to fear they would be left out of the new development, and if their needs, outside of the basic requirement of shelter, would be met.

In the paper *Plans for Dharavi*, written by members of an NGO that support the National Slum Dwellers Association, the methods and tactics used to create a voice for the slum dwellers is documented, as well as the challenges civil society face in working with the state to ensure that development benefits those who it is intended to help (Patel, Arputham, Burra, & Savchuk). By giving development rights to private corporations, there is the potential that the economic needs of the developers, to build commercial and high-end residential to make a profit, will outweigh the basic needs of the community. This point is also reiterated in *The Urban Age Project* conference paper, *A Matter of People*. The redevelopment plan is viewed as a chance for the government to privatize and gentrify the land, instead of a project to resettle the existing settlers in new, modern housing. With the value of the contract, bid on by nearly 80 developers, estimated to be \$234.65 million, there is the potential for the successful proponent to gain financially from the project (D'Monte, 2007). Residents were very concerned of this possibility, so the scheme faced much public opposition and the outright refusal of residents to work with officials, who they saw as not working in their best interest. Luckily, their strong stance paid off. The minimum sizes for units was increased, from 25 square meters to 30, and some space was provided for small businesses at the base of the apartments that would provide free housing to residents. There were still other issues with the scheme though, like the maintenance after the buildings are constructed. The current residents have predominantly free or low cost housing, and maintenance is done on small-scale buildings at a minimal height. Without proper equipment and maintenance personnel, the buildings will fall into disrepair.

All of these sources; *The Economist*, Dan Cruickshank, and Jeb Brugmann; discuss the redevelopment scheme. Each sees the proposal as a means to pigeonhole the

inhabitants into small apartments, freeing up more space for commercial development near the centre of Mumbai. The plan only considers replacing the individual dwelling unit, and does not look at the space throughout the community that has been allocated for businesses and industrial activities that sustain the livelihoods of Dharavi's residents. The settlement will resemble developments of similar scale anywhere in the world, with minimal mixed-use buildings, and certainly no industry that will provide employment to a large proportion of the existing occupants. There are many issues with the current state of Dharavi, especially with water and sewage, which reinforce a need to allow Dharavi to develop [a point also reiterated by Herbert Wright in *Instant Cities* (Wright, 2008)]. However, the diversity and freedom of the settlement, which gives an incredible amount of inhabitants the ability to shape and form their own potential and livelihoods, should not be lost. The variety of housing types and spaces for use for any activities, give residents the ability survive autonomously. Regulating uses, removing density and people, takes the characteristics of Dharavi away that make it a socially, economically and culturally sustainable community, while encouraging the same 'problems' government officials see in Dharavi to reproduce in other areas of the city.

Government officials might also be concerned with the potential for political unrest and insurrection that may come from so many people living in squalor. The urban form of Dharavi, with small laneways and limited access, reduces the ability of authorities to control the large population. This was the very reason that Baron Haussmann proposed his plan for Paris, to break apart the notorious tenant housing in the central districts of the city that were characterized as the very worst of 'social decay' and political instability, not to mention a plethora of small alley-ways, small-scale workshops, industries and markets (Scott, 1980). The similarities between the two areas, in two entirely separate periods of time, is uncanny. However, the city of Mumbai is, and Paris was, motivated for different reasons. Paris in the middle of the 19th century was still evolving its urban transportation, which included the railway, and its infrastructure, which required extensive renovations on the city-scale to provide underground sewers and an uncontaminated water supply (Scott). The 'redevelopment' of Dharavi is entirely motivated by profit, and the desire to rid the area (adjacent to the future second economic hub in the city) of housing that does not reflect the global-image that the city desires. Dharavi's redevelopment will in no way improve the entire city, but it will displace hundreds of thousands that call the settlement home, and destroy the businesses they have created.

The following chapters will examine research that has been done on the relationship between the formal and informal city, the forces of globalization that are transforming cities, and proposed 'solutions' for informal housing that have been proposed by urban planners since the 19th century.

2 The Contemporary City: Understanding the Formal and the Informal

Many cities in developing countries are currently in a state of transition. Many are experiencing the effects of economic globalization and urban migration; two related conditions in many contemporary cities that significantly transform the city, often leading to inequality and an exclusionary condition. Cities are forced to urbanize to keep pace with the influx of people who arrive in the city each year, while trying to create the necessary workforce for a growing economy,

Economic globalization has caused many cities to focus on global markets at the expense of the national economy (Saskia, 2002). Although the global markets are perceived as being placeless, conceptual entities without the influence of any specific context, they do manifest physically in urban environments, from large commercial buildings for corporations, to the hotels and restaurants that provide amenities for the corporate elite. This has created a duality of classes, those that are located in the towers above the street, a part of the global corporate system, and those that live life on the ground, fighting to uphold their own livelihoods by taking advantage of the newfound economic opportunities. As discussed in the introduction, globalization is causing local environments to be transformed by the presence of international finance,

providing the traditionally disadvantaged with a broad array of jobs and work cultures that are a part of the global economy, but excluding them physically from the city by removing many of the networks and spaces they traditionally relied on for affordable dwelling spaces and amenities (Saskia). The city is creating an environment that caters to the needs and desires of the corporate elite, while excluding the very people that these global businesses rely on. It begs to ask the question, as posed by Saskia Sassen: Whose city is it?

The prevalence of lucrative economic opportunities and the exclusion of the poor from the city have translated into a division between formal and informal development, as those who have lost their traditional place in the city have instead created their own; building housing on any available space, joining existing communities who have already made a stake in the city, or using the formal city as the grounds for their own informal activities.

Ultimately, the informal and formal components of the city are inter-dependent, with many intertwined social, economic and social networks. Realizing the importance of this relationship, which is discussed in this chapter, is imperative in order to understand how a contemporary city in the developing world functions, and how informality plays a role in transforming the urban environment.

2.1 Cityness: Saskia Sassen

Saskia Sassen uses the term cityness, in the paper *Cityness in the Urban Age*, to describe the urban environments of cities in Asia and Africa that do not prescribe to our western preconceptions of what a city should be (Sassen, *Cityness in the Urban Age*, 2002). These ideas and preconceived notions arise from our experiences in our own western cities, which we believe to be the ideal. Cityness proposes that we re-examine preconceived notions, accept the differences, and recognize that the social, cultural and economic networks of different cities can transform and shape urban environments in different ways.

A major element of cityness is the relationship between the formal and informal activities in the city, and their manifestation within urban spaces of non-western cities. For instance, Sassen examines the use and allocation of public space in Shanghai. In Shanghai a bus stop, which is privately owned by a bus company during the day, is transformed into a public space at night and used by locals for playing chess or other activities (Sassen, *Cityness in the Urban Age*, 2002). In a western city it would be considered loitering to use a bus shelter as public space, even though the usage is

nonthreatening and the bus shelter is no longer in use. She proposes that public space in non-western cities is an activity in the making; it is not a representation of the 'ideal' public space, which has been defined by our [western] cultures since the beginning of urbanity (Sassen, *Cityness in the Urban Age*). The Shanghai example is extremely specific, which is an outcome of a culture's use of public space. In Canada, where we have more spacious homes and yards, we rarely use public space to relax or socialize with others. In Shanghai, or other cities like Istanbul or Mumbai, where homes are significantly smaller, especially for the urban poor, the space out-of-doors becomes the only option for activities that are not food or sleeping related. When all the space in the city becomes privatized, the only option is to appropriate these spaces for traditional activities, and use them within the rules set out by that private entity.

Considering the current state of urban transformation, as cities become larger and denser, Sassen proposes that we re-think our definition of 'urban', and has identified categories in order to understand it. The first is considering the parts of the city. In our traditional view, the whole is more than the sum of the individual parts. In many cities in the developing world it is the opposite, the importance of the individual parts overpowers the whole (Sassen, *Cityness in the Urban Age*). Our western cities are shaped by the 'master plan' – which provides a vision for the overall city, while ignoring the small, yet significant, components of the city that allow it to function. In Dharavi, the individual *nagar*, housing and employing thousands of people, plays a more important role in the success of a resident's livelihood than the entire city of Mumbai. However, the relationship between these two scales (the neighbourhood vs. the city), is still incredibly important. In Dharavi, the settlement itself has a powerful relationship with the global economic trade community, one that parallels that of Mumbai, even though the markets in Dharavi are informal. City-provided infrastructure, like the suburban rail system, also help in facilitating trade and providing additional space for economic activity. Public spaces within the settlement are also defined by the *nagar*, which are shaped by the activities that are designated to operate in those spaces. The activity defined by the community shapes the public space, as opposed to a 'master plan' that would designate activity, form and ownership, leaving nothing to the spontaneity of informality.

The second is that the intersection of differences is consequential, producing an outcome that may be good or bad, but is always new and tangible, as well as productive and meaningful to the people who use the space (Sassen, *Cityness in the Urban Age*). In Shanghai, the bus stop is the point of intersection between a need for public transportation and the need by adjacent people to have a space outside their home to socialize. This intersection is not conflictive, and is mutually beneficial, as the same

people who use the bus stop in the evening would no doubt use this as their local bus stop during the day. In Dharavi, different uses intersect on a number of levels. For instance, rail corridors border the settlement, which accommodate the suburban rail trains that carry 6.3 million people to the centre of Mumbai on a daily basis (Mumbai Rail Vikas Corporation, 2008). While the rail corridors are physical barriers that separate Dharavi from the formal city, the settlement takes advantage of this open space, using the hot aggregate between the rail lines as space for drying clothes and the soil on the sides as space for growing vegetables, as you can see in Figures 2.1 and 2.2. As a barrier, it also acts to prevent the invasion of the formal city on the informal, a positive when considering the threat of erasure that is currently plaguing the settlement. While a potentially negative space, the settlement has instead used it as a productive space.

2.2 The Kinetic City: Rahul Mehrotra

Rahul Mehrotra, in *Negotiating the Static and Kinetic Cities: The Emergent urbanism of Mumbai*, examines the urbanity of Indian cities, and how its specific culture has transformed this former colonial city. As Saskia Sassen defined the intersection of nonspecific opposing forces, Mehrotra suggests that there are two opposing elements of the city; the Static (or fixed, formal) and Kinetic (transformative, informal) (Mehrotra, 2008). The formal are the built elements of the city, brick or concrete, meant to be permanent and defined by an overarching plan. The Kinetic is perceived as the perpetual motion of the city, it is temporary in nature and often built of recycled materials (Mehrotra). The Kinetic is the mark or commemoration of culture and moments that are not fixed into material or capital investments, the activities that are excluded from spaces of global flows of capital, and have become the "spectacle" or the single image of the city. The festivals, trading activities, traffic, and pedestrian movement becomes the visual culture of the city and urban reality. Although the kinetic relies on the architecture or a physical place, for its existence, it is more the use of spaces that exist between and around the architecture that creates the image of the city (shown in Figure 2.3).

Both of the static and the kinetic are valid parts of the city. If placed on equal footings, their validity as components of the city can be seen more clearly. Mehrotra uses the Tiffen Man to illustrate this relationship. The Tiffen Man delivers 200,000 lunches from the kitchens to offices all over Mumbai. They are transferred (as much as 5 times) using formal transportation methods, like the commuter train, or buses, and then transferred to local methods like bicycle or foot for delivery within the city. The Tiffen Man is kinetic, and is a part of the image and identity of the city. The infrastructure

Figure 2.1 Image of the rail corridor in Dharavi.

Figure 2.2 Image of the side of a rail corridor in Dharavi.

Figure 2.3 Diagram of Rahul Mehrotra's concept, The Static and the Kinetic.

used for transportation, like the roads and trains, becomes a mere backdrop, although it is considered the 'formal' or static component in this relationship and is essential in allowing the spectacle of the Tiffen Man to exist. When each is looked at as a 'service' necessitated to allow for the city to function, they become equal components (as people need to travel quickly through the congested city, and men need for at work). The Tiffen Man is a valid entity that takes advantage of formal infrastructure in order to provide an important service - a productive overlap (Mehrotra, 2008).

2.3 The City is Not a Tree: Christopher Alexander

Christopher Alexander, in *The City is Not a Tree*, begins to discuss the relationships between the fixed parts of the urban fabric. As shown in Figure 2.4, Alexander uses the analogy of a tree to illustrate the hierarchy of the fixed parts, which are disjointed and separate from each other, constrained to discipline and rigidity (Alexander, 1987). In the hierarchy of the tree, there is the desire for order of all the major components of the city. This is much like a master plan that might only examine land use, formal street lines and the vague outline of buildings: but places them in a rigid, symmetrical hierarchy. This excludes many of the small elements that make up the system, as they do not have direct relationships with the major elements of the whole city system, and they deter from the orderly aesthetic of the 'tree.'

Figure 2.4 Diagram of Christopher Alexander's concept, The Semi-lattice.

Alexander claims that the tree represents vernacular beginnings, made of many closed systems. In today's urban centre, the underlying social and economic systems overlap on many different layers in a semi-lattice, and there are many small elements that function together, often without identification or a formal place in the 'hierarchy' of the city. He uses the example of a group of friends to illustrate the difference between the old and the modern city. In the traditional environment, when they are asked who their best friends are, they each say each other, signifying a closed system. In the modern city, those same friends would name other friends, some the original group might not even know. This signifies an open or extended network, where everyone participates in more than one system, and is thick with overlap (Alexander, 1987).

