DEVELOPING THE INFORMAL

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Acknowledgements

I would like to thank Professor Kaufmann for his enthusiasm and the interesting discussions, Matias Echanove and the URBZ team in Mumbai, specially Shyam, for guiding me through Dharavi during my stay, and of course, close friends and family for their support.

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Abbreviations

AFD: Agence Française de Développement

ANHI: Agence nationale de lutte contre l'habitat insalubre

DRP: Dharavi Redevelopment Plan

FSI: Floor Space Index

KRVIA: Kamla Raheja Vidyanidhi Institute for Architecture and Environmental Studies

MINVU: Ministry of Housing and Urbanism, translated to english from « Ministerio de Vivienda y Urbanismo »

MMRDA: Mumbai Metropolitan Region Development Authority

PARHI: Programme national d'action pour la résorption de l'habitat insalubre

SRA: Slum Rehabilitation Authority

VSBP: Villes Sans Bidonvilles Programme

ZAP: Progressive Development Zones translated to english from « zones d'aménagements progressifs »

I. INTRODUCTION

Foreword

The bar of the 8 billion people living on the planet is getting closer, overpopulation is a growing source of debate, and an increasing amount of people live in indecent conditions[1] and areas defined as slums[2], specially in developing countries. Most often, their formation and continued existence is the result of a lacking sustainable economy in the country, which leads to poor formal employment possibilities. Without sufficient income, housing can quickly become a substantial problem. If individuals do not have a legal address, they may be denied access to basic needs, such as a bank account. Consequently, they are pushed to find other means to support themselves, such as seeking opportunities in the informal economy often requiring low paid flexible workers. This informal economy proliferates due to the difficulty of registering and running an official business by the government. Often, it is composed of a simple labour-money exchange and does not provide any form of social security if for instance an accident were to happen (UN-Habitat, 2003: 100).

Concerned governments have undertaken diverse strategies to approach and confront slums and informal settlements. John F.C. Turner (1977) undertook an analysis of the relationship between overall economic growth in Latin America

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1   According to the World Urbanization Prospectus produced in 2014 by the United Nation Department of Economic and Social Affairs (UNDESA), the urban percentage of the total world population increased by approximately a fourth between 1950 (30%) and 2014 (54%) and it is predicted that by 2050, this number will have increased to 66%.

2   The United Nations (UN-Habitat 2014:1) define a slum as "*an area or settlement in which a significant proportion of households lack potable water, improved sanitation, durable housing, adequate living space and security of residential tenure*". Authors, however, criticise the connotations that the term may have because the term 'slum' tends to ignore the complexity and dynamism of the area.

to the positive economic contribution of slum territories and their residents. For delivering services and extracting value from these territories, he recommended that the process should be comprised of a mixture of *hard* and *soft* policies. These should take into account aspects of infrastructure, such as sanitation and access to water, as well as inclusive policies, such as land tenure security. UN-Habitat, in *The Challenge of Slums: Global Report on Human Settlements 2003* divided the approaches into four main groups: *removing, ignoring, relocating* and *upgrading*.

In general, removing and ignoring slums are not considered efficient in the long term. Indeed, demolishing settlements or voluntarily neglecting them does not address the underlying issues that are at their genesis. The third approach, which is to relocate slum-dwellers to semi-rural peripheries of cities and providing them with free housing, disregards several dimensions of a slum by perceiving the latter uniquely as a living space for the poor, when it actually encompasses many other aspects of subsistence such as sources of employment and social life. Slum residents often strongly oppose relocation for reasons of economic insecurity, even if there is a higher chance for better housing, because they fear not finding employment opportunities in the new areas.

The final approach, upgrading, is considered to better adapt to the realms of sustainable development. Defined by the United Nations as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (UNWCED, 1987), this approach is recommended as it is considered to be more optimal in the long-term.

The research
Slum development case studies
In the first part of this research, three different cases of slum development will be considered. The choice of these cases is based on the different approaches which were chosen to tackle their resorption. Although their respective scales and completion stages are different, this study will provide a comprehensive overview of various possibilities and ways to deal with informal urban areas.

The first case is the *half-house* proposition made by Alejandro Arevana and the Elemental *do-tank* in the Quinta Monroy neighbourhood of Iquique, Chile. Here, slum-dwellers were provided half of a new house on the very location of the slum itself. The approach is a variation of upgrading. Homes are dismantled and rebuilt *in situ*, but only *half-houses*. Residents complete the other half of the house by themselves. The second case is an ongoing rehabilitation project which takes place on a national level, the *Villes Sans Bidonvilles Programme* (VSBP) in Morocco. Although it mirrors the United Nations *Cities Without Slums* programme, the strategy is directed by the moroccan government. The focus will be more on the housing strategies than politico-financial aspects. The final case centers on Dharavi, in Mumbai, India. Some consider it a slum, others an informal city within a city. Nevertheless, it has attracted the attention of the international community and been the focus of numerous controversial redevelopment plans throughout the years. The latest one, the *Dharavi Redevelopment Plan* (DRP), was envisioned by an american trained indian architect who proposed to destroy the whole area and rebuild modern high-rises instead. Many people endorsed it, many people opposed it, it is an on-going battle.

The cases will then be compared with each other in order to assess their impact

and effectiveness. Indicators such as the quality of the new or improved infrastructure and living spaces, the neighbourhood comfort and the ability of the residents to adapt to the new conditions and sustain themselves will be taken into consideration.

Work in Dharavi
The second part of this research will focus on the different fields of work that takes place in Dharavi. As part of a process to make Mumbai a 21st century, world-class city, recent redevelopment schemes have mostly focussed on residential, office and public spaces, particularly so with the DRP. In contrast with many informal settlements which may seem invisible from the formal city, Dharavi is a noticeable piece of land and well known due to its size and age, its constant activity and micro-industrial manufacturing and its important history of providing workforce to the city. In the second chapter of this study, it is shown that this new image of Mumbai is incompatible with the actual working communities. Their associated lifestyles and necessary working spaces, which are indispensable to the survival of the current inhabitants, are jeopardised it. To showcase the disconnection between the government plans and the residents, three fields or occupations, that Dharavi is internationally renowned for will be analysed in their context, through their working spaces and their general way of functioning.

The first field that will be analysed is leather work. Due to its long history, the leather industry is considered a cornerstone of Dharavi's foundations. Through the years, the industry has evolved with and adapted to the city. The second field is pottery. The potters' community have an important history in the area as well, their profession remains traditional. The community was assigned a portion of land by the colonial government in 1895 as their profession requires specific spac-

es and tools. The third field is plastic recycling, a more contemporary industry. The process, which starts in the streets of Mumbai converges in the 13th Compound, where most recyclable material is sorted, processed and sometimes exported for further treatment.

The workers in these fields usually operate in the informal sector. Their role and place in the future developments will be explored.

II. SLUM DEVELOPMENT CASE STUDIES

Quinta Monroy
Iquique, Chile

The booming country

Chile is one of Latin America's fastest growing countries. Through the years it has put a lot of efforts into reducing poverty level and rehabilitating its slums. In the early 1960's, the housing crisis affected more than 1 in 25 Chileans, as the country was lacking more than 300'000 units. With an ever growing demand, reforms were made and the Ministry of Housing and Urbanism (MINVU) was formed to address and supervise housing efforts and city planning in Chile (Cook & Boyer, 2010).

By the end of the 20th century, the country was flourishing. But informality was still present, with a significant number of people living in slums and contributing to an informal economy. In order to help the slum-dwellers emancipate themselves from their living conditions, the government provided housing subsidies for new homes. However, the new homes were built on cheaper land, situated in the periphery of the cities, disconnecting "*families from their social networks and often their jobs, further condemning them to a life on the margins of society*" (Cook & Boyer, 2010:7). Furthermore, cheaper materials and little amenities lead to unviable neighbourhoods and as a result, their market-value depreciated quickly. In other words, the social housing strategies were not benefitting the poorer people in the long run, pushing them even further away from the needed stability. Although the former strategies managed to provide shelter from the elements, "*building equity –and rising out of poverty–was still beyond the reach of many families living in social housing*" (Cook & Boyer, 2010:11).

Figure 1 - Half-houses, Quinta Monroy

Figure 2 - Streetside facade, Quinta Monroy

Quinta Monroy

Elemental

Before starting their work on Quinta Monroy, Elemental, the multi disciplinary *do-tank* behind the project, led by Alejandro Aravena, tried to find an innovative solution to the social housing problem, undertaking initial analytical steps as early as 2002. As a starting point, they took inspiration from the works of John FC Turner. In his essay "*Housing is a verb*", he puts forth the idea that housing is an ongoing project, where residents become co-creators, and this is precisely the direction Elemental chose to follow by opting for an integrative and cooperative method. The main points of their initial conclusion centred around the following aspects: the importance of location, the possibility to form sub-communities, an orderly future development potential, understanding what the resident can build himself, and the built-in ability to be expanded. These were considered as the key guiding elements that would lead to a sustainable social housing strategy.

Budget

Having garnered some attention at a seminar on the future of social housing hosted by the MINVU, Elemental was proposed to put the plan into action as a pilot programme in Quinta Monroy. When the pilot project was initiated, the housing policies had slightly changed to benefit the families in the long run. Previously, they were granted loans and subsidies with a total worth of USD 10'000. However, this often became a financial burden as they were not able to pay the loans back. Instead, the government decided to completely subsidise them, but only allotted USD 7'500 per household. This budget was to include the price of the land and the construction. Once the main structure was built, it would be up to the residents to finish the building in their own time. The average cost of completing the building is estimated at USD 1000 per house (Dain Belmont, 2015).

With this budget, Elemental chose to design what they define as *half of a good house*, instead of a full, yet lower-quality house. The project is located on the 5000 square meters parcel that hosted the slum, which used to be illegally occupied by approximately 100 families.

Construction

The idea was to build a structurally safe building, that could be completed incrementally by the owner. Arevana (2008) explains the process:

> Instead of designing a small house (in 30 square meters everything is small), we provided a middle-income house, out of which we were giving just a small part now. This meant a change in the standard: kitchens, bathrooms, stairs, partition walls and all the difficult parts of the house had to be designed for final scenario of a 72 square meters house.

All these difficult parts were to be included in the first half of the building: retrofitting them after the families' appropriation would be too demanding or even impossible. The alternating pattern of single-storey and double-storey allows the families to expand vertically, using the lands potential to its maximum, densifying the neighbourhood. This design creates a frame for future expansion possibilities as well, as the void between the buildings will eventually be filled and difficult to exceed.