In Dharavi, the urban landscape is not a perfect hierarchy, it does not prescribe to an aesthetic or organized criteria. Limited space means the requirement for efficient utilization of space is high, which often means uses and spaces overlap with little regard for order or hierarchy.

2.4 The Urban Advantage: Jeb Brugmann

Jeb Brugmann, in *Welcome to the Urban Revolution*, identifies the urban economic concepts that create an advantage within the city: proximity or concentration, density, scale, association and extension (Brugmann, 2009). Brugmann relates everything back to economics, which is the basis for the validity and legitimacy of the activities and construction within the urban environment. This is especially true of informal

settlements, as the fabric is a product of a need to meet basic requirements like food and shelter, but also sustaining an economic livelihood.

Brugmann concedes that the five elements he identifies are only available in the urban environment, which is by the virtue of the city's density, scale, and critical mass. By just having more people in close proximity, the individual is able to take more risk, because each person represents an opportunity for exchange. Either as ideas, products or services; either relying on others or venturing out on their own. There is also more capital to borrow, different kinds of spaces to inhabit (later Jane Jacobs will explain this further) for economic exchange and other businesses to network with. A person is able to be more ambitious, thus providing an economic advantage.

Both Jeb Brugmann and Saskia Sassen examine the role of globalization in shaping the city. In *Seeing like a City*, Saskia Sassen discusses the relationships between global cities defined by globalization; like Brugmann's idea of extension, where the global processes and linkages that bind cities together begin to materialize in the built form of the city (Sassen, *Seeing like a City*, 2007). They materialize, because the networks associated with globalization still have physical infrastructure in distinct, tangible, three-dimensional city places, as opposed to the idea that global networks are just abstract ideas (Brugmann, 2009). Global city systems are merely extensions of urban markets, networks and services, which link from the city to the rural context and then other urban centres, and ultimately society (Brugmann). As mentioned previously, Roman cities were not isolated systems. They had close relationships to the rural environment for sustenance, but also to other cities in their empire. An empire is essentially the modern reach of a global city. Within the 'empire,' resources, capital and goods are exchanged freely, each city being an outpost for the main city containing government and law structures that support it linked by highway. Now, the reach of the empire is not limited by distances reached by sail or foot, and the force of an army to conquer the city; every empire is global, free for the taking if the city gains a return for the occupation of a foreign global city, and infinitely overlapping with all other global cities.

3 Dealing with informality: Past and Present

Interpretations of Urbanity

This fascination with the self-organizing nature of informal settlements is in complete contrast to practitioners in the past, who were reacting to their own state of rapid urbanization, where parts of the city were transformed into housing for the working poor. During the industrial revolution this type of housing was called tenements, while later their name transformed to slums or ghettos. For each era the housing was characterized by crowded living conditions, a poor quality housing stock, and a stigmatized population who were socially, economically and culturally isolated from the city's elite.

Many architects and planners were horrified by the crowded, ill-ventilated, unplanned, unwieldy, and unhealthy conditions of cities of the late 19th century (Pinder, 2005). Many thought the only 'solution' was to replace them with modern towers or the clean lines of an organized urban plan, without much consideration for the forces in the city that caused them to exist in the first place. Many cities throughout the 20th century, from New York City to Toronto to London, had large portions of city centres replaced, which often only created more issues for these poorer areas of the city. Eventually, during the 1970s and 80s, the attitude and approach to these areas of the city drastically

changed, more architects and planners were taking the approach of 'revitalization' and 'redevelopment' as opposed to complete removal.

For many informal settlements in developing countries, the removal or replacement is the only option considered for providing vital services and dealing with inadequate housing. Replacement only displaces the people who desperately need housing in the centre, and often destroys many of the informal networks that support the occupants in their own settlements.

This chapter will examine some of the approaches laid out by architects and urban planners over the last one hundred years, and will critically examine their potential relationship to informal settlements. Dharavi, threatened by a redevelopment plan, will be affected by the theory and practices that have been developed by architects and planners all over the world; finding the right 'mix' will ensure the future of settlement. The theories of Jane Jacobs, Le Corbusier and Ebenezer Howard are still influences in modern urban planning and architecture that represent a dichotomy of ideas on how people want to live in the city – between low-density or high density, in a busy metropolis or the quiet suburb – and how the city should operate in order to be an efficient, safe, and economically viable place – as connected, dense and mixed-use, or with functions separated and isolated with little interaction.

3.1 The Urban Migrant: Desperation & Profit

David Pinder in *Visions of the City* discusses the works of those who wanted to change urban spaces radically and produce spaces conducive to a different way of living than what was currently happening in cities of the 20th century (Pinder, 2005). He, like many others, begins the discussion with the work of Jacob Riis, who documented the appalling, and overcrowded, conditions of the slums in New York City in his book *How the Other Half Lives*. Through a series of photographs and sketches he shows how the city had to adapt in order to absorb and accommodate more migrants, which was often done hastily and for considerable profit for landowners in the city (Riis, 1971). Owners of large apartment blocks profited from the need and desperation of the migrants by dividing large spacious floor plans into small tenement units, often sticking 10 families into a space that once only took two (Riis).

This is no different than the situation in a number of informal settlements anywhere in the developing world, where pirate subdivisions will spring up in order to house anyone willing to pay, providing housing in hastily built structures on land that is not serviced for occupation. In India these are known as chawls, which are dilapidated

apartment blocks filled to the brim with families, often providing one room for 6 people in a mere 15 square meters (Davis, 2007). In Mumbai, even the middle-class lives in close quarters. Suketu Mehta, in *Maximum City: Bombay lost and found*, describes a condo block in the middle of the city, where a single 20 storey building, with an average of 10 units per floor with 10 people each, from the family members to the servants, will equal 2000 people in one building (Mehta, 2004). Even on the outskirts of the city, the chawl is transformed into a 'squatter settlement,' where tiny plots of land are developed by pirate builders, turning any available material, from cardboard to tin, into small, cheap housing for urban migrants. Mehta also describes the efforts of a pirate developer. In order to secure the land as an asset, his team of builders will produce housing on vacant land, then quickly rebuild when city officials destroy the structures; capturing the land is key to ownership, so informal tenure can be established (Mehta). In the example given by Mehta, the developer's tenants occupy three small shacks on rail lands for free, for the sole purpose of occupation. Building materials are inexpensive, about 1500 rupees or \$35 CAN, and can be reassembled within hours if demolished by authorities (Mehta). Eventually the huts will become a permanent part of the city, and will extend from themselves to other building types, like stores and schools; the huts will become a settlement.

Examining the work of Jacob Riis, the problem with the image as the only means of documenting and understanding informality is that it only captures what is visible in that single image and does not compute the conditions that are happening below the surface or between the captured moments. If Jacob Riis were to enter Dharavi, he might be overwhelmed by the open sewers, the small man-made homes, the barefoot children or the animals in the street; and fail to notice that it is in fact a productive, vibrant and diverse self-supporting community. Dharavi is an intensely grounded and dense urban fabric, that is much different than the tenements of New York City or London. As the residents are firmly planted within the street, they have the opportunity to modify their local environment in order to ensure that the spaces they live and work are able to support the livelihood they want for themselves. In New York City, for instance, the built environment is relatively static, so the residents did not have the freedom to modify the environment to meet their needs. In both realities, the small, independent business is celebrated as the basis of the economy, but in New York many urban migrants were also attracted to low income factory or sweat shop positions, leaving them dependent on others to meet their economic needs. Housing for newly arrived individuals or families is only available if rented. The difference being that Dharavi's built-form allows for additions and modifications, so housing can be built in any available nook or cranny. New York during this period is built-up, and at the control of landlords. To find a place

to own in the city, let alone a place to start an independent business, would be virtually impossible.

3.2 Utopia: Urban Planning Visions

Jacob Riis's photographic depictions also became inspiration for many utopian visionaries; those who saw the need to create urban and social change (Pinder, 2005) by providing the ideal for living, which all new cities could model themselves after. Earlier models of utopianism, often depicted in paintings or woodcarvings, were a projection of an imaginary new place or state – perhaps Eden, lying in another time, and of a social and political ideal (Pinder). When initial utopians were imagined they were ideal agrarian states and peaceful representations of the countryside. Eventually, these ideals were projected on the city, and architects, planners and visionaries imagined the utopian urban environment. During industrialization the city became a dark, dirty place, filled with smoke from factories and the rank stink from the waste from a growing urban population. As a means to make the city more livable, some thought to deurbanize, removing portions of the population from the city and moving them to satellite cities on the outskirts, which will be discussed later, while some wanted to preserve the diversity of the city, aiming to strengthen and improve what it already had. As the city was viewed by some as chaotic and dysfunctional, elements like authority, order, power, rationalism, surveillance and control became the focus of the proposed urban utopian visions - concerns of society of the time (Pinder).

Ebenezer Howard was also appalled by the living conditions of the poor in London, and desired to create social change for urban dwellers by creating alternative locations for living on the outskirts of the large metropolis. He called this plan the Garden City, which he discusses in his book *Garden Cities of To-morrow*. Instead of working with the fabric of the existing city, Ebenezer Howard proposed the creation of multiple town-country hybrids on the periphery of large urban centres. These isolated pods, which were connected to the main city by transportation links but surrounded by green fields, would draw people away from the city in order to reduce its density, with limits placed on the extent that the pod could develop and grow (Pinder, 2005). Howard saw them as developments with both a mixture of housing and separate commercial areas, where people could dwell, but also work and shop, while food would be produced in large gardens between rows of housing. The entire town-country hybrid would be controlled by design, with the hopes that control would help avoid the ill conditions of the city.

In the opening essay of the re-issued *Garden Cities of To-morrow* called *The Garden City Idea and Modern Planning*, Lewis Mumford argues that it was not Ebenezer

Howard's intention at all to support the mass exodus of populous from the city centres, but to create new smaller cities, contained within greenbelts, that would have slightly less density than crowded London and seek to improve the life of both the rural and urban dwellers (Mumford, 1945). If the pods on the exterior of the city would not support populations from cities, it isn't clear who exactly would populate these 'cities' and provide the necessary critical mass to allow the commercial areas of the town-city to thrive. Jeb Brugmann's 'urban advantage' is not really a new idea at all, critical mass at any period of time would be essential to keep infrastructure operational, gardens kept and businesses with enough clientele. Without the ability to support the necessary social, economic and cultural networks of the city, it isn't a city at all and would fail as such.

This inability of the controlled model to create a convincing city-like environment became one of the reasons why Ebenezer Howard's Garden City became a starting point for our modern suburbs (communities made up entirely of housing) that still rely on the city for economic, social and cultural livelihoods. Developers took the basic elements of Howard's plan, like the swaths of green space, single-detached housing, and circular roads, and applied them to many suburban schemes without considering all the required components required to make it a successful and 'complete' community. The plan proposed by Ebenezer was only a diagram, yet it was taken literally, becoming the ideal for many Americans; who access the city with private vehicles, enjoy the privacy of a single-detached house, as well as the green space around their property.

Although the suburb is equated with wealth, especially in western cities, it is often the 'redevelopment' option for many families in informal settlements that are evicted and forced out of their homes. These peripheral communities lack the spaces in the informal settlement, like commercial spaces, small industrial spaces and retail, which provide the means for their economic stability. Being located on the periphery of the city, they are physically isolated without the means to freely access the city centre. Transportation to the city centre would require a considerable amount of income, to purchase a private vehicle or take public transportation, and time, as distances are considerable and traffic is congested. Considering these risks, using peripheral settlements for replacement housing is inappropriate. Especially since sprawl has negative effects on the city as well, increasing air and water pollution, and congestion in the inner city.

Jane Jacobs, in *The Death and Life of American Cities*, is highly critical of Howard's plan, arguing that the Garden City does not contain the ability to adapt and change overtime, as the formal lines of the Garden City are unchangeable and its density,

only allowing for 30,000 people in 1000 acres, is not sufficient enough to have a pool of unique situations that could allow for urban evolution (Jacobs, 1961). In a large metropolis, with a fluctuating population who has access to a variety of spaces, new ideas and opportunities can multiply. By only focusing on the housing stock to create social change in the city, this fails to address the ability of residents to create their own opportunities and continue to exchange ideas. Addressing the quality and density of housing alone, also, ignores the other issues that contribute to a settlements' condition, maintenance, services and how cities police themselves (Jacobs).

In contrast to the low nature of the Garden City, Le Corbusier's concept for living was the *Vertical Garden City*. While both schemes look incredibly different, Howard creating a low-rise settlement and Le Corbusier creating high, stark, dense towers, the schemes underlying goals are surprisingly similar. Each contains a mix of residential, commercial and industrial uses that are separated into 'zones' by use, and an immense amount of green space that can be used for agriculture or recreation – different in their form, but considerably similar in their function, a fact reiterated by Jane Jacobs (Jacobs, 1961). Le Corbusier did not want to make new pods on the periphery of a main city, though he wanted to replace segments of its urban fabric, transforming the conventional grid into superblocks, characterized by their huge amounts of [empty] green space and huge highways to carry private vehicles quickly through the metropolis.