Residents

At the early stages of the project, Elemental played a fundamental role in more than just the formal design process. They were fully aware of the social housing situation of the country and pinpointed the essential needs that the poorer families had and found a way to approach the situation from a different angle than a

Figure 3 - Neighbourhood map
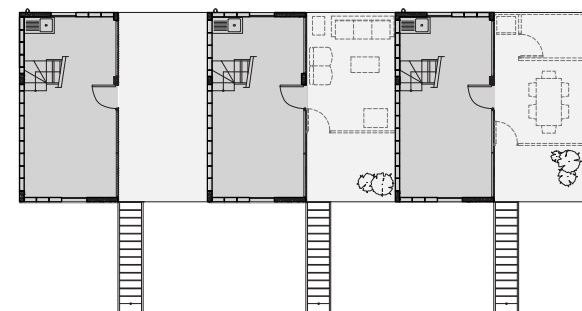
Second floor
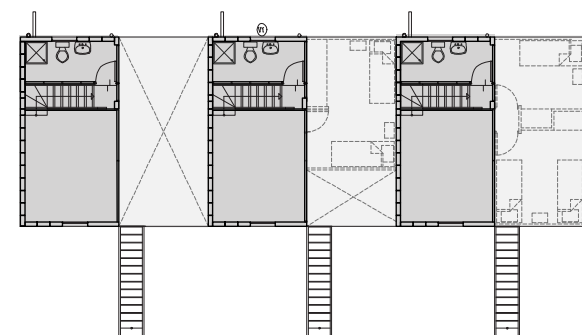
First floor
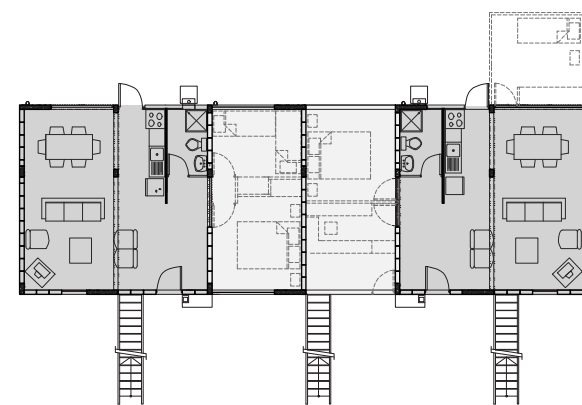
Ground floor

Designed by Elemental

To be completed by residents

0m   5m

Figure 4 - Half-house plans

humanitarian one, considered by Aravena an "easy out". Through participatory workshops and discussions, they found a possibility to engage directly with the people and got the chance to hone the concept. This enabled them to express their opinions and preferences, which proved to be beneficial. Indeed, the spotlight was shone on issues that policy makers would not have necessarily thought of. For example, the residents were given the choice between a water heater and a bathtub, and it was the latter which was chosen, although a middle-class citizen would have most likely chosen the former. The reasoning behind this is that the water heater could be sold in order to obtain some money to subsist in the short term, and reacquired once the financial situation was stable again, whereas the bathtub, which approximately had the same monetary value as the heater, provided a certain space and comfort. If it was not included in the original design, the financial situation of these families and the spatial conditions of their houses would not have allowed them to buy and retrofit a bathtub.

Residents played a crucial role in the choice of the urban shape as well. Early in the development process, while considering the different options, it was revealed that medium-rise buildings would be able to accommodate each family, "*but because of the stigma of medium rise social housing, [they] threatened a hunger strike if this option were to be proposed*" (Cook & Boyer, 2010:16). The design team had to find a different kind of solution that incorporated the needs of the residents, and they had to build it efficiently and fast. Eventually, the land was divided by building strips that formed U-shaped shared spaces to enable the formation of sub-communities and reinforce social ties. At the same time, these spaces could accommodate parking spots and walkways across the site.

Outcome

Compared to previous development efforts, Quinta Monroy stands out by its location in the city centre of Iquique, on the former slum in which approximately 100 families used to live. It has now been upgraded into a new neighbourhood, in the very location of the settlement. The desire to build there was justified by the proximity to jobs, amenities, the city community and activities, allowing the residents to keep their daily routines. Indeed, the land was occupied during the last 30 years. Building on the site aimed to give the less fortunate families a chance to develop and grow out of poverty by maintaining their ties in the area.

The praise that this project garnered is non-negligible. Indeed, building 36 square meters that can be expanded by each family to reach the double of its original size is an interesting feature. Instead of just providing a shelter from the elements that would depreciate with time, Elemental turned the equation around and provided an asset which would gain in value. The project thus responds to a chronic issue of social housing: the progressive decrease of the house's value. Some houses are estimated at a market value of USD 20'000 (Cook & Boyer, 2010), a difficult feat to attain considering the budget of the improvement and the fact that it used to be a slum area.

The speed at which the buildings were erected is also an important asset. The main infrastructure was completed in a year and the incremental completion works by the families started almost immediately (Sinclair, 2006).

Discussion

It is an elegant solution, yet this pilot programme raises an important question: can this strategy be replicated anywhere? Although similar housing efforts have

Figure 5 - Villa Verde in Constituciòn, Chile

Figure 6 - Housing complex in Monterrey, Mexico

later been reproduced in different regions, such as the Villa Verde in Constitucìon (Chile, 2013) and Monterrey's housing project (Mexico, 2008), they are often located not in city centres but in their peripheries. In most cases, the price of the land dictates the location, as it is usually the most expensive aspect of the project. When cheaper city-centre land is available, it is often located in less desirable areas. As the neighbourhood of Quinta Monroy is only 5000 square meters, it was justifiable to redevelop the neighbourhood *in situ* and not displace it's residents.

As the idea of a half-house went around the world, many people have criticised it precisely for the fact that *only* half of a house is provided. This is almost seen as an insult because the solution relies on the skills of the residents instead of the expertise of the architect. Even if the structure of the first half is sturdy, the expansions are eventually made with low construction techniques, resulting in an appearance that is similar to that of the slums which the project aimed to replace. According to Boano & Vergara Perucich (2016:67):

> *Adaptation, self-construction and community innovation are certainly central issues, but approaching them by leaving half of the house unbuilt can easily lead to the aestheticisation of poverty and the subsequent processes of marginalisation.*

They also state (2016:62):

> *Profit, not quality, is the aim of neoliberalism, which is why the way in which Aravena develops social housing is just perfect: half houses obtained with public funding to activate cycles of capital accumulation and urbanise so to prepare the field for soon-to-come, better profitable real estate developments. Without touching the Chilean neoliberal rule […], Aravena has invented a neoliberal method to produce social architecture, which has been broadly accepted and praised.*

Synthesis

On the one hand, there has been a lot of criticism about how the proposed architecture is mediocre, sub-middle-class-standard and how the poor deserve to be treated better. Some perceive that the needs and dignity of the families trying to climb the social ladder were neglected. Others accuse the approach of being *starchitecture* that glorifies the poor by letting them finalise their residence, making it a somewhat high-quality-slum. On the other hand, from the perspective of the inhabitants, half of a good house is exactly what was needed at the time, as it provided a much needed stability allowing them to develop in an organised manner. Since then, some residents have already moved out, freeing the space for other people in need (Groundwater, 2015).

Figure 7 - Quinta Monroy intra-neighbourhood

Elemental took on the issue of social housing from an economic aspect, citing asset appreciation as one of their principal interests (Cook & Boyer, 2010), while staying clear of a humanitarian approach, the "easy outs". Their choice was to remain as pragmatic as possible. This enabled discussions, in Chile and around the world, about possible low-rise, high-density solutions. Although Quinta Monroy was an experimental pilot project, it has proved that a *half-house*, which can be completed into a full house, is an improvement compared to a hut in a slum.

The success of Elemental's process is in its ability to make sense of a complex set of inter-related issues and identify the weighted balance of these relationships, yielding a decision making frame- work that is rooted in actual needs, and is keenly aware of actual consequences.

The power of this framework is evidenced by the peculiar decision to deliver houses at Quinta Monroy without water heaters. From the perspective of human dignity alone it's a clear decision to mandate that all new homes must have a water heater. However, once this basic social policy decision was seen within the context of a poor family's economic reality, and further illuminated by recognising Chile's culture of self construction that makes the later addition of a water heater very likely, it is clear that the different sets of policy intersecting to govern housing delivery were not designed in concert.

Elemental's design process made this blind spot visible, offered a clear pathway to resolution, and supported that decision with irrefutable evidence. When the solution, a house with a tub instead of a heater, met with political opposition the team benefitted from their thorough needs-finding process and could direct the objecting politicians directly to the families who requested the purportedly "inhumane" solution.