Le Corbusier uses this idea to consider a new plan for a portion of Paris, called the Plan Voisin, in which he creates an island in the middle of the city, cutting off the roads and creating a new grid of cruciform towers. He gathers all the housing and commercial buildings that would traditionally lie connected to the ground plane, and forces them into rigid geometrical forms to rise close to the sky (Corbusier, Centre of Paris, 1924). This is quite unlike his previous work, as outlined in *Toward an Architecture*, like the New Fruges Quarter in Bordeaux, where the design of the individual unit, in long mid-rise tower blocks, and the amenity spaces provided to the inhabitant are the focus (Corbusier, Toward an Architecture, 1924). Jane Jacobs critiques Le Corbusier's ideas on how the base of the towers would be connected to the city, as the ground plane between green space is designed for the quick movement of automobiles, instead of being an enjoyable and engaging environment for the pedestrian at grade (Jacobs, 1961). Without an engaging and vibrant street, would people walk around at all to enjoy the vast amount of green space? Or, like the tenements of London, would people feel isolated within their small apartment and lose ownership of their place in the city altogether? As Pinder points out though, Le Corbusier's images were meant to be provocative representations of an idea; Le Corbusier never intended their exact implementation. Unfortunately, just like Ebenezer Howard's Garden City, many public

housing and office buildings projects in Europe and North America duplicated elements of the scheme proposed by Le Corbusier, without complete consideration of how they would actually affect the community, and if they were intended to become a part of reality at all (Pinder, 2005).

Both Ebenezer Howard and Le Corbusier saw the need to harmonize and order the life of the city, in highly constrained and rigid plans. While it was recognized eventually that these rigid plans could never be implemented without complete destruction of the urban fabric, many designers and architects still attempted to use these plans as a point of departure (Jacobs, 1961). Perhaps though, it is impossible to lay down any plan that completely controls the city, and attempts to create a perfect utopian environment. The city is chaotic, unpredictable, and has so many forces intermingling that it is impossible to predict how they should interact together, let alone which particular forces should be happening at one time. The urban dwellers, at a micro-scale, given the opportunity, will transform the city to be their own liking, to be able to support their own livelihood. They have ideas that can be combined with the ideas of others, which will continue to proliferate and move the city into the future. Eliminating individual freedom only points the city in one direction, the direction laid out by the planner or architect; leaving fate up to the people gives it the potential to move in a multitude of directions.

3.3 Suburbs: Consideration of the Periphery

In the essay *Squatter Settlement*, John Turner makes an argument for supporting the periurban or suburban settlements that informal settlers often find themselves in when they are removed from the centre of the city by its commercialization, or if the slum dweller obtains the capital that allows them to afford living on the periphery of the city (Turner, 1968). The periurban or suburban conditions that many informal settlers find themselves in is described and not supported by a number of authors, like Geetam Tiwari in *Urban Transport in Indian Cities*, who reiterates that those who live on the periphery of the city often have to spend as much as 30% of their income on public transportation in order to reach the city's core (Tiwari, 2007). Finally, in the *Endless City*, Wolfgang Nowak makes the point that "anyone not living in the city felt like a second-class citizen...People living in cities have always enjoyed more freedom and possibilities for development than those living outside them (Burdett & Rode, 2007)."

A few urbanists and thinkers see the city as an inevitable force that, treated in the correct way, can create an urban advantage for those that dare to live within its boundaries. Hence Dharavi, a refuge for those that take the risk of moving away from the rural environment to find a new life for themselves and their family. In *The*

Death and Life of Great American Cities, Jane Jacobs argues to keep the city intact, as a diverse, dense, and lively environment. In the 1950s she studies a number of the housing redevelopment projects in the major cities of the United States, analyzing their lack of connection to the city and the resulting urban environments that facilitated crime, reduced economic activity and destroyed strong community connections. Jacobs identifies four components of what she calls 'city diversity' – primary mixed uses, small blocks, aged buildings, and concentration. Primary mixed uses basically says that one area of the city should contain a multitude of uses, ensuring that people interact with the environment during all parts of the day and for different purposes (Jacobs, 1961). In zones where only one use is prevalent, like a Central Business District (CBD) or a 'bedroom community' – like the suburbs created in the image of a Garden City - there are times where there is little to no activity happening on the streets. The existence of multiple networks, that are allowed to be active 24 hours a day in a multiplicity of spaces, from formal to informal or interior and exterior, creates a diverse community with many social, economic and cultural opportunities that ultimately support the livelihood of residents or urban migrants alike.

3.4 Designing for Permanence: Modern Architectural Responses

The informal settlements of the developing world have a palpable autonomy. They live without assistance from the government, developing their own infrastructure for survival, and economic networks that maintain their deep social and cultural connections with their ancestry and land. However deep the connection to these networks, the built form (where people live and work) is constantly being adapted to accommodate fluctuations in use and resources. Finding a solution for housing, food, industry or meeting basic needs like potable water and proper sanitation would require a response that works with the kinetic nature of the informal settlement.

Design Like You Give a Damn: Architectural Responses to Humanitarian Crises discusses Architecture for Humanity's emerging role in addressing the needs of the disadvantaged in developing countries, using the competition as a forum for collecting ideas from the wider design community. The need for collaboration is shown in the use of juries that have members of the design team, but also from the community in which they are providing a service. This collaboration gives a contextual perspective on how the facility would be used, and the components that would make it more usable to the community. In the case of the AIDS mobile clinic, a competition from 2002, the jury contained members from South Africa, who gave feedback on how it could be constructed locally to meet the needs of the community (Architecture for Humanity, 2006). There is a clear balance in the scheme between structures built by outside forces, the components that would hold sterile medical equipment, and vernacular

structures built by the community, that create a sense of ownership and make them a permanent part of the settlement. The structures are also hybrid: as multiple networks overlap at the new clinic – health, culture, socialization and economic – as the huts double as a marketplace during the day and allow for social gathering in the evening. The book contains a variety of other projects, from emergency shelters to more permanent buildings contained within settlements.

There are also projects that focus on creating structures that defy permanence; that might be assembled at one spot, but have mechanisms for disassembly, either for the possibility of mobility or upgradeability of components. Safe[R] House, designed at the Harvard School of Design, works with the idea of adaptability and expansion in order to meet a changing requirement for housing in a tsunami ravaged area of Sri Lanka (Architecture for Humanity). Structures were deemed to require the ability to change to accommodate additional uses, but also the ability to replace and install new materials as parts decay or as capital becomes available for improvement, or move altogether. This is the very essence of the Kinetic City, and of the diversity that Jane Jacob speaks about but on an informal basis. The Safe[R] House case study is discussed in 5.2. The city needs to be able to transform and adapt to changing conditions, if not the permanent infrastructure that supports the community then the networks that occupy those spaces. In the informal settlement, where structures are built rapidly and in order to meet the initial need of shelter, it will inevitably transform and adapt until it reaches a stage of relative permanence, where networks, relationships and ideas change, but the buildings do not.

Figure 4.1 Image of overpasses and congestion in Lagos, Nigeria (Harvard Project on the City, 2009).

4 Context: Growing Cities in the Developing World

As architects and planners in the western world, we have very fixed ideas about how a city should look and function; our preconceptions based on experiences, and memories of, our own cities. In western cities, uses in spaces rarely overlap nor are they allowed to exist as unsanctioned by city officials. There is an expectation of order and formality.

In the developing world, spaces in both the formal and informal realm are hybrid; they are morphed by use through time allowing multiple uses to be carried out in a particular space by people from different networks. Saskia Sassen called this idea 'Cityness,' examining some of the spaces in the city where this can occur. Commercialization of urban cores in cities of the developing world is threatening these unique hybrid spaces and the underlying networks that rely on them, because it is attempting to force this hybridism into a form of western formalism. In most cases, like the example Sassen gives of the bus shelter in Shanghai, the suppressed informality will continue to operate in the new formal environment.

Figure 4.2 Images comparing the development of Shanghai, China and Le Corbusier's Ville Contemporaine.

4.1 The Informal City: Lagos

Rem Koolhaas and the Harvard Project on the City document the city of Lagos, Nigeria in the book *Mutations* and in the film *Lagos*, where the self-organizing entities and continuous activities of the city are documented through a series of mappings and images. Lagos is quickly becoming one of the largest cities in the world, with the population projected to be 23 million by 2015 (Davis, 2007). Lagos is an informal city, developed with the absence of formal infrastructure, systems and amenities (Harvard Project on the City, 2000). Despite the obvious ugliness in Lagos, that manifests itself in piles of garbage throughout the city or standing water that breed malaria infested mosquitoes, it enthalls Koolhaas, he refers to it as the “reconceptualization of the city itself” and the “modern city reconsidered” (Harvard Project on the City, p. 653).

Koolhaas defines the form of Lagos as being broken up into 4 elements: Property, as being continually reassessed and negotiated; Plot, porous and ever changing; Line, the physical manifestation of what once was an abstract legal division between plots; and Wall, the barrier that creates an interior world separating itself from the congestion of the street, the interior may regenerate and reinvent itself, but the wall remains (Harvard Project on the City). In Figure 4.1, the wall is concrete off-ramps, and the plot is the open space inside of it, part of a large highway running through the city. Although this space is owned by the city, when a business occupies it, the space becomes informally owned by that entity, becoming an economically productive space. As an entity it has permeable boundaries, using the highways as a shipping system, and lulls in traffic, which is often in gridlock, as an opportunity for marketing and selling wares. This formal infrastructure is a platform for economic activity, an informal marketplace on the road while below is anything from industry, to storage, to car packs (Harvard Project on the City, 2000; Haak, 2002). Within the city, public space is always being reconfigured; the sidewalks being occupied in new ways to suck in the congestion of the streets, the flyovers providing shelter for activities like recycling, where scavenged metals and plastic from the city are exchanged as commodities with some of the largest steel companies in the city. This is where the formal and the informal, or the static and the kinetic overlap to create a productive outcome, an expensive piece of infrastructure with a single use, becoming a multi-use mediator.

Other authors would disagree with Koolhaas, focusing on the ugly surface of the city. Harry Goldstein in the article *How Not to Make a Megacity* paints a dark picture of the streets of Lagos, describing them as being plagued by wrecked cars, burned-out vans, and the occasional corpse (Goldstein, 2007). Despite Nigeria’s booming oil industry, poverty is rampant in Lagos and is marked by overcrowding, poor sanitation,

air and water pollution, clogged sewers, solid-waste contamination, and staggering traffic (Goldstein). From the images presented by Koolhaas, Lagos is always in a state of chaos; a point reiterated by Saskia Sassen in *Cityness in the Urban Age*, where she describes the city as a mess, but with an underlying order (Sassen, *Cityness in the Urban Age*, 2002). How does the ugly surface mediate with the underlying productivity of the social, economic and cultural networks of the informal city? In the end the chaos becomes a mere backdrop, as productivity, in a form highly unlike our own cities, remains the predominant image. Just as Mehrotra makes the point for Mumbai, the spectacle of the wild, chaotic African city is its lasting image and voice.

4.2 The Global City: Shanghai

Shanghai is essentially the opposite of Lagos, a city with informal roots that has been pushed into rapid development by globalization. The once mixed-use central city has been converted into a haven for global corporations and vast commercial developments that have broken the bounds of size and scale, thus isolating the city from conventional urban precedents into its very own category (Sudjic, 2007).

In *Asian Megacities*, author Richard Marshall compares the North American fascination with equating smallness with livability of cities with the trend in Asia to expand upwards and outwards to extremes, comparing development scale in Shanghai to that of Le Corbusier's *Ville Contemporaine*, where extreme density is used to create the ideal [global] livable city, as shown in Figure 4.2 (Marshall, 2004). In a sense, Marshall is playing the devil's advocate, as even with our own western urban perspective we could not possibly see how either the urbanized Shanghai or *Ville Contemporaine* could be a livable city. He is challenging us to accept and celebrate size, although our ideas about sustainability and reducing the footprint of the city would tell us to do the opposite. However, the scale of the Asian megacity does not apply to urban centres in North America, as only New York City parallels the density and population of cities like Mumbai, Shanghai and Mexico City. These types of cities are so different than the models explored in Europe or North America, that perhaps the 'megacity' is the type of urbanism that is appropriate to deal with their density and scale.

In the *Speed and the Friction*, Deyan Sudjic explores the consequences of Shanghai's rapid growth, examining the negative consequences (friction) of rapid development. Shanghai, while large and brand-new, has grown hastily, not unlike the growth of the informal settlement. Although the informal settlement is built without architects, in Shanghai lack of time between design development phases and construction has meant

that professionals like architects, engineers and planners have very little time to consider the problems and possible solutions for building correctly (Sudjic). Building components are oversized, building envelope solutions are poorly considered and are now failing, and the street, is poorly considered, if at all. Shanghai is also being pushed to become a global city. One signifier is the growing informal economic sector, which has marked the city's change from being socialist, and having an industrial tradition, to being an economy shaped by capitalism (Sudjic). Shanghai in a sense is a formal in-formalism, with the materials to build permanent structures, but without the mechanisms to make them a part of the existing networks of the city. The networks of the city, market places that provide food or the people who use the streets for informal activities, did not have the ability to shape any of the new structures in the city; they did, however, have the ingenuity to use the spaces in their own way after they were complete. The buildings and the streets are unmovable, but the uses, like the example given by Saskia Sassen of the bus shelter, are flexible.

4.3 Maximum City: Mumbai

While some cities are growing with the absence of formal infrastructure, like the city of Lagos, others are being forced into formal development under the guise of globalization, like the city of Shanghai. Mumbai is in the middle ground of both of these cities; social and economic disparity forcing many to find refuge in informal settlements, while

POPULATION GROWTH IN INDIA

Figure 4.3 Population growth in India, comparing rural and urban population from 1901 to 2030 (The Urban Age Project, 2007).

corporations are taking control of the public domain, creating a city that is being shaped by two strong yet opposing forces.