Cook & Boyer, 2010:19-20

Figure 8 - Completed houses, Quinta Monroy

Figure 9 - Completed streetside facade, Quinta Monroy

Villes Sans Bidonvilles

Morocco

Tanger

Oujda

Jerada

Kénitra

Salé

Meknès

Fès

Casablanca

Rabat

Khénifra

Marrakech

Agadir

Laâyoune

Dakhla
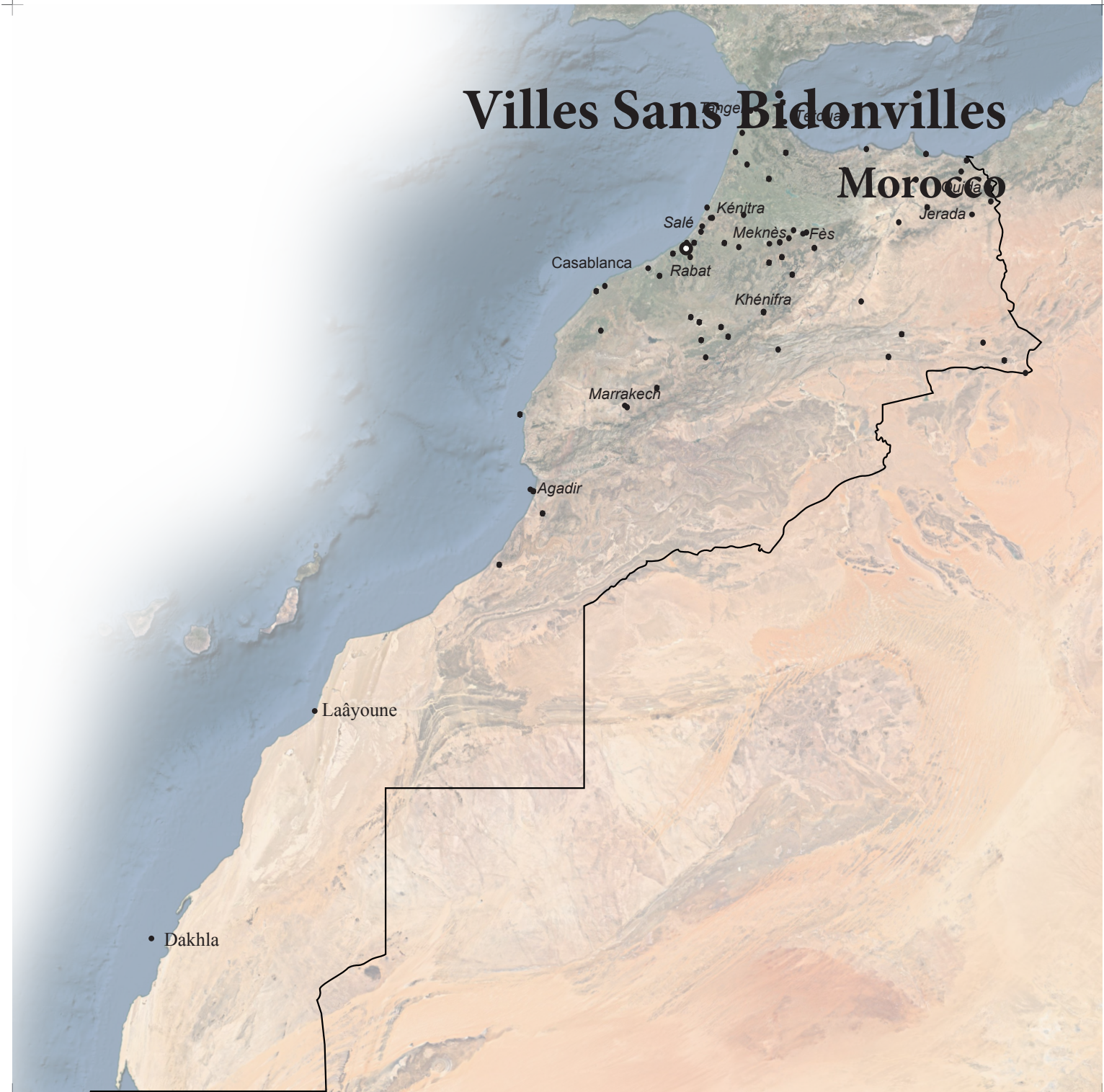
Context

As in many countries in economic transition, Morocco has experienced a strong rural flight. From the 1960s onwards, urban population has grown, reaching 57% of the country's population in 2002. However, the growth happened too fast for the government to manage it accordingly. In a time where the average income was only of 960 euros per capita per month, insalubrious housing, slums and clandestine settlements developed in bigger cities (AFD, 2011). While the urban population grew from 3,4 million in 1960 to 16,5 million in 2004, the housing supply did not match the demand (Le Tellier, 2008).

Over the years, the government had an ambiguous attitude towards slums-dwellers. Official statements portrayed them as a threat to security throughout the country and until the 1990s, politicians also used them as a means to gain power: slum-dwellers, although living in illegal settlements, were an important part of the voting population. Their fragility and dependence on the government was taken advantage of by local authorities, who often forced them to vote according to specific directives in order to avoid eviction (Barthel & Jaglin, 2013).

On the one hand, the slum-dwellers were tolerated because there were little alternatives for them. But on the other hand, the government was not letting them develop their neighbourhoods into more liveable places, prohibiting more permanent constructions and self-procured collective services which could enhance their living conditions. Furthermore, authorities refused to provide even the most basic amenities, fearing the slum-dwellers would consider themselves acknowledged and settle permanently (Barthel & Jaglin, 2013).

Informal neighbourhoods[1] were built throughout the 1970s without permission from the government. But the State was aware of the housing crisis, so migrants were given the possibility to acquire land to build upon informally. As these settlements were tolerated, it marked a difference between informal neighbourhoods and slums, which were condoned. While the 1970s proved to be problematic because slums were mostly ignored by the State, slum reduction operations were resumed in the 1980s and the *Agence nationale de lutte contre l'habitat insalubre* (ANHI) was established to contend against the creation and perpetuation of slums, considered as dangerous and as a menace to social peace (Barthel & Jaglin, 2013), while trying to improve and legitimise the informal neighbourhoods (Le Tellier, 2008).

During the 1990s, the proportion of slum-dwellers who were attributed building lots grew compared to the residents of informal settlements, so in situ upgrades began to be favoured instead, leading to the creation of the *Programme national d'action pour la résorption de l'habitat insalubre* (PARHI) in 2001. After important political turnovers in 2002 and the 2003 Casablanca bombings, the PARHI was reconfigured and became *Villes Sans Bidonvilles Programme* (VSBP), which took shape in 2004, echoing the United Nations 2020 *Cities Without Slums* strategy. When the programme was launched, it comprised 70 cities. Today, the number has risen to 85 (UNWM, 2016).

While the PARHI favoured *in situ* upgrades of slums, the VSBP's aim was to eradicate them completely. Specific measures were taken to make the plan viable (Le Tellier, 2008). Firstly, an important amount of public land was mobilised, destined to be used for social housing. Secondly, a special fund to support poor-

1   Quartiers non-rééglementaires

Figure 10 - A slum in proximity of the Al Fath resettlement site, Casablanca

er families was created, as new housing is not always an affordable option for poverty stricken families. Thirdly, in order to help slum-dwellers adhere to the proposed solutions and allow a social follow-through of concerned households, a social engineering plan was put into place.

The *Villes Sans Bidonvilles Programme*

The VSBP did not have a standardised process as each slum is unique and comprised by different actors and forces. As there were an estimated 340'000 households and families living in precarious conditions, it was important to understand the different needs of the different groups of people. To do so, the VSBP proposed three different types of interventions.

The first one is the *resettlement*. It aims to facilitate the households of small slums[2],

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2   Small slums contain less than 100 homes

or the ones which cannot be included into the urban fabric access to ownership of a reasonable portion of land in areas defined as Progressive Development Zones (ZAP[3]). The new owners can build their house in assisted auto-construction, on a plot varying in size between 64 and 80 square meters. These areas allow the acceleration of the slum resorption processes by adapting them to the needs of the intended people. In this alternative, the State provides the land, the drainage system and public lighting, while drinking water is distributed by standpipes located throughout the area (UN-Habitat, 2014).

The second type of intervention is *restructuration* and concerns medium[4] to large[5] slums that can be integrated into the urban fabric. The objective of this type of intervention is to set up proper infrastructure and amenities while regularising the neighbourhoods property wise for eventual future city planning. In practice, these interventions lead to a dedensification of the slums, which in turn causes the relocation of certain families to different areas. While the financing of the road network and sanitation costs are sustained by the government, clean water and electricity is to be paid for by the beneficiaries (UN-Habitat, 2014).

The last form of intervention is *relocation*. This solution is favoured in bigger urban agglomerations, where free space is scarce. New, modestly-priced buildings are built through a public-private partnership. The costs of these homes vary between DH 80'000 (USD 8'000) and DH 120'000 (USD 12'000), the State contributing DH 40'000 (USD 4'000) per home (UN-Habitat, 2014).

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3   *Zones d'aménagements progressifs*

4   Medium slums contain 100 - 500 homes

5   Large slums contain over 500 homes

Figure 11 - The Al Fath resettlement site in construction, Casablanca

Initially, it was planned that 45% of the families would be concerned by the resettlement, while 32% would be concerned by the restructuration and 23% would be relocated. However, practice has shown that 80% of the cases are resettlements, as the other two alternatives are more complex to put in to practice and less favoured by the concerned population (UN-Habitat, 2014).

As the VSBP took shape, several problems arose, generating a certain number of complications. Land management proved to be a sizeable one because of the low availability and high prices in the zones that were to accommodate new housing. Land cleaning procedures were slow and demanding, and sometimes incompatible with the desired projects. Discerning land ownership is another issue that has been hard to deal with, as contracts and various documents often contained wrong information, with nobody claiming responsibility for problems. The lack of financial resources and unclear contracts stating each party's rights and obligations lead to unhonoured commitments.

The VSBP was to provide social follow-through of the slum-dwellers, however the procedures were not thorough enough and led to a lack of a national database of families who had benefitted from the plan.

The AFD Study
Private spaces
An independent study was made by the *Agence Française du Dévelopement* (AFD) to evaluate the impact that the VSBP had on households. The results revealed that there has been an undeniable rise in the quality of private living spaces belonging to rehoused families, with greater comfort and better sanitary conditions, a feeling shared by many families who were in precarious and insecure positions. It is

important for them to have a "solid house" and a "roof on their heads" (Barthel & Jaglin, 2013:94). Living in a normal home, in a normal neighbourhood and not to be considered as a slum-dweller contributes to the sense of social ascension. A solid home, being a strong symbol of stability while providing the space to accommodate personal possessions, is in most cases what they need, and justifies the wait and the long administrative processes.

The improvement of living conditions is the result of specific factors. Habitable areas have been conceived larger, the average having risen from 57 to 63 square meters. Sleeping conditions have also increased as the percentage of families who share bedrooms with other family members has dropped from 38% to only 2%. Home configurations have improved as well, with the apparition of independent kitchens and living rooms, leading to a greater sense of comfort, and households have been supplied with better equipment, such as modern bathrooms, refrigerators and other kitchen appliances, as well as better water and electrical infrastructure (Barthel & Jaglin, 2013).

Land tenure
The report underlines a strategy that has worked and satisfied many inhabitants in Casablanca, that of the *tiers-associé*. It is a strategy where two households that are to benefit from the VSBP are given the option of associating themselves with a third party, usually an investor or a promoter. The third party is to finance the construction of a four storey building, which includes the ground level, on an attributed lot in exchange of a part of the built surface. It has been described as an original solution, as the financing of a new building is one of the greatest difficulties slum-dwellers face.

In other cases, families who benefitted from a piece of land were interviewed and declared that they did not want to build due to disagreements among family members or co-owners of the land while some preferred to wait for the neighbourhoods infrastructure to improve before investing in a new construction. Some families acquired land but chose to sell or exchange their attributed lot while others had to do so by obligation. Others still could not afford the construction prices so they refused the lot as a whole. However, the study was not able to quantify these situations because the local operators did not follow-through closely enough (Barthel & Jaglin, 2013).

Social impact, location and public spaces
Although a general sense of hope, generated by the better living conditions, is present and people feel that the situation is improving, difficulties still remain. When the study was conducted, it was shown that in the ZAP areas, slightly more than half of the lots were occupied or built. The different factors affecting the households' building process are their financial situation, the advantages or constraints of their location, administrative constraints and alternative solutions.

The study showcased the city of Agadir, where many families are not part of the programme or are in a transition phase. A part of these families had to find temporary housing, sometimes significantly far from their original neighbourhood. It was shown that a significant number of them were incapable of financing the new homes due to economic and social precariousness as the income earners of the family only have daily jobs or are seasonal workers, not generating enough revenue to access banking credit. Moving expenses, as well as the rent and service costs of the transitional housing, are high and sometimes out of reach. This induces some people to feel resigned, revolted and anguished due their indebted-

ness and the illnesses associated with stress.

Despite the fact that general housing standards have increased, residents still encounter problems concerning urban conditions and have trouble integrating or forming new communities. Less than a quarter of the planned social amenities, whether collective ovens, hammams or kindergartens, were built, making it hard for the residents to form a strong and stable community. On the contrary, a feeling of isolation and being relegated is common, as the lack of parks and green spaces generates bland, inhospitable urban landscapes.

Accessibility of the city
In peripheral areas that have been developed, road networks are often incomplete and the public lighting systems are defective, generating a set of problems of their own. If the roads do not distribute the buildings properly, public services such as trash collection cannot be provided efficiently. As these new areas were developed in a rush, there is an important shortage of shops, markets and proximity services, reinforcing the impression of isolation.

In the case of big cities (Agadir, Casablanca, Berkane), distances among points of interest increase so that walking and other forms of sustainable travelling options are not used anymore, while public transportation facilities are quasi-inexistent. This causes households' transportation budget to grow significantly. It also has a negative impact on youth and women's social mobility, as they often depend on the head of the family for displacements. This has reduced families' potential of mobility as well as which, in turn, complicates their access to the city.

When residents of these neighbourhoods look back on their previous situation,

they almost regret the change, explaining that they used to have anything that they needed close by (Barthel & Jaglin, 2013:99). Even though these families lived in impoverished conditions, most of the slums, especially the older ones (Casablanca, Kénitra, Agadir), were well integrated in the city and access to services was easy. Moving into a new area shakes a household's foundations and daily habits, and affects the management of their financial situation or their relationship with the surrounding community.

Employment
According to the report, there seems to be no direct correlation between the families' relocation and the employment of their main income earner. Often the families' finances are based on the sole income of the head of the family, a fragile situation which can be easily affected by illnesses and work related accidents, among other factors. Financing the new living costs gives them little other options than keep their jobs, accepting longer commuting times and greater distances in order to guarantee a regular income. However, it is mentioned that the survey is more of a quantitative nature, and does not reflect a qualitative result.

Synthesis
Compared to previous development efforts in Morocco, the VSBP has had many impacts. The availability of financial resources and "*the multitude of funding sources (subsidies, guarantee funds for low-income families, bank loans, equalisation products, international financial organisations, advances of recipients) […] allowed the program to succeed*" (Chtouki, 2016). The private sector's involvement is not to be neglected either, as it allowed a wider range of actions through better funding and investments. When the programme was designed, policies were made flexible enough in order to leave room for unforeseeable problems, related
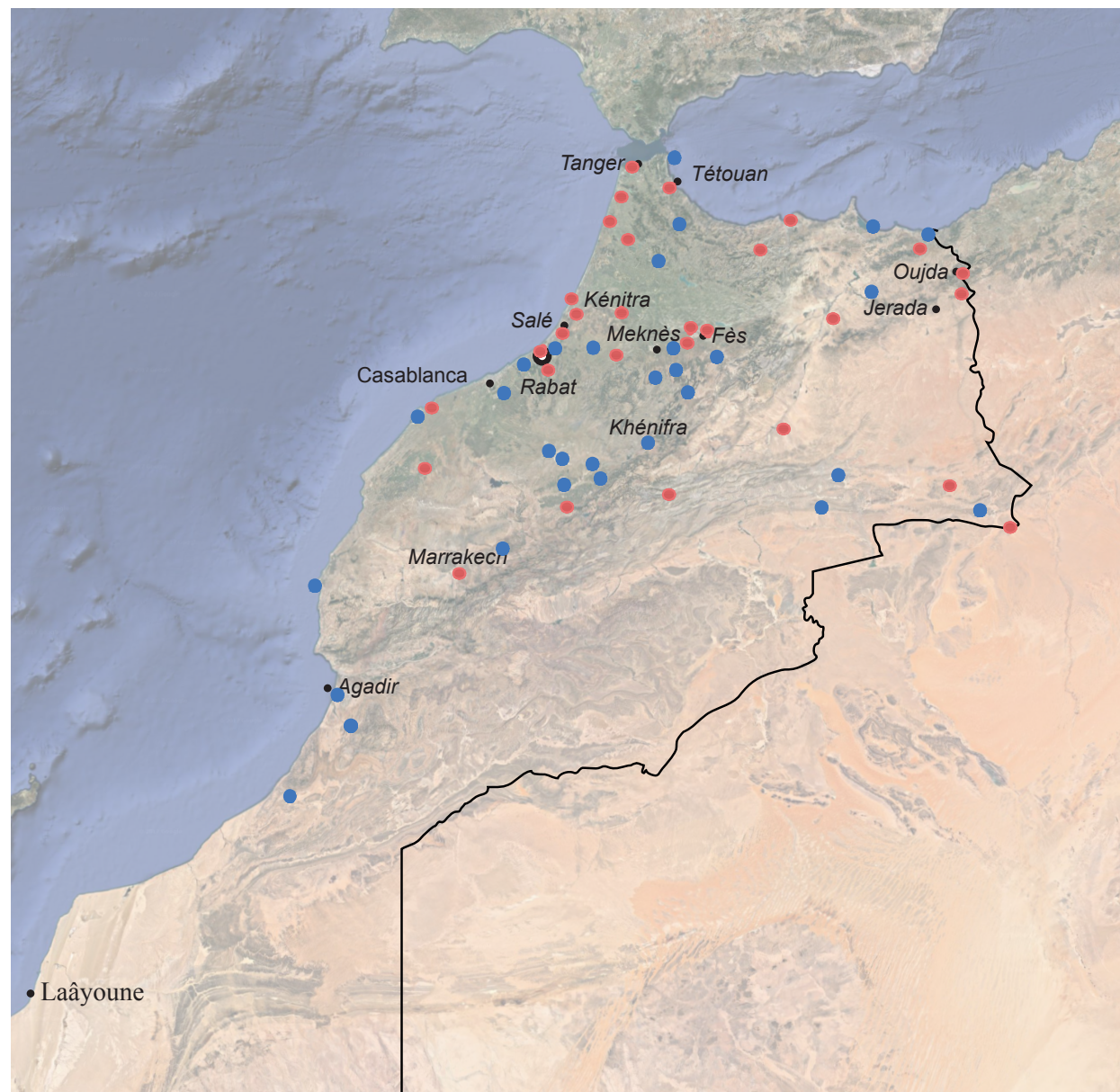
Figure 12 - Map of cities which have been declared slum-free in 2011

to local contexts, which would be managed by decision-makers and operators.

In early 2016, 55 of the 85 concerned cities have been declared slum free in Morocco and the programme is ongoing. Although the 55 cities are mainly small or medium sized, approximately 82% of the households that used to live their slums have acquired a decent housing accommodation or are in the process of acquiring one (UNWM, 2016). But is this a viable way to proceed?

It was shown that the VSBP has increased living standards of previous slum-dwellers by providing them with land on which to build a solid house granting them stability. The fact of owning a solid home with "normal" surroundings emancipates them from the notion of slum-dweller and generates a feeling of social ascension. There is more personal comfort, as the new homes provide more rooms and surface area allowing greater personal development and are equipped with higher quality appliances, facilitating everyday life.

However, the drawbacks of the relocations in the peripheries of big cities have led to a sense of social confinement and insecurity, affected by the low financial resources of the families who cannot afford the new housing, the difficulties of social integration in new areas due to the loss of bearings, the lack of proper public transportation facilities and potential socialising urban spaces.

The Cities Without Slums programme has allowed for a deepening of the knowledge of how slum treatment may occur on a national level and the various problems that can be encountered. However, it has also shown that even if personal wellbeing has improved, social comfort does not always follow.

Dharavi
Mumbai, India

The Dharavi Redevelopment Plan

As the second biggest population of the world, India has a long history with informal settlements, one of the largest being Dharavi in Mumbai. From the late 1800s onwards, people from around the country have moved there in the hope of building a better life for themselves and their families, as Mumbai was already at the time a cosmopolitan city with many businesses and industries. After a plague epidemic in the late 1890s, the government exiled industries from the city towards the northern marshlands of the city, as they were deemed too polluting. Throughout the 20th century, Mumbai expanded rapidly and completely engulfed Dharavi. Easily accessible today, bordered by two important suburban railways and the Mithi river, it is located in the city centre.

From its early days, Dharavi has constantly grown, accepting migrants from every region. Already in the early 1920s, it was considered an important slum in which people lived with scarce resources. In the beginning the government did little to help the inhabitants because of their location outside of the city. In later years, various acts and schemes were put in place to try to improve the living conditions in the slums. However, they were not implemented properly and resulted in a never-ending stream of problems.