Starting in December 2006, as part of The Urban Age Project, over 50 experts in Mumbai and Delhi conducted research on cities in India, a growing country that now supports 1.1 billion people (The Urban Age Project, 2007). The results of this research are published in the conference paper *Urban India: Understanding the Maximum City*, where a number of the urban centres in India are discussed, including the city of

Figure 4.4 Image of the Ganesh Festival in Mumbai, India.

Mumbai. In *The Democracy of India*, K.C. Sivaramakrishnan examines the politics of a country that despite having two of the largest cities in the world, and a growing number of cities with populations in excess of 1 million inhabitants, is still 70% rural, although as shown in Figure 4.3 the overall urban population is growing (Sivaramakrishnan, 2007). The rural nature of India shifted following colonialism, where the British used the city as the base for trading and power. Traditionally India was rooted in the self-sufficiency of the Village, a concept explored by Deyan Sudjic in *India's Urban Shift* (Sudjic, India's Urban Shift, 2007). Although the population is slowly moving towards

the city, much of the power and authority for decisions still rests with the rural majority. This has consequences for the city, as many aspects that should be controlled and monitored by municipal government is the responsibility of the state; from investment in local infrastructure, like the extension and upgrade of the Suburban Rail System, to the installation of vital services, like additional water connections or a reliable power system (Sivaramakrishnan, 2007). In *Dwellings*, Paul Oliver, discusses the caste system, a deeply entrenched social system in Hindu culture that is followed strictly, especially in rural villages. Many of the poor in lower castes are landless and working long hours as sharecroppers or day-labourers to the needs and expectation of those in higher castes (Oliver, 2003). They are drawn to the city for its anonymity, and the hope of economic opportunity when they are able to escape from the caste system.

After India gained independence from the British Commonwealth in the mid-twentieth century, Bombay, continued to grow as the economic capital and centre of the newly independent country, obtaining ethnic and religious diversity of a true world city (Sudjic, *India's Urban Shift*, 2007). In *India's Urban Shift*, Sudjic discusses the disparities in Mumbai, for instance 6.5 million people in Mumbai live in slums that occupy only 9% of the city's area and 65% of the employment is in the informal sector (Sudjic, *India's Urban Shift*). This marginal existence in extreme density and precariousness, is discussed by Sujata Patel in *Mumbai: The Mega-City of a Poor Country*, where this image conjures up the worst that contemporary urban India represents: crime, gang warfare and prostitution (Patel, 2007). Gyan Prakash in *Mumbai: The Modern City in Ruins* also explores this disparate division. From the very beginning when Mumbai was primarily a British outpost, the city was divided into Foreigners, who had an enclave in the south peninsula of Colaba, and Indians, who existed north of this area in overcrowded chawls, which did not receive government investment (Prakash, 2008). Colaba was the proud and comely city developed in the style of a European city, while the vitality and identity of the 'Indian' Bombay was shaped by commercial and industrial activities of the northern neighbourhoods (Prakash). The many juxtapositions are also discussed by Rahul Mehrotra in *Negotiating the Static and Kinetic Cities: The Emergent Urbanism of Mumbai*, lack of investment in the architecture of the 'rest' of Bombay, meant that the dominating image of the city was not created by its architecture, but by the spectacle of the festival (Mehrotra, 2008). Figure 4.4 shows the Ganesh festival, a yearly celebration that sees streets transformed into processions of thousands of people, and squares appropriated for the worship of their treasured deity. The public space of the formal city is the meeting places for the non-Indian and the Indian, the place where the formal and the informal meet for social, cultural and economic exchanges, like promenades or festivals. There is a productive node in the meeting of these two 'separate' and 'opposite' entities. Chowpatty Beach, depicted in Figure 4.5,

is one of these public spaces, where people from all classes go to seek pleasure in the interstitial space between the city and the sea (Luke, 2008). Both the wealthy and the poor have equal possession of this space.

As discussed by Sujata Patel in *Mumbai: The Mega-City of a Poor Country*, Global corporate enclaves are beginning to show themselves in central Mumbai, changing its historical roots as a shipping and manufacturing port to part of the global system in finance, telecommunications and media service sectors (Patel, 2007). This has caused many urban dwellers, having lost a physical place in their own city, to move to the

Figure 4.5 Image of a market on Chowpatty Beach in Mumbai, India.

outskirts of the city, to the growing suburbs. Globalization is creating networks of cities that have very similar physical features. India is unique, because while it has embraced the processes of Globalization, many archaic and preglobal technologies are still widely used throughout the city (Patel). This is especially interesting when investigating the informal recycling activities in Dharavi, which rely heavily on manual labour for collecting and sorting. Pottery or tanning industries that still use traditional techniques are also located there. In Colaba, the Dobi Ghat, an open-air laundry facility, cleans and dries

the laundry from hotels in the financial and tourist centre of Mumbai. While the development of this area represents Mumbai's status as a "Global City," the still use traditional methods and labour from residents who live in nearby 'slums' to do this work.

Although Mumbai is not interested in embracing its identity of a formal-informal city, it is characteristically a city that contains both worlds. Recognizing the role of informal systems and networks that support the city's bid to become a Global City is imperative in giving the urban poor an equal stake in their own city.

5 Case Studies

The following case studies were chosen to investigate the types of interventions Architects are employing in informal settlements. There are many social, economic and cultural networks that support the huge amount of people who live in Dharavi; the urban landscape has to support and enhance those existing networks. The ideas of Cityness, the static and the kinetic, and the semi-lattice, explain the idea that within the informal settlement different networks and elements continuously interact with each other to create moments of productivity. These ideas are continuously analyzed in the context of the case studies.

The current structures of Dharavi are user built, so they are designed to meet the specific needs of the user and his or her family. Overtime, the informal framework can be adapted to meet changing needs, expand or upgrade as materials become available. An intervention without this ability would be disastrous. In Dharavi, many of the homes take on mixed-use aspects as well, with residential, commercial functions or rental properties, in order to generate income for the family. Jeb Brugmann identifies many incredible mixed-use buildings, like the industrial-residential-warehouse, which would not be permitted in many parts of the world (Brugmann, 2009). Also, in *Dwellings*, Paul Oliver identifies a number of techniques used by informal builders. In some settlements dwellings are constructed from bidons, cut and flattened oil drums which are overlapped

and used as cladding and roof materials. Oil drums are available in a number of areas in huge numbers, so they and other containers like kerosene cans can also be used (Oliver, 2003). Although as architects we might identify brick or concrete blocks in our schemes; in the end when construction and resources are left up to the occupant, any found object or material could be used to complete the shelter. Corrugated metal is also used in a number of areas, as well as more traditional materials like thatch, tiles, stone or adobe. Dan Cruickshank, in *Adventures in Architecture*, describes the ingenuity of settlers to use found materials, like doors, tarps, or cardboard to build walls (Cruickshank, 2008). A framework that allows material, when available, to be added to a safe structure would coincide with this requirement, but would also allow the dwelling to be adapted or expanded over time, see Figure 5.1.

Figure 5.1 Analysis of a typical market street in Dharavi.

Some of the most appalling conditions in informal settlements arise from basic vital services not being met, like public latrines, potable water supply, and sewage disposal. In the documentary, *Don't Leave me Now*, the struggle of the Slum Sanitation Program (SSP) to implement toilet blocks in informal settlements in Mumbai is documented. Although many toilet blocks have been built (there are currently 9,956 with 78,000 toilet seats) there remain issues with providing a waste management system that can accommodate the intense usage of the toilets blocks over a long period and the maintenance of the facilities after they are built (Menon, 2009). One solution is

providing the community with a paid position for taking care of the toilet block, which is funded by the World Bank. Sewage handling and disposal is done with a septic tank, while water comes from either a city source or with storage tanks above the toilet block. In Dharavi, the supply of public latrines and water taps is a crucial issue, as well as the infrastructure for the proper sewage and solid waste management. Plans for implementing such widespread infrastructure would be essential to creating a long-term plan for Dharavi, while considering the settlement's unique density and urban form.

In modern waste and water management systems these forces are invisible. While many propose similar systems in informal settlements, incomplete or deficient sewage networks make this proposition impossible (Stokman, 2008). In Dharavi, water and sewage are visible elements of the community. The informal nature of having many families share a water connection or public latrines, will not change, so re-thinking the current scheme as an urban landscape instead of an enclosed system would greatly improve the overall ecology of the settlement. Working with the idea of kinetic spaces, this urban landscape could also be used as recreation space, while improving the sanitary and ecological conditions of the settlement.

There is also the issue of establishing a strategy for how a settlement should be developed over time. The current development plan for Dharavi proposes wiping out the low-rise buildings on the site and building brand new towers for new space and the existing residents. In Toronto, Regent Park was developed similarly, where the area was deemed 'blighted' with poorly constructed buildings that fell below the minimum standard for housing, so it was proposed that all buildings would be removed (Collins, 1996). Much like Dharavi, before the redevelopment, Regent Park was a diverse neighbourhood, with a mixture of housing, commercial and industrial uses, see figure 5.2 and 5.3. When the redevelopment of Regent Park was proposed, only a small amount of community space was included on the site, and even existing schools were removed. Many of the residents were not eligible for re-housing, and an income cap was placed on residents wishing to apply, while single people were not given an option for housing in the new scheme. Housing was concentrated into taller buildings ranging from two to fourteen stories in complete contrast to the existing context of Regent Park. Surrounding community context and streets were removed, leaving large expanses of green space without ownership or connection to the surrounding context (Collins, 1996; Sewell, 1993). Out of the 822 families that originally lived on the site, only 350 chose to take units in the redevelopment (Sewell). During construction, families were uprooted and moved off-site, destroying any community ties that once existed between members. Having been labelled a 'slum,' it was also difficult for the community to lose that stigma, and to this day, the area still continues to struggle with the label of being a

slum or a ghetto in the city. Regent Park became a fragmented and isolated settlement in itself, without connections between long-standing members in the community, and from the city, that kept it socially and economically sustainable.

Just like Dharavi, diversity allowed the initial settlement of Regent Park to function. Without the diversity, including a range of housing options and the inclusion of a multitude of commercial, retail and even industrial options for employment, Dharavi would not have a means to survive. Maintaining these attributes, while upgrading and improving the physical condition of the settlement will be the only means to allow the existing networks to sustain themselves.

Figure 5.2 Image of Regent Park, in Toronto, prior to the first redevelopment project.

Figure 5.3 Image of the Regent Park, in Toronto, in present day.

5.1 Quinta Monroy Housing Project, Chile, 2002 – 2005.

In 2002, the Chile-Barrio program was implemented to upgrade existing informal settlements in Iquique, Chile instead of pushing residents out of the central city to the periphery or housing them in vertical slums (Architecture for Humanity, 2006). Part of the program was implementing a housing subsidy, where a homeowner could get a loan of \$7,500 (a reduction from a previous subsidy offered by the government), to improve the quality of their home on their existing plots instead of building new on the periphery of the city. This put pressure on housing developers to create housing typologies that could work with this small subsidy.

ELEMENTAL, an architecture firm from Santiago, worked stringently within this cost restriction, for the design, construction and land costs of the project, in order to show that it was possible to build housing for the poor even with the reduced subsidy (Levinson, 2004). The Quinta Monroy Housing Project was designed to house 100 families on a 5025 square meter plot of land that had been occupied in the city for 30 years, as shown in figure 5.4 and 5.5.

Resettling the families on the site of the original settlement was an important element of the work done with the Chile-Barrio project. The existing central site allowed the families to maintain proximity to the networks that support their livelihood, from other families to places of employment in the area, the very reason the families occupied the site in the first place. This point is especially important for Dharavi, if the urban poor are forced to relocate to new housing on the periphery of the city, this will increase the distance between the established networks of the settlement which provide a livelihood for residents. Long commutes to the city centre that reduce

Figure 5.4 Outline of original Quinta Monroy site (left).

Figure 5.5 Outline of Quinta Monroy site after the settlement is upgraded (right).

Figure 5.6 Interior perspective of a typical unit in the Quinta Monroy project.

available income and time in the day to dedicate to economic activities, putting the residents of Dharavi at considerable financial risk.

Flexibility was also important in the scheme. Although it was the goal to provide families with the largest home possible for the subsidy provided, instead of only

Figure 5.7 Diagram of how units were stacked and overlapped to obtain the appropriate density and open space at the Quinta Monroy project, from ELEMENTAL Architects.

providing the space that could be achieved with the available funds, a framework was developed that would allow the home to expand over time as resources are obtained by the resident. The framework is a combination of 'base' spaces; that would be enclosed to provide the kitchen, bathroom, living spaces and internal circulation; and open spaces, that could be enclosed for additional bedrooms or living spaces. The 'base' contains the components that are more difficult to add during an expansion process, which includes plumbing, electricity or stairs. The base would be 25 square meters, the same size of units being offered in the Dharavi redevelopment scheme. With expansion, the homes could be as large as 75 square meters (ELEMENTAL, 2007). In figure 5.6, it shows one of the basic rooms in the unit, where walls are left unfinished, as a wood structure or concrete block, and bare floors. Instead of using resources to install drywall or flooring, funds were used to supply the more costly, but vital items, like plumbing fixtures or windows.