By the 1990s, India's economy was liberalised and as Mumbai continued to grow, land gained value and real-estate speculation became more profitable. Echanove (2014:9) explains:

> *At the same time, upgrading and self-help projects were abandoned as public land became too valuable for the poor to be allowed to occupy it. Officials refused to regularise the situation of slum-dwellers, routinely referring to them as squatters and thieves.*
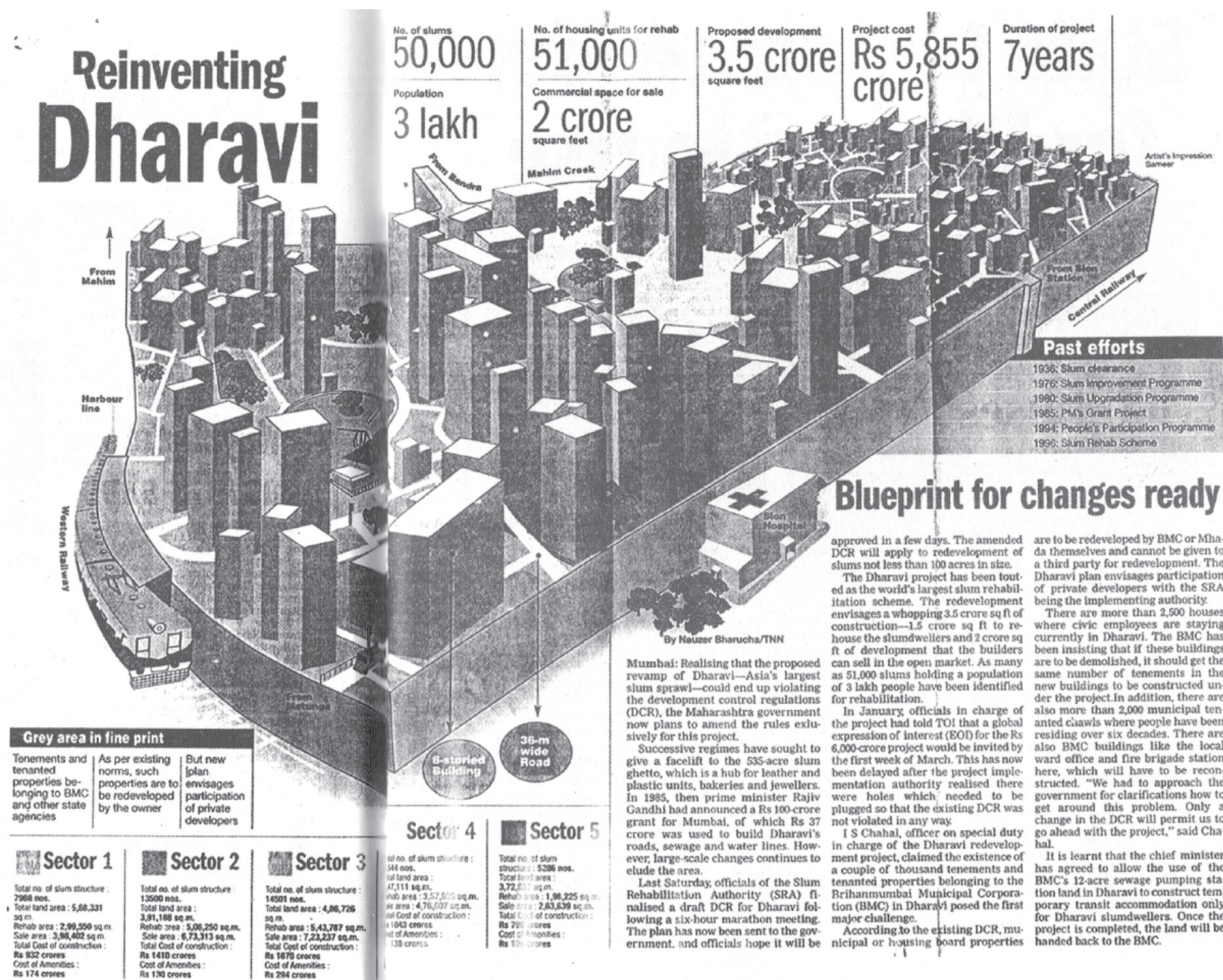
Figure 13 - Dharavi Redevelopment Plan article, published in the Times of India, 2007

The *Slum Rehabilitation Scheme* of 1996, where private developers were encouraged to clear slums by building high-rises in which eligible families would benefit from a free 20 square meters apartment, was expanded to Dharavi and evolved into the Dharavi Redevelopment Plan (DRP). The land was initially to be divided into five sectors, which would be distributed to the highest international bidders. As part of the agreement, the developers would re-house the displaced residents and provide necessary amenities such as schools, healthcare and infrastructures in order to benefit from "*incentivised Floor Space Index (FSI) that could be built for commercial and residential land uses for sale in the open market*" (Baweja, 2015). The DRP is portrayed as a sustainable development program aiming to rehabilitate all slum-dwellers and their businesses, reestablish the non-polluting industries and integrate the slum residents into the main stream society (Baweja, 2015). For the residents to benefit from the plan, their name must "*appear in the voters list as on 01.01.1995*" (SRA) and must be the "*actual occupant of the hutment*" (SRA). In return, they would be "*allotted a self contained house of 225 square feet (21 square meters) carpet area free of cost [and] will be included in the Rehabilitation scheme*" (SRA).

While the cause may seem to serve the city and its community, intending to emancipate Dharavi's residents from their apparent misery by providing them with better housing, clean water, hygienic waste disposal facilities and elegant open spaces, the plan has been rejected by the residents themselves. Indeed, they do not trust the government nor the developers, believing it is yet another plan to evict them from their homes.

Dharavi in a glance
To understand their fear one must understand how people live in Dharavi. From

its beginnings, the slum has always grown organically, its inhabitants using whatever they find to build their homes, forming a diverse and personalised sector. As resources are scarce, each square centimetre is used to its maximum potential. Everything is built compactly: a 4-5 person family "home" is usually a room that will rarely exceed 15 square meters, the average being closer to 10 square meters.

As there is a regular flow of migrants, Dharavi has evolved into a dense multi-cultural place, a self-made city, generating social ties and responding, to a certain extent, to the economic needs of the community. The high density and variety of businesses and industries allows the residents to fulfil all of their needs in a walking distance. Displays of different cultures and different religions are everywhere, streets are buzzing with activity, ambulant street vendors discuss with their clients in one part of the locality, while in another workers push hard plastics into
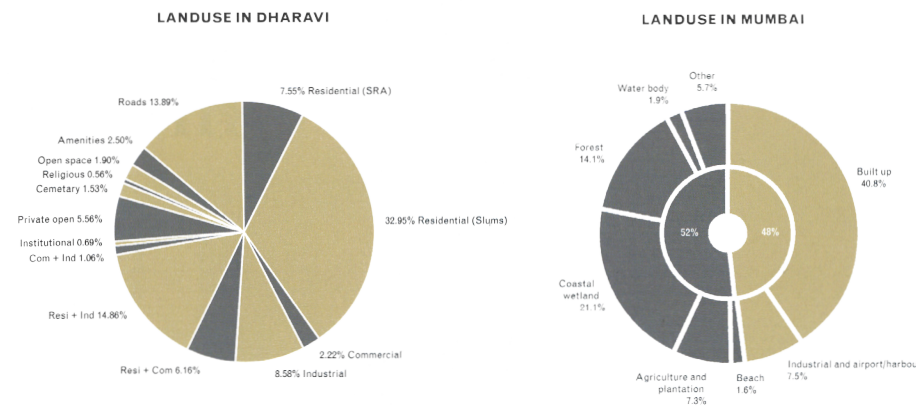
Figure 14 -Land use in Dharavi and Mumbai

Figure 15 - An open street temple in Dharavi, February 2017

shredding machines for recycling. Micro-industrial production of goods happens at every street corner, goods that are later exported elsewhere in Dharavi, in India or even the rest of the world.

At the same time, public infrastructures are poor: running water is only accessible at specific times, there is no real waste disposal system and hygienic conditions are deplorable, with an average of 1 toilet for 1400 people serving as an example. Although recycling is an important business in Dharavi, its heavily polluting industries affect the in-salubriousness of the settlement.

Very often the home becomes the workplace. Many buildings have multiple uses: ground levels can be used for business purposes (industrial production, small shops, informal take-away restaurants) by day, while they can become dormito-

ries for the night. Upper levels are usually family rooms but can be used as extensions of the ground floor businesses. Approximately 80% of the residents live where they work (Day, 2010) making Dharavi, as Boano (2016:161) describes it, a "*settlement in which the intersection of diverse income groups, built environment, traditions, and local economies allow such territories to constitute a production system in and of itself*".

The residents want to develop, they have the hope to upgrade their living standards. When families are better-off, instead of spending money on upgrading their homes, they spend it on their children's education, investing in a better future for them. Craftsmanship has been passed from generation to generation, this exacerbates their difficulty to find a new source of income in case of an important change.

Since the early settlements, the people of Dharavi have always found ways and means to sustain themselves, usually without government help, as it was never given to them in the first place. Now that the latter has taken serious interest in them, it is understandable that the plan to destroy Dharavi and rebuild high-rise out of reach buildings in which they could not afford to live, and the prospect of losing everything they own, was not taken lightly by the residents.

An ongoing struggle

Dharavi's residents believe that they have the right to live there. Indeed, their families settled there many generations ago, at a time when it was uninhabitable marshlands. With time they have constructed buildings, establishing themselves in the best possible way, upgrading the region incrementally. The government, however, has a different opinion: Dharavi's inhabitants are seen as squatters, be-

cause they live on a land that is not theirs to start with, without paying rent. Not many residents can prove their tenancy, let alone claim ownership of the prime, centrally located, valuable land that the government needs for development purposes. To try to keep Dharavi's evolution under control, the Maharashtra municipality has put in place a ban of construction and/or renovation of buildings in slum areas, preventing the slum-dwellers from improving their living conditions. In response, some inhabitants pay extra to make their homes look old and shabby to "*avoid unwanted attention*" (Echanove, 2014).

The insalubrious state in which Dharavi is leads to a need for urban renewal in the area. It is not uncommon for the government to send bulldozers to destroy the slum buildings to make way for new roads and new buildings. Often, these actions are carried out on a short notice. Some of these operations have been violent as well, with residents refusing to evacuate the premises, requiring police interventions. This makes the Dharavi inhabitants' future completely uncertain; even the better-off residents are concerned. This uncertainty generates a status-quo situation in which there is no point for them to invest in building a better home, legally or not, as it could be destroyed at any time. The only value their homes retain is an economical one, the income it can generate (Echanove, 2014).

The implications of the implementation of the DRP do not only relate to the land itself and its inhabitants, nor are they only financial: they are strongly political as well. When interviewed on the matter (PBS, 2009), a consultant to the DRP explained:

If a city has ever had a chance to reinvent itself, to make its mark on the international world, I believe that the process through which it will happen is

through slum rehabilitation. The whole country is waiting and watching for the first bulldozer to go in and bulldoze those slums so they can start doing it in their cities, too. I think this is really a pilot project for the rest of India and maybe even the rest of the world, as far as slums are concerned.

There is also a clear advantage of opening the market to international developers as the DRP rids the government of their responsibility to rehouse the displaced residents.

In *R[E] Interpreting, Imagining, Developing Dharavi*, Rani Day mentions that when the initial plan was conceived, the residents had never been consulted, making it a prime example of top-down planning. In previous schemes, at least 70% of the residents had to understand and approve of the plans before they could be validated, and even though the agreements was not carried out properly, at least there was some sort of provision for the residents (Day, 2010). Arguing against the DRP (PBS, 2009), a social commentator stated:

> *We have a tragic way of dealing with rehabilitation [in India]. We believe that we need to take people out from where they are, put them into multi-storey buildings, consume that land, and hope that we've succeeded. The Dharavi issue is not about relocation. It is about avarice. It is not about genuine benevolence. It's about greed.*

From the inhabitants' perspective, the developers do not understand the way Dharavi functions, so they cannot conceive projects that allow Dharavi to develop in a viable way. One of the most important arguments against the DRP is that the new buildings will not have suitable working spaces traditional workers need for their craft and that it will not be able to accommodate the various industries and businesses that exist in Dharavi. The business-owners would not be able to

work, preventing them from generating income and thus causing them to go out of business. Without income, they will not be able to afford the living costs of the new buildings, and eventually will be forced to move out and find cheaper options.

As Dharavi is Mumbai's prime land, the DRP has become a race for commercial development. Mukesh Metha, the instigator of the DRP, hopes to set the example of slum rehabilitation, developing Dharavi and making Mumbai a *world-class* city. According to the Slum Rehabilitation Authority of Mumbai the DRP will include many amenities, including playgrounds, schools, colleges, medical centers and socio-cultural centers. Among the various upgrades that were planned, the ambition of building a cricket museum and a golf course was put forth, with the justification that there is no reason that "*slum-dwellers cannot be playing golf*"
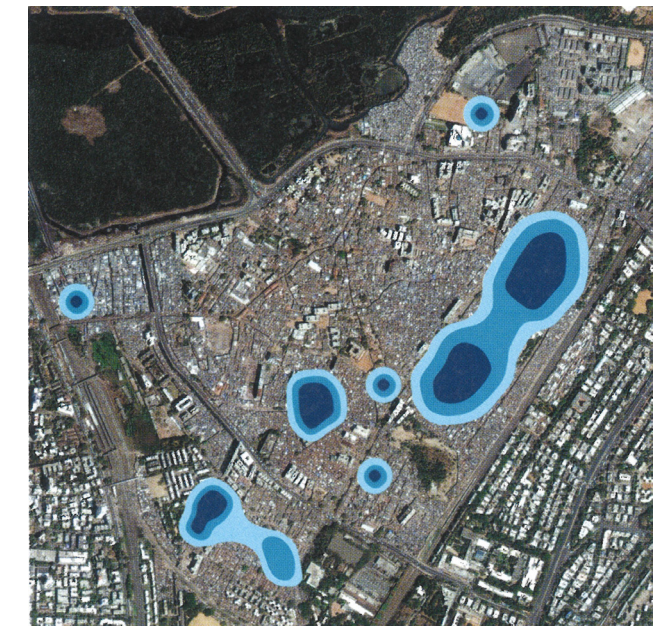

Figure 16 - Dharavi flood map

(Benoit, 2006), which seems quite incompatible with the actual needs of the inhabitants, who struggle to make ends meet. Mr. Mehta was aware that his plans would not satisfy the needs of everyone, but claimed to abide by the rules and regulations that were set by the municipality.

Larger scale complications

In addition to common problems found in informal settlements, such as the general lack of space, deplorable hygienic and sanitation conditions, there are specific problems in Dharavi. Its geographical position on the river bank is prone to floods during the monsoon season. There are also security hazards due to the way the area has been built upon. Because Dharavi is formed of heavily compacted huts distributed by extremely narrow streets, there is no emergency access or exit ways in the case of disasters (fires, floods, building collapses).

Moreover, there is a strong cultural and ethnic variety and over time, the residents of Dharavi have formed their own communities. Moving into new homes would explode such ties, and will cause families to end up on their own, alone in an unfamiliar situation. If the DRP is to be implemented, it will likely result in many people moving elsewhere, recreating their own slums again, starting the slum-dweller cycle in another location, as they will eventually not be able to afford their new life.

Boano (2016:164) points out that a major problem is that "*governments simply do not know how many people are actually living in slums. Surveys have become outdated with the increase in urbanisation and the migration of people to cities for work*". This makes it hard for any development masterplan which takes the people of Dharavi into consideration to be realistic and credible. In this respect,

some smaller organisations and associations work towards gathering information "from the frontlines", engaging directly with the residents through collaborative workshops and by acting as facilitators between the residents and the government officials. As one of these organisations, *URBZ: User-generated cities* (URBZ) explain:

> *For policy-makers, urban planners, architects and real-estate developers, accessing this knowledge is the best possible way to enhance the quality and impact of their work. Understanding a locality from the point of view of those who inhabit it improves the chances of success of a project.*

The redevelopment of Dharavi seems to generate as many problems as it aims to solve. As previously stated, to benefit from the DRP, one must be eligible. Thousands of people are not, so what will happen to them? They shall be displaced, most likely to another slum in the region, as many of Dharavi's residents actually work in Mumbai, employed in various, less desirable fields. If Dharavi and other slums were to be destroyed and rebuilt as Mr. Mehta had planned, the displacement of thousands of workers could trigger Mumbai's economic downfall. From the developers perspective, there is much to be gained in the short-term, but it is not viable for the population in the long run.

Synthesis

Dharavi's situation is complex, with numerous actors and complications at every level. Nonetheless, the problems cannot be pushed back any further. There is a great need for proper housing and better infrastructure providing water and electricity while improving hygienic conditions.

Ignoring the situation and maintaining the status-quo is not a viable possibility:

Figure 17 - Narrow streets of Dharavi

Figure 18 - Waste-filled open sewer allong Dharavi's 60 Feet Road

in ethical terms, people living in indecent conditions for the lack of better options should not be condoned. At the same time, the never-ending growth of Mumbai cannot afford to have prime, city-centre land used as a slum, where health related hazards are highly due to industries and pervasive pollution. However, the utopian equity solution — where every resident is involved, expressing their personal opinion on what should be done and acting accordingly — is not optimal either, due to the lack of resources, whether it is time, money or space. Even if such a study were made residents' interests would clash and would eventually become an administrative ordeal.

Destroying the slums and rebuilding high-rises instead is not the most humane solution either, as dwellers would be displaced without a guarantee of relocation and a sustainable source of income. By banning new constructions and/or renovating the existing one, it is obvious that there is a clear lack of will from the government's side to remedy to the situation. The developers are evidently more interested in the profit they can make by selling their new buildings. It is not sustainable in the long term. Dharavi's inhabitants understand that the redevelopment plan is important, but they will not accept it at any cost. Many of them have their business' in their homes, and if the home is displaced into a "better" new building, their businesses will most certainly not follow.

As the global crisis has put the development plan on hold, there is a limited timeframe for alternative solutions to be worked on and proposed.

Ideally, space should be decongested and infrastructures reinforced. In the short term, building the high rises would be a great spatial solution as streets would be freed, aerating the city. But this solution has its limits: after a certain height,

the streets become more crowded again. In Dharavi, space is already used more efficiently than architects and urban designers could design through a controlled process, demonstrating the urban poors' collective creative potential. From this angle, the ideal solution is to upgrade the slum in situ. Necessary resources for this are the workforce , who are the residents of the slum, and the money / construction materials. Upgrading in situ would allow the residents to retain the flexibilities and qualities of the original space. But would this solution accommodate the projected urban growth of the region? In *Urban Design Thinking*, Dovey (2016) explains:

> There are limits to the role of architecture and urban design in this context. Upgraded housing alone cannot stop overcrowding anymore than architecture can stop poverty.

The future strategy should be somewhere in between the actual development proposition and the utopian one, where the residents of Dharavi are understood and their needs taken into account. If the main problems are low income, scarce space and sanitation, what is the role of the urban designer? Boano (2016:165) suggests:

> We must move away from a certain narrow vision of architectural and urban design, characterised by the mere provision of solutions, instead seeking to adopt a more nuanced and critical becoming of what Richard Buckminster Fuller famously called the new kind of designer, a "synthesis of artist, inventor, mechanic, objective economist, and evolutionary strategist.

CONFRONTATION OF THE CASE STUDIES

In 2016, the number of people who live in slums or informal settlements is close to 1 billion (Dovey, 2016) and this research concerns only a fraction of them. Although contexts are different and the proposed strategies to tackle their development vary, their respective degrees of successes depend on similar core issues.

Private life and spaces

In the case of housing, private spaces are usually the easiest elements to improve upon, because of the scale of the private sphere and the possibility to apply the same changes on a larger scale.

For Quinta Monroy, the general construction quality of the first half of the house, mainly its infrastructure, has shown drastic improvement. The reason behind this is the proper management of the government subsidy. Moreover, the controlled design process was crucial in defining what should be built by the constructors and what could be completed by the residents themselves and maximising the use of the intended budget, generating a semi-formal housing typology.

In the case of Morocco, the quality of living spaces is improved through a more controlled design process. Housing typologies are enhanced: living quarters are better defined, leading to larger living spaces and greater privacy through a clearer separation of rooms.

In Dharavi however, redevelopment has not taken place yet at a large scale. There have been attempts to build better buildings, but administrative processes and corruption prevent them from being successful. Land tenure is still a problem and its ownership continues to be disputed, so the situation has not evolved formally.

Table 1 - Private life and spaces

	Quinta Monroy	**VSBP**	**Dharavi**
Land tenure	Bought by the residents, the price of the land is included in the government subsidy	Depends on the case	A part of Dharavi, Koliwada, is owned by the community. The rest is owned by the State.
Quality of living spaces	Appreciated	Housing conditions have generally improved with bigger living spaces, better equipments and increased privacy.	Living spaces are cramped, with sometimes up to 10 people living in a single room.
Hygienic conditions	Good	Hygienic conditions have improved	Unhygienic conditions
Government participation	7500 $ government subsidies + 1000 $ own investment per household	*Resettlement*: Government helps residents access ownership of a land parcel (64-80 m2) *Restructuration*: Government finances road networks and sanitation costs; clean water and electricity are at the cost of the residents *Relocation*: Government provides 40'000 DH per home	Opposition to self development housing. Within the DRP, eligible residents can benefit of a 225 sq. feet (= approx 21 m2).
Sastisfaction with new conditions	A general sense of satisfaction.	Depends on the case	N/A

Once the need for improvement reaches a more public level, improvements become harder to put in place, while results are not necessarily guaranteed.