It was also important to maintain the dense urban fabric of the informal settlement, as the site could not be expanded to provide new space. In devising a plan for the site, the architect eliminated three common place strategies for providing housing, 1 house per lot with space between the structures, the row-housing strategy, and the stacked strategy, as shown in figure 5.7. Instead of designing a concept where one family would have one plot, individual units were stacked and overlapped, with the expansion spaces placed between units, as shown in figure 5.8 (Levinson). This strategy also allowed open space to be introduced to the site, which was not possible with the original layout,

Figure 5.8 Exterior photographs of the units from the Quinta Monroy projects.

that had relatively dense but low-lying buildings taking up large amounts of space at grade. The new open space allowed for vehicle access, as well as play-space for the children on the site.

Although Dharavi and Quinta Monroy are both informal settlements, each has characteristics that make them unique, and a product of their individual culture. In Dharavi, the space allocated for expandability would also have the potential to be converted into income generating spaces, especially those spaces that are provided at grade. Even renting a room to an individual or small family is possible because there are many communal services shared by the community, like cooking spaces and toilets, so it is not essential for them to be provided privately in the space. In Quinta Monroy, these spaces are left unserviced, so it is not that easy to convert them to rental units, especially since sharing amenity spaces is not a significant part of their culture.

Also, the public or open spaces around the dwellings are undeveloped and left as parking only. In Dharavi, this space would never be left this way; eventually it would be appropriated to become more informal dwellings or be enclosed to provide economic space. By elevating the living spaces above the ground plane, the opportunity for a market street is increased. For Quinta Monroy, as the settlement is an isolated lot, designating commercial space at grade would not connect with existing market streets, and therefore would not have the clientele that would be required for it to be profitable.

For Dharavi, this scheme could be used as a model for sequential development. Although, perhaps at a higher density, and incorporating the ability to designate a variety of uses beyond residential. Community spaces, and spaces for community amenities like toilets, would also have to be incorporated into the design. Ensuring a plot that can connect with an existing market street would also ensure that income-generating space, in the form of small stores or factories could also be incorporated into the project, creating a livelihood for those that live in homes above. Construction methods should be context specific, as the operable glass windows like the ones used in Quinta Monroy might not be suitable for the climate of Dharavi, while access to light and air in the units is vital to ensuring a comfortable and sanitary environment for the occupants.

5.2 Safe[R] House, Sri Lanka, 2005.

After the tsunami in 2005, the Sri Lanka government created a buffer zone along its coastal regions that prohibited any construction 100 meters from the sea. This was imposed in order to prevent the devastation that was experienced in the tsunami disaster of 2004. Although this restriction was put in place with the best intentions, it reduced the amount of space to provide relief housing for devastated communities, while also having significant social, cultural and economic consequences for those families accustomed to being located close to the sea (Architecture for Humanity, 2006).

The Harvard School of Design, in collaboration with the SENSEable City Laboratory at MIT, began a project to investigate the possibility of developing new construction techniques that would allow new buildings to be sited in the buffer zones. Building in these areas would stipulate a construction method that would be able to withstand the forces of incoming waters, and prevent the structure from bending under such force. The original structures were concrete block, which deflected heavily under the tsunami forces, causing the structures to fall apart (MIT, 2005).

This resulted in the creation of the Safe[R] House, as shown in figure 5.9, a structure that combines traditional Sri Lankan building techniques, using local wood, with solid 'cores' - basically a rigid structure that contains the main services of the building

Figure 5.9 Exterior rendering of the Safe[R] House.

(Architecture for Humanity, 2006). The cores can be expanded to increase the overall size of the unit, accommodating different household sizes, or different functions, like community centre spaces or an indoor auditorium.

The building uses a number of overall strategies that can be applicable to Dharavi, as shown in figure 5.10. Exterior components can be replaced over time as materials or capital becomes available. The initial cost of the overall structure can be low, and the infill materials can be anywhere from free (if they are scavenged from nearby collapsed building or are recycled materials) to low cost (if they are regular building components like timber or plaster). Over time, the structure is flexible enough that the basic dwelling can be expanded, using the cores as columns for supporting the upper levels, as shown in figure 5.11, or expanding horizontally. In the coastal regions of Sri Lanka, this is fairly easy, because the buildings are situated with ample space between them. In Dharavi, where space is limited, and the open space is in control of potentially hundreds of people who live adjacent to it, expansion can only happen vertically. However, utilizing a rigid core or structure, and lightweight infill material, vertical expansion would be possible.

Figure 5.10 Diagram showing the elements of upgradeability, expandability and flexibility in the Safe[R] House.

Safe[R] house is based on Sri Lankan building techniques, so it would be important to adapt the design for the Dharavi climate and local building techniques. For the version designed for Sri Lanka, the large roof provides comfort for its occupants, in the form of shade, and prevents water from entering the interior volume. In Mumbai, it might be ideal for this roof surface to be used as a water collector, for re-use and water retention. As the monsoon season causes flooding in the settlement that can cause considerable damage, finding a way to retain fallen water in soil or other surfaces like roofs would reduce the risk. The cores, although a direct response to the force of the hurricane waters and wind speed, could be a means to provide wet services (potable water, latrines) to either a group of households located together, or even on an individual home if small areas of Dharavi are developed incrementally.

The framework for the Safe[R] house is used as a method to design expandability and upgradeability into a structure. While some attributes are difficult to transmit because of different environmental and urban conditions, the idea that a structure should be able to adapt to the changing needs of its occupants is important in a place where surface area is scarce, and where the population is constantly changing.

Figure 5.11 Section of the Safe[R] House, showing the flexible building components.

5.3 Kampung Improvement Programme, Java, Indonesia

After a long period during which many design professions thought it was necessary to destroy the 'slums' in urban centres, many architects and urban planners changed their school of thought, and believed replacing them with public housing was more of a burden on the system than a way to alleviate the problems associated with a highly dense settlement. Instead, many became advocates of upgrading existing informal settlements to supply basic sanitation, reliable electricity, and make them safer places to live for residents (Architecture for Humanity, 2006).

During the 1950s and 1960s, Jakarta experienced an influx of rural migrants, mainly attracted to the city to meet the demand of the booming construction industry, which was responding to the new government's need to create a modern, progressive, twentieth-century city (Holod & Rastorfer, 1983). The city needed these migrants to meet the needs of the growing city, but failed to provide them with affordable, conventional housing. Most found refuge in unplanned, unserviced and informal settlements, known as Kampung, on the periphery of the city, which were adjacent to employment opportunities, either in commercial, industrial, or residential sectors, of Jakarta. By 1969, 75% of Jakarta's population lived in these settlements, which covered 60% of the city's urbanized land area (Holod & Rastorfer).

While occupants in more established Kampung upgraded their homes as capital or materials became available, there was still a complete absence of basic infrastructure in the communities, like potable water, proper sewage disposal, and electricity. When the

Figure 5.12 Aerial of the Kampung in Java, Indonesia, showing the density and intricacy of the urban fabric.

areas were first settled, it was primarily a rural setting, with more space between homes to absorb and dissipate solid waste, reducing environmental degradation and public-health risks. As the areas became more crowded, as shown in figure 5.12, and other migrants invaded the voids between existing homes, the lack of adequate sanitation facilities became an issue for the community. Waterways became contaminated with human waste, household toxins and refuse (Holod & Rastorfer, 1983). Despite this pollution, it was a source of drinking water, putting many of the Kampung at risk of cholera infections and other water-borne illnesses.

Despite the infrastructure deficiencies, the Kampung were socially stable communities, many of the occupants with steady incomes, a range of ethnic groups and socioeconomic levels that promoted social tolerance and community stability (Devas,

Figure 5.13 Typical street section in a Kampung in Jakarta.

1981). This is similar to the situation in Dharavi. While the community lacks individual infrastructure connections, and much of the settlement is unserved, the community itself is economically and socially stable. In both Dharavi and in the Kampung, most would rather upgrade their present dwellings, than move to another area in the city. In Dharavi, the situation is slightly different, as much of the industry is actually embedded in the community. In Jakarta, public transportation is scarce, so many of these Kampung form in areas where it is possible to walk to places of work. Other sites, on the periphery, would make this situation impossible.

Many options were explored by the city government in Jakarta for redevelopment, one was a similar approach to what is being proposed in Dharavi, where the government would acquire and raze existing Kampung, and in their place construct new, multi-storey residential buildings. This would accommodate the high-densities of population without the congestion and environmental degradation that accompany the overcrowded, tightly packed, low-rise structures of the Kampung, however, there is the issue of housing the families temporarily during construction. Many complex logistical issues arise, like access to the city while the residents are moved to the periphery temporarily, thus creating other social problems associated with large-scale displacement.

Figure 5.14 Typical building construction in a Kampung in Jakarta.

In the end, the Site and Service approach was used for the Kampung, where the government purchases land in the settlement to develop paved roads, sanitary facilities and public water taps (Holod & Rastorfer, 1983). In figure 5.13, a typical laneway street is shown, where the loose gravel was transformed into a hard surface, and proper drainage was placed in the street for rainwater and wastewater. Housing development would be left to the individual, as they've been able to provide their own housing and upgrade it for generations as shown in figure 5.14, while the government would be able to provide services to a vast amount of people (Holod & Rastorfer).

A key component was responding to the individual conditions of a settlement, as the needs of the community varied depending on the age of the settlement and the density. This caused the government to set standards for the infrastructure, providing taps and

paved roads based on the amount of individual units instead of the size of the kampung, an initial strategy used in the first settlements serviced by the program. Other facilities, like health centres or primary schools, were also provided based on population clusters, and were within walking distance of the community members they served.

The Kumpung Improvement Model accepted squatter settlements, rather than removing them, emphasizing the role of urban infrastructure in transforming squatter settlements into prospering urban communities. Since the 1970s, the Jakarta government with assistance from the World Bank was able to upgrade 7700 hectares of Kampung, improving the conditions for 3 million people (Devas, 1981). As a strategy to address the informal settlements in all of Mumbai, this project represents the possibility of allowing them the opportunity to develop individually. Although, it requires the city to give residents tenure, the only way they would feel secure enough to develop their own homes, with the agreement of the city to improve public infrastructure in the settlement and their informal ownership is legitimized. Dharavians have developed their own dwellings without tenure for generations, their strong voice and critical mass a difficult barrier for city bulldozers. Tenure and consistent investment would only strengthen the continuation of their sense of security. This change would not happen instantly, the process would take generations to complete, just as the settlements themselves took years to develop.

5.4 Sambarchitecture, Rio de Janeiro & Incremental Housing, Pune, 2009.

Filipe Balestra is an architect who engages with the built form of informal settlements around the world. He has initiated numerous projects, including a school project in the settlement of Rocinha in Rio de Janeiro, where an existing building was upgraded and expanded to include new educational spaces, and a housing scheme called Incremental, a method for incrementally upgrading the informal fabric of 'slums.'

Rocinha is the largest informal settlement in all of Brazil, with an estimated population of 200,000 people. It is highly dense and built on steep hills, as shown in figure 5.15 (Balestra, 2007). In 2007, the settlement had only 3 schools to service the community; which meant many students in the community had no opportunity to attend a local school. Balestra initiated the opportunity to work with a local NGO, The Two Brothers Foundation, and the community to adapt an existing building for use as a multi-purpose education space.

The building is located in Valão, the centre of the settlement, which has a very small footprint consistent with other sites in the settlement, approximately 5 x 6 meters. Density, scale and limited access makes it very difficult for buildings to be removed, let alone re-constructed as new structures. In order to maximize usable space in the small structure, and correct some of the existing issues with the layout of the building, Balestra re-orchestrated the space (see figure 5.16), to create a mixture of classrooms and multi-purpose rooms. The very dense nature of Rocinha, and the physical

Figure 5.15 Image showing the density and configuration of the informal settlements in Rio de Janeiro.

topography of the site, makes it very difficult for widespread removal of buildings. To give the building prominence within the settlement, the exterior was painted bright colours, even the roof, to set it apart from the other buildings in the area, and give it visual prominence.

In Dharavi, re-using an existing structure may be difficult, as many of them are built poorly or material not safe or durable enough for an adapted use. This is especially true if vertical expansion would be proposed, as many of the structures constructed in Dharavi are made of lightweight material not appropriate for two or three stories. However, in line with the normal transformation of the fabric, adapting an existing building, utilizing its footprint and orientation, while transforming its use, would be appropriate.

Incremental Housing was started after Jockin Arputham and Sheela Patel from SPARC invited Filipe Balestra and Sara Göransson, to develop a strategy for housing in informal settlements in Pune; a city east of Mumbai in India. The only proposals traditionally used by the Slum Redevelopment Program were to 'clear and rebuild,' where the settlers ended up being uprooted from the networks of their community and pigeonholed in towers in or around the original site (Urban Nouveau, 2008). This scheme is not unlike the one proposed for Dharavi. Instead, the team worked with a strategy where the existing fabric would be upgraded over time, involving the design input of the community, but then offering a technique that would allow the settlers to build the structures themselves.

Figure 5.16 Elevations of the school in Rochinha, showing it's existing condition (left) and final construction following its renovation.

Figure 5.17 Diagrams of the Incremental Housing project, showing the potential structural system and different configurations.

The first development was located in a settlement called Netaji in Pune. The team worked with the community to develop a prototype dwelling that could be built in-situ to provide basic services, like water, sewage, storm water drainage and electricity, as well

Figure 5.18 Rendering showing the Incremental Housing project embedded in the urban fabric of Pune, India.

as shelter. Three different housing options were developed, each that worked vertically to create a variety of spaces, similar to what Balestra did in Rocinha, see figure 5.17. The first option would be one-storey, and allow vertical expansion, one floor at a time, in future. The unit would be accessible from grade during the initial stages of occupation, although it could be transformed into an income generating space when additional floors are added for dwelling space. In options 2 and 3, voids were left in the structure to allow open-air space or expansion in future. This is similar to the strategy developed by ELEMENTAL for Quinta Monroy, although the small foot print of the housing for Pune allowed it to be built in a denser environment, and one that could relate more appropriately with the existing fabric of the settlement. Although both housing types are built as a multi-unit structure, with shared walls, the incremental housing strategy does not require a large space to be vacant in order for the structures to be built. In Dharavi, where control and occupation of the ground plane is vital in maintaining informal ownership, the incremental strategy works to meet that need.

The structure was created as simply and sturdy as possible, but would also allow modification for unusual shaped sites. Although the buildings are rendered as stucco with brightly covered surfaces, the walls can be built with any found material in the settlement, and upgraded as resources are found. Although the community in Pune envisioned private plumbing in the new structures, this might be more difficult in Dharavi considering the higher density of the settlement; the technique could be adapted to create a toilet block, similar to the scheme proposed by the World Bank, or vertical shared amenity space for community use. If infrastructure is laid out more extensively, in a grid pattern through the streets linking plumbing stacks in individual dwellings servicing could be much easier in future.

The overall strategy, preserving the integrity of the informal fabric, ensures that the social, economic and cultural networks of the settlement are maintained. Community involvement is especially important in larger scale projects, as there is the potential to create the same sort of interesting hybrid buildings that can be found in Dharavi, like incorporating community space in the new dwellings, or creating more income generating spaces for residents at grade.

Figure 6.1 Map of Koliwada, Dharavi, Mumbai showing different land uses (Dharavi.org, 2009).

6 Design Project: Architecture & Legitimacy

6.1 Background

Although perceived by formal Mumbai as a 'slum', Dharavi is an incredibly vibrant and productive part of the city. Autonomously developed, without any government support, the settlement is a collection of 80 different ethnic nagars (or neighbourhoods). There are numerous languages spoken in the settlement, and there is a variety of religions from Jains, Hindus, Muslims and Christians. The settlement is the basis of their livelihood, which provides the social, economic and cultural networks necessary to sustain it. With just over 1 million people, in only 175 hectares, the settlement is always alive with cultural activity, from religious festivals to the exchange of knowledge, as well as continuous economic activity. Dharavi is estimated to have 15,000 single room factories, which can include a variety of activities from the production of pottery to extensive large and small scale recycling activities. Some of these manufacturing areas can be as small as a single room to outdoor spaces that can cover large portions of uninhabitable spaces near the Mithi River. Shown in figure 6.1, there is an array of land uses throughout the settlement, with many commercial streets, and areas behind them that are predominantly residential. Many high-risk, toxic industries have also settled in Dharavi, creating buildings and streets that pollute the air and water. These industries

Pre-strategies: Key Plan

Figure 6.2 Master Plan for a strategy originally devised for Koliwada.

employ people in the settlement, but put residents at significant risk of toxicity and death.

The proximity of affordable housing and places of employment makes Dharavi an ideal place to live and work for many urban migrants who arrive in Mumbai. Although Dharavi provides housing and a livelihood for many people, it also has many issues that put the residents at risk. Some of the key issues already highlighted include lack of proper sanitation, barriers to access potable water, issues with solid waste disposal, shortage of schools and health facilities, and highly toxic land uses. Different parts of the settlement have different levels of these issues, although they are widespread.

6.2 Pre-strategies

Figure 6.3 Typical street in Koliwada, Dharavi.

Program

Figure 6.4 Diagram showing the distribution of building programme in original intervention proposed for Koliwada.

In order to begin working with the built fabric of the settlement, a design problem was established to develop methods for dealing with the physical constraints of the density, and the need to be able to preserve the networks using and interacting with spaces. Using the example of a language school space required in the nagar of Koliwada, a single building was designed with the intent that the built fabric would be maintained, and that the social, economic and cultural networks that existed around this site could continue to function with minimal disruption from this new structure. This single building would begin to examine how conditions within the fabric could be resolved, while attempting to meet a variety of secondary, yet vital, needs for the residents in the vicinity of the structure, like access to potable water and clean toilets.

The language school was proposed for small site on the northern boundary of Koliwada, as shown in figure 6.2. The buildings surrounding the site had a number of blank walls, so it felt like an ideal space for placing a new structure, as it wouldn't interfere with the light and views for the building's neighbours (see figure 6.3). Examining the site and its relationship to the surrounding a context, a strategy was developed that would link this small building to two distinct elements on this corner of the settlement: the formalized slum rehabilitation housing to the west and an underutilized open space to the east. Elevating the structure would give it visibility from two public points in the settlement, while giving it a sense of permanence by physically connecting it to the built-fabric below (see figure 6.4). Extending the structures on the ground (with the administration building to the west, and the washroom structure to the east) ensured that the person, embedded in the street, would have a marker to reach

Site Plan

Figure 6.5 Plan of the original intervention, with a school, administration building and washroom, proposed for Koliwada.

the building as well. Manoeuvring around the blank walls and existing access ensured the fabric stayed intact, and that the neighbouring residents still maintained the use of their dwellings.

The resulting intervention, figure 6.5, had program split into two structures, one that held the administration program in a small building oriented towards the slum rehabilitation housing, and another with the classroom spaces, which wrapped over an existing building in order to access the re-defined open space and an outbuilding which had public washrooms. The resulting building was distinct from the existing settlement, but 'squatted' on the urban fabric, becoming a contiguous part of it. Each of the buildings were linked by a physical connection, stairs accessed through the structure itself, or on the surface, with permeable paving linking the different structures. The permeable paving also acted as a way to deal with the flooding issues in the settlement during the monsoon season, sending water below the surface instead relying on constructed gutters for a slow release into the Mithi River.

Ultimately, this structure only presented a single option for dealing with a very specific condition in the settlement. Site conditions throughout the settlement are unique, as well as the design requirements for dealing with issues like sanitation and drainage. Attempting to combine multiple issues into one intervention is impossible, but also negates the incredible effort required to deal with one issue on a large scale, let alone 5 or 6 at a time. This experiment changed from working to solve an issue or providing a program space to the community, to how the fabric of the settlement (from density, how residents use their existing space, building type and how the fabric transforms to meet new needs of the settlement) can be the basis of interventions, when called for by the community.

6.3 Strategies

In determining a process for preserving the integrity of the fabric of Dharavi, while allowing for autonomous development, goals were identified to ensure any intervention would be compatible with the settlement.

First, is to recognize the processes and activities that take place in the informal fabric and the role of architecture plays as their stage and backdrop. As stated by Rahul Mehrotra, the architecture is outshined by the activities of the settlement, and is adjusted to adapt to those activities. In figure 6.6, it shows the potential progression of the informal fabric. In the first stage it is merely built to meet the needs, providing housing. Eventually, the activities of the settlement, a market street or a square with a

Figure 6.6

Diagram showing the informal settlement as use begins to transform the physical fabric, based on the diagram showing The Static and the Kinetic.

1. Recognize the processes that take place in the *informal fabric* and the role of architecture in everyday lives.

2. Assert *ownership*.

3. Facilitate the processes that allow for *gradual upgrade*.

4. Promote *autonomy*, allowing individual control of the dwelling and community control of public space.

5. Sustain and promote *legitimacy*.

Figure 6.7 Diagram showing the three methods proposed for preservation the fabric of the informal settlement: The Network, Line and Point.

small outdoor factory, begin to shape neighbouring buildings. Density increases around the market street as vendors arrive to live adjacent to it, while the streets around the outdoor factory might open up to allow easy access. The informal fabric adapts and changes as quickly as the residents' desire, and their ability to obtain resources. The scale, height, and relationship to the ground plane, as well, aids in how the settlement functions. These elements ensure that the fabric can continue to adapt to changing needs, but by efforts by the residents themselves.

The second goal is to ensure that the informal ownership of the land is asserted through the development. Although legally the residents do not have ownership over their land, by merely occupying and maintaining it themselves they have asserted their informal ownership. By continuing this occupation, and maintaining a critical mass throughout the settlement by avoiding mass removal of buildings to build 'new', eviction becomes more difficult for city officials. If there is a sense of security for families, they would also feel comfortable in investing in their own homes without the fear of demolition. Occupation of land over many generations may cause the city to grant tenure, as with the Kampung in Java, which could eventually lead to these settlements being recognized as the legitimate counterparts that they are.

The third goal is about facilitating the processes that allow for gradual upgrading of the settlement by the informal owners themselves. In much of the work by SPARC, Society for the Promotion of Area Resource Centres, self-help housing that is incrementally developed is promoted (SPARC, 2009). Temporary housing might begin as a simple plastic sheet with a wooden structure, which over time is replaced with more permanent materials, and eventually expanded upwards to allow for more space. By considering this process in new structures in the settlement, inevitable modifications that would be made informally are allowed for. The permanent structure might be built by a contractor, as cast-in-place concrete post and beams, while the occupant would complete the infill for the floors, walls and roof. Provided the system is flexible enough, a temporary solution like lightweight corrugated metal could initially be used as infill to provide immediate shelter, while brick or concrete block could be later substituted.

The fourth goal is to promote autonomy by allowing individual control of the dwelling and community control of public space. Control of the dwelling is supported by the ability of the settlement to be upgraded by the individual, without the need of outside forces to interfere with development. Autonomy of the entire settlement is also created because of the existing social, economic and cultural networks that support the people in the settlement. By preserving the spaces that these networks utilize for their activities, it prevents the settlement having to rely on outside forces for their livelihood.

The final goal is to sustain and promote the legitimacy of the settlement. Each of the previous goals strives to work with the existing built fabric of the settlement as well as the processes and activities that are already contained within it. Recognizing the importance of allowing the settlement to remain intact, preserving all of the elements that make up the settlement, is a true testament to its legitimacy. However, preservation and legitimacy cannot be granted to the detriment of the vital need to continue the development of the settlement. All informal settlements still require infrastructural improvements, to meet the most basic needs vital to a healthy and safe existence, in order to ensure dignified habitation for all residents within the settlement.

These goals translate into three methods of working with the existing fabric of the settlement; they are abstract with the intention that they could be applied to any portion of the settlement to create space within it for any need or program requirement. Figure 6.7 shows how the goals transform into the three methods, then into criteria that can be achieved by them. The Network is the most basic strategy, replacing singular elements in the fabric with new construction that extend and interact together to meet a common need. Any element could be replaced, from a building to a surface. The Line aims to take existing structures in the fabric and appropriate them to be mixed-use, giving them

Figure 6.8 The Slum Rehabilitation Towers in Koliwada, Dharavi.

Figure 6.9 Typical street in Koliwada, Dharavi.

new owners and fortifying them to be a permanent part of the fabric. Finally, the Point adds program space to the settlement without removing buildings from the existing fabric, while attempting to create an architectural piece that stands out from it.

It is important to note that each of the three methods overlap, and can achieve multiple criteria that are critical to the settlement. Sanitation is a critical element, as well as preserving the existing social, economic and cultural networks of the settlement.

6.4 Urban Transformations

Although each of these methods can be universally implemented throughout the settlement, Koliwada was chosen as the site for testing of the proposed strategies. Koliwada is a more mature area of the settlement, as the residents have had many years to develop and invest in their neighbourhoods, which is present in the permanently constructed buildings and sealed streets, as shown in figures 6.8 and 6.9.

Figure 6.10 Master Plan for the three proposed methods: The Network, Line and Point.

Koliwada still has the critical issues that the overall settlement has. As the settlement is mixed-use, sanitation that can extend from the home to the workplace or school would ensure access to all, while new development, to help house those that still require safe housing, could contain spaces to ensure the economic networks of the settlement are preserved and provided space throughout the settlement. As Koliwada has its own unique culture and language, space should be set up in the myriad of mixed-use spaces to allow for its continuation, as well connect to established cultural spaces to ensure dedicated space is preserved in the settlement. Using each of the methods, the identified critical issues are addressed. In Figure 6.10, the proposed projects are revealed.

7 Network: The Replacement

7.1 Background

As Dharavi grew as a settlement, there were little provisions for infrastructure. The settlement's isolation on the far reaches of Mumbai meant that initial requirements for water and waste disposal were achieved by using the Mithi River. The relatively small amounts of migrants were able to sustain themselves, and have a small affect on the environment. When the settlement became increasingly dense, this method of sanitation began to pollute the waterway itself, as well as the coastline (World Bank, 1995).

It was only in 1976, when Dharavi was recognized as a part of the city, that the government began supplying basic amenities like water taps, toilets, drains and electricity to the settlement (Urbanology, 2008). Despite this initiative, for the most part, residents either pay for their own private water source, or utilize a communal tap. Many families rely on communal toilets to meet their sanitation needs, which have been accepted as a solution. Unfortunately, many of these toilet blocks are not maintained, causing them to fall into disrepair, leaving many young children and women without a safe or functioning option, forcing them to defecate in the street. This issue is also faced by the residents at their workplace. As most people in Dharavi live,

work and shop in the community (and away from home), when they leave their own neighbourhood, there is a lack of public toilets.