Social ties and public spaces

Concerning public infrastructure and amenities, Quinta Monroy proved to be successful. Its location in the centre allowed easy access to the city, where many residents already had their jobs and daily routines. On a social level, the thoughtful U-shaped urban design, with it's strong appearance and recognisable facades, generated a strong identity of the neighbourhood and allowed families to form ties with their neighbours and create smaller communities, generating a safe environment.

In contrast, different scenarios arose for the VSBP. The analysis showed that in relocation and resettlement strategies, the inhabitants sometimes had to move significantly far from their original settlement, into generic new housing neighbourhoods, with close to little amenities, breaking social ties in the process. Some found it hard not to feel isolated and helpless, almost unsafe. The feeling of social repression is exacerbated by the unfinished road networks and lack of public transportation, as if they were denied the access to the city.

Like Quinta Monroy, Dharavi is located in the heart of the city. Although diverse, Dharavi has a strong cultural identity as well. However, decent public infrastructures are scarce, with waste management being managed by private recycling businesses of the region, running water accessible only for few hours in the day and a general lack of sanitaries. Nevertheless, for everything it lacks in public services, it makes up for with businesses and various shops and facilities. The multi-cultural dimension of Dharavi provides a platform for every need.

Table 2 - Social ties and public spaces

	Quinta Monroy	**VSBP**	**Dharavi**
Access to social amenities	Neighbourhood is close to amenities	When residents are displaced to city peripheries, amenities become scarce	Shops, street vendors and temples are abundant in Dharavi.
Neighbourhood social quality	U-shaped design favours social interaction	Neighbourhoods in or close to the city centre retain their social ties. However when they are further, social ties are broken, making it hard to recreate them	Strong sense of community is very present
Safety	Safe	N/A	Considered very safe.
Order and cleanliness	N/A	N/A	Paradox: organised and very disorganised. Not clean (trash isn't collected, pollution, dust, etc.).
Public space	Defined by the U-shaped urban design	In newly developed areas, the design of public spaces was second to the need of housing.	Many temples and shrines located in the public space are gathering points throughout the day.
Infrastructure in the neighbourhood	Included in the architectural and urban design	Included in plans	Clean running water is accessible at specific points for a couple of hours at a time.

Work environment and self sustainability

With slums and informal neighbourhoods being redeveloped and populated, residents need to be able to generate income and sustain themselves.

As Quinta Monroy was built *in situ*, on the very location where the slum used to be, residents managed to keep their jobs and kept a steady income.

In Morocco, the employment rate of main income earners of affected families, their respective income had not decreased with the VSBP. In some cases, studies suggest that residents might have had a negative impact in the long run, due to longer commutes. However, results have been inconclusive.

Dharavi is the most interesting case: streets are constantly boasting with life. Whether it is the micro-industries, the street vendors, the thousands of shops and small establishments or restaurants, there is economical activity everywhere and at every level. This is a complete paradox, as it is described everywhere as a slum, with every connotation that is associated with the term. From a self-sustainable point of view, Dharavi, of all places, has the greatest potential to evolve and be developed into the world-class neighbourhood that the instigators of the DRP wished for it to become.

Table 3 - Work environment and self-sustainability

	Quinta Monroy	**VSBP**	**Dharavi**
Work availability in the neighbourhood	Only a housing neighbourhood, work is to be found in the city	In the peripheries, it is harder for residents to find work.	Work opportunities are abundant in Dharavi, although usually through contacts
Proximity to the work place	The neighbourhood is located close to the city centre, where many residents work.	Displaced residents tend to keep their city-centre job, leading to a greater travelling distance.	Approximately 80% of the residents work in Dharavi.
Transportation and access to the city	The neighbourhood is located close to the city centre.	Public transportation in the peripheries is not well serviced. Closer to the centre, transition from one place to another is easier	In the city centre. 3 important roads distribute Dharavi: Dharavi Main Road, 60 Feet Road, 90 Feet Road.
Residents' potential to upgrade housing	Residents complete the second half of their house	Assisted auto-construction in the case of recasements.	Great potential for self-upgrades, repressed by the government.

Analysis

These case studies show that understanding the needs of the residents and taking them into account during the design process affects their future quality of life positively. Although policy makers sometimes may sometimes have the best intentions, they do not necessarily have an educated point of view about the needs of the poor, which can lead to involuntary, undesired, or opposite effects.

Often, projects have a greater outcome when the upgrade happens *in situ* and incrementally, as this allows residents to keep flexibilities and qualities of the previous space. A stable home is important in the process of emancipation of the slum-dweller cycle, as it was demonstrated in Quinta Monroy. It allows the residents to assess their needs and plan their life in the long term. Of course, when the constructions are too run-down to be upgraded or the land too unstable to build solidly on, it is easier to destroy and rebuild completely.

Designing quality spaces for slum-dwellers to develop themselves requires a technical knowledge and understanding of space, but before being an architectural or urban design problem, these studies suggest that the root of the problem is first and foremost of a political nature. As slum-dwellers live on land that often is not theirs and can sometimes be a great source of trouble (pollution, crime), governments want to keep them under control or eliminate them. However, since many slum-dwellers contribute to society by accepting low-paying jobs and can have an important impact on the economy, completely disposing of them would certainly be problematic.

Nevertheless, when the political power or land owner gives the right to build and upgrade, it can be achieved. As it was seen in Morocco, the government made an important amount of resources available and have been able to declare 55 cities slum-free (UNWM, 2016). If similar resources were made available for Dharavi, construction would begin immediately; its inhabitants are just waiting for the permission. Since it is self-made and its residents would be the primary users of the city, they would develop it in the same efficient style that has crafted Dharavi's uniqueness. But there is a clear lack of will from the government's side, banning the construction of new buildings or the renovation of existing ones, and developers are evidently more interested in the profit they can make by selling their new buildings. It is not a sustainable solution.

When considering the emancipation of slum-dwellers from their informal habitats, the project should be devised to serve on the long term. Learning from previous experiences and failures in the local context is a key aspect in understanding the needed changes in the way of conceiving the development plans and their implementation.
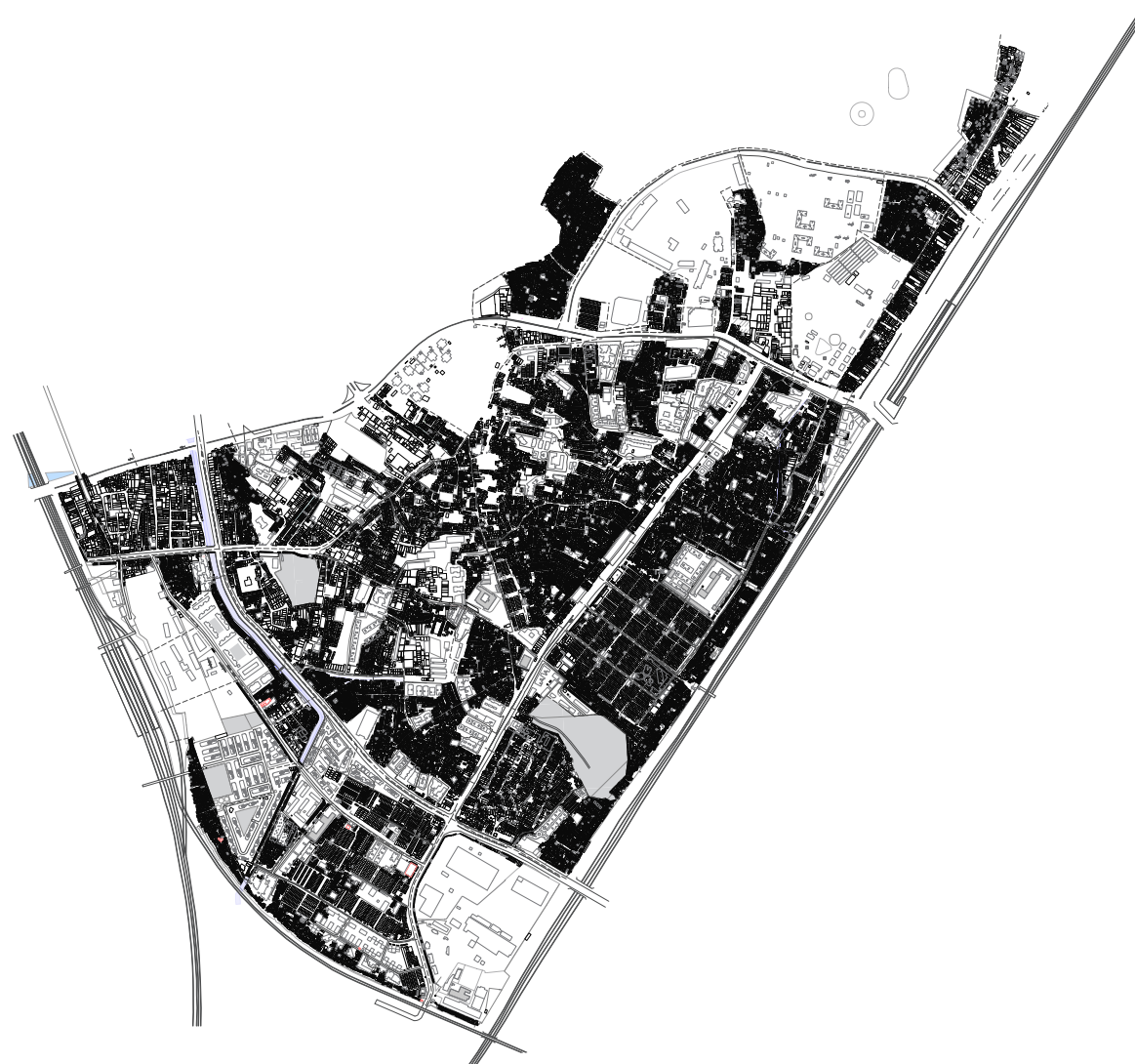
III. WORK IN DHARAVI

Industrial Dharavi

Dharavi is often described as a slum that will be destroyed in a near future, on the brink of collapsing under its precarious situation. However, its residents' ingenuity and relentless efforts to keep on moving forward, even in the light of a completely uncertain future, has gotten them from the early days of the fishing village until today.