7.2 The Method

The Network is the most basic strategy which replaces singular elements in the fabric, like a building or an open space, with new construction to meet a common need (like sanitation, health or safety). The element, or node, is then multiplied in order to meet the needs of a wider group of residents in the settlement. A node in one location can, for example, provide public washrooms for nearby residents, but also those that are visiting the area for school, work or shopping. The sewer lines and water connections required to operate the public washrooms, could also extend and connect to other points installed in the community, making their installation costs more economical. Also, by creating visual connections that mark the circulation paths between nodes, a collective knowledge of their locations within fabric can begin to develop, ensuring that each resident knows where that particular service is being provided and that the benefit reaches the community.

As the built fabric of the settlement is very dense, there are few open or vacant spaces that can be acquired for new structures. Building these infrastructure needs on the periphery of the settlement is possible, but it would require residents to move out of their homes to access them, increasing the possibility that they would not use the new services at all. Replacing existing structures or spaces in the settlement would ensure the new structure is used by the residents. Dilapidated buildings would be an ideal choice for providing a new service, as it would allow the majority of the built fabric to stay intact, but should be chosen carefully and with full consultation with the community. However, if the need is to provide vital health services or public sanitation, there is the potential that families could be moved to new accommodations if a site's location is in a critical position to provide the most amount of benefit to the largest group.

7.3 The Project: Sanitation Network

As part of the World Bank's project for providing sanitation in informal settlements, this project proposes to install toilet blocks as a network that will allow the individual to have access to the infrastructure they need throughout their day. As a sanitation network would require interventions at multiple sites, to meet needs for where residents might live, work, shop or go to school, a master plan will be devised, as shown in figure 7.1, as well as a prototype structure, see figure 7.2.

- Communal Sanitation (Network)
- Permeable Paving (Network)
- Residential (SRA)
- Residential (Informal)
- Industrial / Manufacturing (Small)
- Residential + Commercial
- Residential + Manufacturing / Industrial
- Commercial + Manufacturing
- Commercial
- Industrial / Manufacturing (small)
- Institutional
- Public Utilities
- Religious
- Open Space
- Koliwada Boundary

Figure 7.1

Map showing the Land-uses of Koliwada with the proposed interventions showing "The Network"

Figure 7.2 Prototype proposed for the public sanitation point proposed to be implemented in Koliwada as a Network.

The replacement is used in two ways to provide this need. First, small buildings are replaced in the settlement to provide the necessary space for the new toilet blocks. Toilet blocks are able to provide proper sanitation to more people, as opposed to individual toilets installed in private homes. If they are installed as a network, the individual can have access to proper sanitation in all locations they might visit in the settlement. Sites will be chosen because they are available and adjacent to residents that will benefit from the new toilet blocks.

Second, the installation of these new toilet blocks is being used to replace pieces of the hard surfaces to create a bed of permeability for rainwater during the monsoon season. Flooding is an issue throughout the settlement; providing surfaces for absorbing water during the heavy rain will prevent areas from flooding. Replacing multiple sections of surface in a few areas of the settlement could be a catalyst for replacing other surfaces within the settlement, as they would also be a prototype of that type of change. Areas with rough paving, or loose dirt, would benefit from a sealed and level surface, making the surface more accessible to near by residents.

7.4 The Process

As these needs are required in the short-term, the process of replacement is done in a short time period. First, an assessment would be done, to find appropriate locations in the settlement for replacement. It might be appropriate to locate them adjacent to a public square in the settlement, for visibility. Once selected, sites can be cleared

Figure 7.3 Typical ground floor and second floor plan of the prototype proposed for the public sanitation point to be implemented in Koliwada as a Network.

rapidly for the required infrastructure to be installed, before the structures are built. The designated locations for the permeable surface can also be cleared at this point, as the materials below the surface would have to be replaced with layers of aggregate to allow for permeability.

While establishing where the structures will be built, complimentary program spaces that will ensure the structures are maintained and the sites are used by the community can also be considered. For example, the World Bank recommends a strategy where a unit above the toilet block is built, and provided to a family, with an income, in exchange

Figure 7.4 Rendering of the prototype proposed for the public sanitation point to be implemented in Koliwada as a Network.

for maintaining the toilet blocks below. This gives them access to the toilets for continuous maintenance throughout the day, but the proximity also gives them incentive to keep them clean (World Bank, 1995). Other uses might be a community space or

religious facility for use by the community. Having the funding to build the toilet block might also be extended to build such a space.

The structure will be designed as a prototype that will be implemented throughout the settlement. A construction method that can be utilized by local contractors would ensure they be built expediently. Wall infill can be determined by what is available within the settlement, but durable materials like brick or concrete block are preferred. To make the structure a part of the settlement, the community can do the exterior decorations, like murals or painting.

7.5 The Result

After determining a master plan, one location was selected and the prototype was designed for the site, although multiple sites were designed to have the prototype fit, see figure 7.2. The location was chosen adjacent to a square in the settlement, which had businesses, a religious facility, and homes surrounding it. Using the World Bank's model for maintenance, a caretaker's apartment was provided above grade, while the toilet block with a public tap for potable water was located at street level, see figure 7.3.

The structure is cast-in-place concrete post and beam, while the infill is brick, as shown in figure 7.4. The plan is utilitarian, fronting on the square to allow visibility to the entrances, to ensure the safety of the users, while the entrance to the apartment is slightly separated to allow for a private entrance. The existing circulation of the settlement is maintained by creating a passageway through the structure, this also provides an access to a storage closet for cleaning supplies for the toilet block. The structure becomes a part of the settlement, with a point for collecting water, and elevated slabs for sitting. The section of permeable paving in the front demarcates this as new construction in the settlement.

8 Line: The Appropriation

8.1 Background

The Informal Settlement begins with a need for affordable housing. Land or open space that is deemed safe for habitation, and free for the taking, is found and claimed by individuals, groups or informal developers. This begins the process of taking ownership of the land, which is first marked by the construction of a physical barrier to designate ownership; the perception of ownership or control is only marked by the physical occupation of space, realized by any degree of permanent construction, from cardboard walls to a rigid concrete structure (Davis, 2007). Eventually, when occupants have the appropriate resources, and a strong sense that they will not be evicted, fortification and a transformation from temporary to permanent can begin. This process can be long, and might include subtle progressions through a variety of materials before the fully permanent structure is realized. Fortification may also involve expansion, vertically or horizontally, and improvements to the surrounding context, by replacing street surfaces or investing in open space. Together, it is a process of embedding the individual and his or her home into the built fabric of the informal settlement, making it a more comfortable place to live, and ultimately providing a stake in the settlement that will prevent eviction.

In a settlement that is already densely developed, the occupation of open space becomes much more difficult, especially when so many people have fervent and rightful claim to the designated use of an open space. Unable to utilize vacant lots in the settlement, If a group of people immediately requires shelter for survival, they might end up appropriating space that is not fit for development; space that is adjacent to a rail corridor, on sidewalks, or close to the settlement's sewage or garbage disposal site.

Figure 8.1 Typical market street in Koliwada.

8.2 The Method

The Line is a method of appropriating existing structures within the fabric of the informal settlement to provide spaces for dwelling and income generation, but also giving them new owners and fortifying them to be a permanent part of the fabric.

The appropriation applies to obtaining physical space in the fabric, but also appropriating the settlement's existing patterns, scale, density, land use and tectonics to determine the overall form of the transformed existing structure. The appropriated structure is physically part of the settlement, but is also embedded in the processes that

Figure 8.2 A rendering of a warehouse building in the Koliwada, proposed to be appropriated as a Line

have already been designated by the community, legitimizing the building's place in the community, as much as the processes themselves.

The Line also refers to the type of urban configuration that this method applies to, choosing to appropriate long and narrow structures that mimic the market streets common in many informal settlements (see figure 8.1). The market street is primarily mixed-use, allowing for a variety of configurations that relate to the ground plane and provide space above grade for dwelling space. Providing both shelter and a space for income generation ensures that the occupant has a livelihood, either as an autonomous business, by renting space out, or by being in the employment of someone else who lives in the Line. Height is limited to and determined by the amount of resources that the occupant has obtained, as much as the precedent that has already been set by the street, as 3 or 4 stories is usually the maximum height that can be created by hand, and without the need for complicated lifting systems.

The line also refers to time. The appropriation process, from ownership to permanency, can occur over a number of years and is mostly attributable to the occupant's ability to obtain resources to continue the project. Incorporating this process from the beginning of the project ensures that when the occupant wants to make changes they can, allowing them to play a vital role in his or her own housing, which

Figure 8.3 Typical ground floor plan of the appropriated warehouse building, before it is transformed, proposed to be a Line, or mixed-use development.

is key in ensuring the project actually meets the needs of the occupant and can be maintained by them for generations.

8.3 The Project: A Prototype

For this exercise, a local NGO called SPARC, the Society for the Promotion of Area Resource Centres, has put out a call to international design professionals to create a prototype dwelling for a group of shelter-seekers who need living space within Dharavi. It is the expectation that the majority of construction will be done by the occupant, while a contractor will build more difficult components like the structural system or service connections. The ability to upgrade or expand as funds become available to the occupant is important, as the initial funds to build the project will only allow for the basic structure and wall infill. Sanitation and potable water will be supplied communally.

Figure 8.4 Two images showing the appropriation and transformation of the warehouse building proposed to be a Line, or mixed-use development.

In Dharavi, heavy industry is embedded throughout the settlement, occupying large amounts of space deep within a mixed fabric. These industries, including raw material processing for different companies, often release toxic exhaust into the air and chemicals into the local bodies of water, creating a toxic environment for the many who live and work around them. For the project, it has been decided to work with the assumption that in future these large polluting industries will be moved away from the settlement, leaving many large buildings that can be potentially appropriated by others.

This is a proposal for these abandoned industrial structures to be secured and then re-purposed to provide the dwelling space requested by the shelter-seekers in Dharavi. As a project developed as a Line, these structures will be re-imagined as multi-use; providing dwellings, individuals units for income generation, as well as sanitation and community space. The scale and density of the fabric in which the industrial buildings are situated will also be matched, while still allowing the existing street patterns and circulation to shape and modify the form of the building.

8.4 The Process

First, the initial structure would be used for temporary shelter for owners until the design is complete and funds are obtained for development, as shown in figure 8.2. Ownership is initially staked out by creating plots within the structure, while the exterior shell is left intact. The overall area of the structure will determine how many families can occupy the building; an initial dwelling will typically be 20 – 25 square meters. The plots will be physically divided, temporarily at first and designated as a multi-purpose space, for dwelling and income generation, until the plan is developed and resources are obtained for fortification and expansion, see figure 8.3.

The plan will involve designating goals for the structure: short, medium and long-term. Short-term goals will involve meeting immediate needs, like how large the initial grid will be for individual dwellings, how existing streets will modify the overall form of the building, and where sanitation and community space will be located for use by the community. Circulation is also necessary at this stage, perforating the monolithic exterior of the industrial building to allow access to the multi-purpose spaces at grade, but also where vertical circulation will be located to access the future second-level dwelling spaces, part of the medium-term goals. Once enough resources are obtained, the dwelling spaces on the upper-levels can be developed, separating the occupant from their place of work – although within the short distance that is set by the scale of the settlement. The transformation from the existing structure, from existing, to degrees of fortification, and finally expansion, is shown in figure 8.4.

Figure 8.5 Building sections showing the different options for the development of the warehouse building proposed to be a Line, or mixed-use development.

Multiple configurations are proposed for the upper level dwelling spaces, including methods for safe vertical circulation, ensuring natural ventilation and natural light, a place in the dwelling for a safe hearth, rain water collection and options for materials. Semi-private communal spaces for the occupants can also be planned at this stage, like outdoor terraces or internal corridors, to ensure they will be preserved, as well as options for sub-dividing spaces for lease to other dwellers, either for their small business or for shelter. These different sectional options are shown in figure 8.5. In

Figure 8.6 Ground floor and second floor plan showing the different options for the development of the warehouse building proposed to be a Line, or mixed-use development

the long-term goals, this project can be a catalyst for developing adjacent spaces and surfaces, adding public space, land for growing, and new permeable surfaces to mitigate the risk of flooding during the monsoon season.

Once this plan is set, each initial temporary plot can be developed by the owner. The shell can be perforated, allowing light to enter through the roof to spaces below and openings can be made to allow multiple entrances from the exterior into the structure itself. Streets and alleys in the existing settlement can also begin to break apart the structure and shape the monolithic form, allowing the large industrial building to become a contiguous part of the fabric and begin to reflect its scale.

Initial investments, like the concrete structure or concrete slabs-on-grade, will be done communally with plans set by the Architect. The concrete framework is a common technique utilized for most permanent structures in the settlement. This can happen in stages though, with upper levels, like the third or fourth floor, left as future options for the individual dwelling. The flexibility comes from being able to choose the wall infill, utilizing discarded material from the industrial building itself or dismantling the structure they vacated to come to the new site, and the time they choose to eventually become a fortified wall, with brick or concrete block infill.

8.5 The Result

In the appropriated structure's full fruition, the main floor is transformed into all income generating space, for the informal owner or rented out to other people in the community, see figure 8.6. The community spaces and toilet blocks that were initially established are being used by the occupants of the overall structure, but are part of the fabric and being used by the community at large. As surfaces and spaces have been 'replaced' as a result of this appropriation; it has become a catalyst for development of other neighbouring streets. The community centre has expanded into the street, creating a community garden in an empty space adjacent to the new development, see figure 8.7 and 8.8.

As a prototype for development, sites can be selected in order to fit the form of the building, in this case long post-industrial buildings that create their own relationship to the street, or other structures can be appropriated for a new use. Perhaps the Slum Rehabilitation Towers (see figure 5.4), which have no relationship to the street, could be appropriated. The grade can be transformed into income generating space, and the exterior skin modified to allow for maintenance by the owner instead of allowing it to go into disrepair.

Figure 8.7 Rendering of the exterior of the warehouse building after it is transformed into a Line, or mixed-use development.

The fabric of the informal settlement is incredibly dynamic. It will continue to change throughout its lifetime, so anticipating the changes in the beginning, or being a part of the transformation, will create an architecture that becomes a part of the settlement.

Figure 8.8 Rendering of the exterior of the warehouse building, and an adjacent open space, after it is transformed into a Line, or mixed-use development.

9 Point: The Addition

9.1 Background

For some informal settlements, residents have been a part of the fabric of the city for generations. When initial urban migrants settled the land, it was probably on the periphery of the city; only time and continuous development brought the two elements together, the informal settlement eventually consumed by the formal city. Despite their proximity, the informal and formal exist as physically separated entities, with a relationship that exists in the overlap of their social, cultural, economic and political networks.

In Dharavi, the formal and informal city overlaps in a number of ways. Socially and culturally, these entities share space for festivals and religious practices. When a festival transforms a street, the boundaries of formal or informal become indistinguishable as it moves from one location to another (Mehrotra, 2008). Economically there are significant exchanges of goods and commodities between the two entities, based on relationships that are built as networks are established and then maintained over time. This is especially true of the recycling networks established in Dharavi, as components are brought to Dharavi to be transformed into raw materials (Brugmann, 2009). Corporations and businesses may even establish themselves in the informal settlement,

often to take advantage of the informality of the workforce and to avoid many of the fees and taxes associated with conducting business formally. Politically, with their large population base and a cohesive voice, the settlement has elected representatives who have seats within the city or state's council. This gives the people of the settlement a voice and stake within their city, a true indicator of the informal settlement's status as a legitimate part of the city.

Despite not having legal tenure, these connections with the formal city allow the dweller to become more comfortable with their place in the city, giving them the ability to invest in their homes and their community. Safety and comfort become important to the family, as well as their desire for individual expression, as the exterior and interior become a place for decorations. There is much pride in the care and maintenance of their homes, as well as the idea that this is a home to be passed on to future generations.

Also, many permanent families have larger land holdings, which often include properties for income generation. These might be small apartments to rent out temporarily to new families or retail space for their own small business. A family is rarely contained within a small portion of the settlement; their activities, movements and relationships are ingrained with the whole of the fabric, and are a contiguous part of it.

As the most basic needs of the individual and their families are met over time, the community pools together resources to create spaces that meet other needs, like schools, recreation centres, health centres and religious facilities. There is a desire to create objects that are a showcase of their culture, represent the legitimacy of the settlement, and provide the necessary elements to that allow the settlement to move forward into the future.

In Dharavi all areas of the settlement have developed for different periods of time, so multiple levels of permanency exist throughout. Koliwada, which contains the original fishermen who occupied the land even before the city of Mumbai, has had years to obtain enough resources and capital to invest in their dwellings, but also the streetscape and community buildings. For community residents there are schools (both public and private), a wedding hall, fish market, and a gym (Urbanology, 2008). Despite lack of legal tenure over the land and the continuous transformation of the fabric, these are permanent structures in the community.

9.2 The Method

The Point adds program space to the settlement by creating an architectural piece that stands out from the fabric, which still creates a relationship to existing fabric that has been long established by continuous occupation and investment. As the individuals who occupy a street or home obtain resources to make their own improvements to the existing fabric, these new elements can be ready-made facilities that become a permanent part of the community. The preservation of the existing fabric reiterates the legitimacy of the structures that the community has worked to improve and develop over time, as well as the social, economic and cultural networks that support these spaces and the livelihoods of the people who use them.

The configuration of the informal settlement, with small amounts of open space, tightly packed blocks and minimal road access, will require unique configurations to insert this program into the fabric. This might mean extreme configurations, like floating over existing structures or systematically adding volumes to them. In the dense fabric though, height does ensure visibility from a distance and when walking through the narrow streets.

Figure 9.1 The interpretive centre designed for Nelson Mandella in the township of Alexandra in Johannesburg, South Africa, from Peter Rich Architects.

Figure 9.2 The interpretive centre designed for Nelson Mandela in the township of Alexandra in Johannesburg, South Africa, from Peter Rich Architects.

In the township of Alexandra in Johannesburg, Peter Rich Architects created an interpretive centre for Nelson Mandela that bridges across a number of animated and loud streets (Saieh, 2010). It fits into the existing fabric of the street, creating numerous squares with seating and retail spaces, but is a beacon for community engagement at the highest point of the township, acting as a visual marker for this important component of their history, as shown in figure 9.1 and 9.2. The structure is built modestly, and takes on the visual cues of the neighbourhood with its eclectic use of materials, but creates new types of visual connections to its surroundings by using out-of-place materials, like the use of polycarbonate for glazing in some of the large open spaces or large operable glass doors. The light steel structure has a lightness, that invokes the idea that it is being supported by a fabric that is more permanent, creating a stable base for its existence, while still providing much needed relief for the poverty in the neighbourhood and the means to preserve an aspect of their culture.

Figure 9.3 Processes for creating the Point, the Koliwada Language School, within the urban fabric of Koliwada.

This method takes a strong stance on recognizing the importance of all cultures, informal or formal, and the structures they have created in order to have equal access to the city.

9.3 The Project: A Showpiece in the Community

For this exercise, the Koliwada Language Society, a local organization of elders who want to preserve the local Koli language, in partnership with an International NGO, have requested assistance in designing a language school and museum for the community. As a gift from both entities, the school will be designed and built primarily by outside

Figure 9.4 Rendering showing the market square that is created as part of the Koliwada Language School.

forces; it can be bold and of a different character from the existing fabric. It is a true testament to the preservation of the language of Koliwada, and can be an attraction for the community, the settlement of Dharavi and the city of Mumbai.

The permanent nature of the settlement at this stage negates any attempt for an architectural intervention that replaces any portion of the informal fabric. Considering its complexity, the strong sense of ownership over existing buildings, as well as lack of any open space, the new structure must be an addition to the fabric. The structure

Figure 9.5 Rendering showing the classroom spaces that are created as part of the Koliwada Language School.

must be thoughtful and sensitive to the fabric, but have an architectural presence that gives it visual prominence. The structure itself has the potential to resolve or bring light to conflict in the settlement, something that should be explored with the architectural intervention.

The site rests between the three Slum Rehabilitation Towers that replaced dwellings just on the periphery of the settlement and an undesignated open space (the same as the project described in 6.2). It will act as a transistor that links these two areas with

the informal fabric that rests between, providing a space that can be used by all. The site is buried within the fabric, so height as well as a material contrast will be important in distinguishing it from the existing fabric. Although it will have some visual markers to the outside, it has the potential to be a treasure to be found if the perimeter of the settlement is penetrated, and be a moment of pride for the settlement itself.

9.4 The Process

The first step in this process would be laying ownership to a piece of open space in the fabric, as shown in Figure 9.3. Although this is an addition to the existing fabric of the settlement, space for an entrance and creating a relationship to grade is still required. Like other civic-like structures, this entrance could also demarcate a new public space for the settlement. One that can be adapted throughout a lifecycle to meet the changing needs of the settlement over time and throughout the day.

The next step would be determining how the structure should interact with the fabric of the settlement. A multi-use structure, with program space to meet multiple needs in flexible space, might make the structure more accepted by the community for use, while it might also be used for other functions if some become obsolete. Determining whether or not a structure should be elevated over the existing fabric, or attached to existing buildings, should be done by examining the opportunities of such a gesture. It might allow a different perspective to view the fabric, allowing existing important economic spaces to remain intact, or it might be too expensive or complicated to even attempt.

9.5 The Result

The Koliwada Language School stands out from the fabric of the settlement. At one point it touches the settlement at grade, transforming a gap in the fabric into a public space, at another it floats above the settlement, creating a visual marker on top of a low-lying fabric.

The entrance is a hybrid structure, one that provides stairs to reach the classroom space above grade while providing seating that can be utilized as a performance space or space for socializing. This entrance also flanks a new public square that can be utilized as a market space or informal sports field, see figure 9.4. Underneath the stairs is a set of public washrooms, providing sanitation facilities for students who attend the school and those that use the public space. As with the other two methods, the creation of the public square is a catalyst for upgrading the surfaces and spaces that

surround it. Pavement is replaced to be sealed and level, while existing barriers, like the fencing around the Slum Rehabilitation Towers are removed.

Figure 9.6 Rendering showing the structure of the Koliwada Language School floating over the existing fabric of Koliwada.

Above grade a variety of flexible classroom spaces are located within a long angular space, each with a different configuration to allow for variations in teaching methods or class size. At the end of the long space is also an outdoor porch, that allows a viewing point to the settlement below (as shown in figure 9.5).

Both the entrance structure and floating classroom space work together to create a facility that is embedded within the fabric. The height and difference in character, also makes the structure stand out from it, which is shown in figure 9.6. This relationship creates a strong visual connection to the Slum Rehabilitation Towers, addressing the dichotomy that exists between them and the informal fabric of Koliwada. Looking at the plans, shown in figure 9.7, the structure is attempting to mediate this relationship, both visually and physically.

Figure 9.7 Plans of the Koliwada Language School.

10 Conclusion

This thesis is making the case for the city and the equitable inclusion of all people, especially the urban poor. As the most vulnerable group, preserving their self-made structures and urban neighbourhoods ensures they can sustain their own livelihood, by maintaining their attachments to existing networks for support and giving them the security to be ambitious. Yes, these settlements have several issues, but with support and recognition from the city that they are legitimate communities, they can begin to develop in order to improve the quality of life for residents, ensuring they too can have a dignified existence and the support necessary to continue their informal activities.

Ensuring density and a place within the city for all people, also reduces the need for the city to sprawl; which negatively affects the eco-systems surrounding the city as well as the potential for the city as a whole to maintain its livelihood autonomously. By drawing more people to the city, it increases its potential to be productive, vibrant, and chaotic, enabling everyone to have access to a variety of networks and other people to support whatever life they choose. The new cities of Asia and Africa will follow their own, non-western path to development, which will in turn create unique environments formed from the needs of the people who use the urban spaces. In some cities like Shanghai, the government will attempt to control how spaces can be used and for what purposes, while Globalization and its proponents will continue their attempts to

transform the city to meet their needs. In the end, however, the people on the streets will determine the uses of these spaces, and the cities will continue to be both informal and formal. These elements can co-exist, they need not be separate; eventually informal activities will be formalized, and the informal housing in settlements will develop to be a contiguous part of the city. Time, resources and security are necessary to allow that transformation.

In maintaining the places created by the urban poor in the city, the three strategies: The Network, The Line, and The Point; ensures that the fabric of urban informal settlement is preserved, as well as the networks contained within them, as shown in Figure 10.1. Even if the governments of cities fail to recognize the legitimacy of informal settlements in a timely manner, maintaining the informal ownership of land, by not allowing any portion to become vacant for too long, is extremely important. Informal ownership is only maintained by occupation. While many researchers have identified the need to use the resources of private developers to make the transformation of informal settlements profitable to [officials] landowners, these methods are in line with the on-going grass-roots development that has taken place in Dharavi. Without the support of financial institutions or city officials, residents have been able to transform the settlement from simple shacks to a range of sophisticated residential, commercial and cultural buildings and streets. If this is allowed to continue, but with the help of government officials and the recognition that the settlement is legitimate, other aspects like sanitation, infrastructure and health can begin to also propagate within the community.

The architecture proposed in each of the methods facilitates the processes that would allow for gradual upgrade, while promoting the legitimacy of the settlement by ensuring that the existing built fabric and social, economic and cultural activities are preserved, and that the residents remain as informal owners within the settlement. Although this thesis proposes specific interventions, these methods are meant to be a guideline that can be adapted to any type of project. Other projects might include integrated health clinics to provide vaccines and pre-natal care to residents, or mobile play spaces for children who work in factories in the settlement. The needs of Dharavi residents is endless (for other informal settlements around the world as well), these project examples are just a small portion of possibilities.

The methods also take into consideration that many factors can affect the outcome of a project. Local construction knowledge will determine what structural type is possible, while available materials and funding sources will be factors in how the overall building will be rendered. These factors, which might be known during design or be

Figure 10.1 Rendering of Koliwada showing all methods: The Network, line and Point integrated into the fabric.

a new discovery when construction begins, would ultimately dictate the process and final result. As architects we can only hope that the intent of the design, elements like orientation or program areas, will end up in the final version of the project. Survival of residents is based on being able to manipulate and transform the built environment in order to meet needs and resources, new structures designed by architects would not be any different. As representations of the legitimacy of the residents and their activities, these new structures are bound to be shaped and transformed by them.

The architecture proposed in this project is a product of research on how people use spaces within the city and how they form their own communities in order to survive. Survival comes from being autonomous, and fighting, tooth and nail, to keep a grip on the spaces required in order to do so. These methods facilitate the fight, defending Dharavi, and all informal settlements, from out-right destruction. Dharavi should not be destroyed; residents should be given the opportunity to develop as an autonomous and legitimate community. Maintaining their built fabric of the settlement, while providing the means to continue to develop, along the same path they have already created for themselves, will ensure their dignity and continue their legitimate claim to their land. All informal settlements in cities throughout the world, during multiple periods of time, have struggled to maintain their claim on the city. These architectural methods would help ensure Dharavians keep their place in the city.

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