However, the numerous tentatives to untangle the seemingly never ending stream of problems and contradictions surrounding Dharavi suggest that an efficient development solution, benefitting as much the residents as the government and the developers, is yet to be found. When the DRP was first drafted, Mr. Mehta planned to make Mumbai a 21st century city, modern and slum-free, citing Shanghai as an example. The DRP would pave the way for cities around India and world-wide. But this new image is incompatible with the actual working communities and the associated lifestyles and necessary work spaces, indispensable to the survival of the current inhabitants. Today, the DRP is slowly being shelved, succumbing to the the difficulty of the task and the ensuing retraction of investors (Phadke, 2016).

A great number of the residents work in Dharavi as well, close to 80% according to Rani Day in *R[E] Interpreting, Imagining, Developing Dharavi* (2010), notably in the micro-industrial production fields and the waste recycling business. Until now, redevelopment projects have been oriented towards new housing, office buildings, commercial and public spaces, neglecting generations of local residents, their struggles, their respective occupations and what they have incrementally built to fit their needs. Manual labor is an important part of the job-market, existing at almost every level, whether it is the manufactures of fine leather goods, production of the potters or even sorting plastic for recycling. The great number

of small-scale workshops generates a constant activity in a densely packed area, all the while allowing residents to generate income.

There are, of course, many negative aspects that are not to be downplayed such as the low living conditions and the general lack of sanitation, without mentioning the hazardous working conditions, which leads to question the importance that manual labour in Dharavi's future. In new development plans, is the main focus on housing and offices the right path to chose or can the right use of its enormous work force be the key to its future? Can it even be considered in the development process of a slum into a central neighbourhood of a world economic capital?
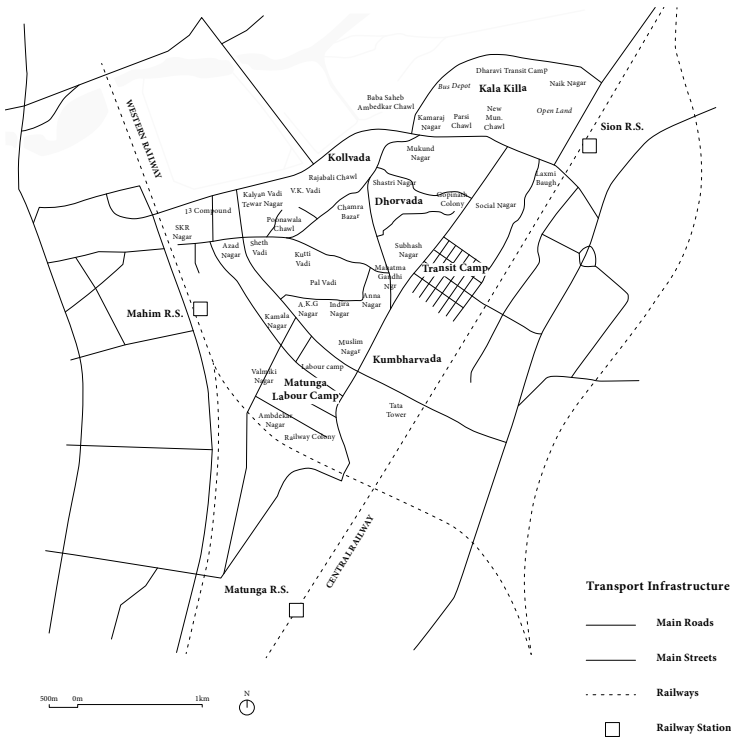

Figure 19 - Dharavi locality map

Informal Dharavi

Formation

In Mumbai, approximately 54% of the population, or 7 million people, live in slums or informal settlements (Saglio-Yatzimirsky, 2013). They are a result of the housing offer which is not adapted to the demand, their development in Mumbai is due to several factors. There are some cases where migrants come looking for labour in the citiy due to underemployment or even the lack of jobs in their origin villages. As Mumbai has been an important commercial hub since the end of 18th century, work possibilities in factories and business opportunities were, and still are, abundant, generating an important *urban pull*. In other cases, people from rural areas have been persecuted due to their castes and were eventually *pushed* away. These migrants seek emancipation of the stigma and wish to reinvent themselves. Dharavi, as a multi-cultural and multi-ethnic commercial hub, favours such life possibilities.

From the late 19th century until today, hundreds of thousands of people have migrated to Dharavi due to the rural push and urban pull dynamics. Occasionally, the government has taken measures to construct houses for city workers but at each occasion, the efforts were weakened by the the lack of political interest and insufficient funding. As the city constantly needed workers and the housing offer could not adapt fast enough, informal settlements and illegal housing were tolerated, resulting in the formation, and persistence, of slums. As Weinstein (2014:3) explains:

> *The combination of accessible yet difficult-to-develop marshy land and limited administrative oversight fueled the settlement's growth as a site of informal housing, unregulated industries, […] that drew thousands of families [from around India].*

Informal sector in Dharavi

A key feature of labour in Dharavi is the high number of informal workshops and micro-industries, where most work is not automated, but manual. According to KRVIA (Engqvist & Lantz, 2009:120), over 30% of the land is used for commercial and/or industrial purposes, often overlapping with residential spaces. Many of them are of a smaller scale, with approximately 10 to 15 workers, employed by the owner of the workshop. The size of the workshops, usually only a single room equipped with the most basic elements and simple tools, are characteristic. Firstly, space is a luxury, there is not room for expansion. Residents have to manage with whatever is available. Secondly, workspaces are small, which limits the number of people they can hold, a feature workshop owners want to keep. While bigger factories need to declare themselves to the authorities, smaller ones do not have the same obligations, which leads to an absence of working regulations. As the workshops are not formally controlled, employers are free to devise their own conditions, and often exploit the possibilities to the maximum to increase their flexibility (low salaries, long work shifts, specific demands). The more flexible they are, the more prone they are to get contacted by bigger companies of the formal sector looking to subcontract their products, another key feature of Dharavi. To enhance the workshops' offer and adapt it to potential clients, seasonal workers are often employed, with a monthly salary. Workers in these small factories do not have any insurance or security in case of accidents. All of these aspects lead to lower priced products, fit for competition.

It is important to note that in Dharavi, informality is not necessarily synonym of illegal, rather it just means that the workshops are not officially declared to the authorities. As Saglio-Yatzimirsky (2013) explains, it is not a parallel circuit to the formal sector either. In Dharavi, both are closely entwined and co-dependant.

Figure 20 - Small factory in Koliwada, Dharavi

Horizontal vs Vertical

Dharavi is notable for its high population density, but also the fact that it has developed horizontally instead of vertically. Various factors have affected the formation of these low-rise neighbourhoods. Most importantly, it is the lack of resources available for residents to build higher and more resistant buildings. As there are only a few government funded buildings (chawls and SRA buildings, among others), the rest of the constructions are usually auto-financed by residents, who have limited sources of income. Higher buildings, specially in Dharavi where land does not always meet constructible standards, require bigger and stronger foundations, leading to higher building costs. Additionally, as mentioned in the second chapter of this study, the buildings can be destroyed at any time, so residents favour quicker and cheaper constructions.

From a business and production perspective, horizontal development is almost crucial at Dharavi's micro-industrial scale of work. Contact with the street is necessary for business to take place. As there are more showrooms and workshops which manufacture goods than office spaces, it is in the business owners best interest to be easily visible and accessible from the streets so that potential buyers can see and feel the goods to assess their quality. Among the same lines, many buildings in Dharavi double up as small scale factories as well, so there is an important influx of raw materials and or semi-finished goods that will be worked on or be completed. The storage spaces must be easy enough to access, as much from the street for deliveries as from the workspace itself. If they are above the ground floor, they cannot be too high. The elevator of course would be an ideal option, but such an installation requires strong foundations, a significant amount of space and the financial capacity to invest in and maintain it, but in Dharavi's setting, it is not imaginable.

Standardisation in the informal sector

To adapt to the growing international competition, standardisation in the production line of goods is more and more frequent in the small factories of Dharavi. The standardisation of products leads to a compartmentalisation of work and it's deskilling (Saglio-Yatzimirsky, 2013) as a result of the division of labour. Large scale production does not need the technical and thoughtful craftsmanship present in smaller workshops. In opposition, division of labour allows an increased productivity due to the repetitiveness of the work and the important volumes. As the divided work requires less skill, traditional techniques are forgotten because they are not passed down to the next generation in favour of on-the-spot training for specific tasks. This allows the workforce to adapt easily to different types of orders. In consequence, this option is favoured. As tasks are small and specific, the necessary workspaces and tools are limited to the minimum, allowing workshops to keep their small sizes.

As standardised work is becoming more widespread, skilled artisans could make less money than less experienced workers. In fact, by accumulating small street-side jobs, one can earn enough to live with a certain comfort in Dharavi. Saglio-Yatzimirsky (2013:210) gives an example of a 14 year old boy who makes a living by "*gluing plastic soles, patching and reparing and selling laces*", instead of working in a manufacturing workshop. The small jobs allow him to earn more money than his father, who is an experienced artisan.

Social mobility

Through Dharavi and its growth, some low-caste residents have been able to climb the social ladder. While it is only a minority of them, this highlights yet another feature of Dharavi, where it is perceived as an indian El Dorado, where anyone

Figure 21 - Horizontal expansion of Dharavi

can make their fortune regardless of their past. A few decades ago, it would not have been possible due to the traditional mentality (Saglio-Yatzimirsky, 2013).

Some more established families, with members having found stable employment in the formal sector, maintain their links with the informal sector as an extra source of income. However, it is the profits from sales which are their main motivation, not the work itself: usually they keep their trade because they know the channels. It sometimes serves as a back-up activity, a side-work, as they call it. For people who wish to start their own business, two conditions have to be met: good knowledge of production and sales network and a capacity of initial investment for the business. Often, it is families who have settled in Dharavi a long time ago who have managed this.

Of course, the emancipation does not happen suddenly. Saglio-Yatzimirsky (2013) outlines a three generation process. The first generation are original migrants who arrive in Dharavi, who work in the trade. The second one manages to quit the field through education or other opportunities. In their new environments, they have been stigmatised due to their low caste origins, increasing their desire, almost need, to severe there ties with their origins. The third generation usually improve upon and polish the second generations' assets. But if and when there is a commercial opportunity, they will return to the original trade. However, favourable circumstances do not always appear, sometimes leading to a complete withdrawal from the trade[1].

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1   Saglio-Yatzimirsky has collected a significant number of testimonies during her extensive research in Dharavi. They appear throughout *Dharavi: From Mega-Slum to Urban Paradigm* (2013)
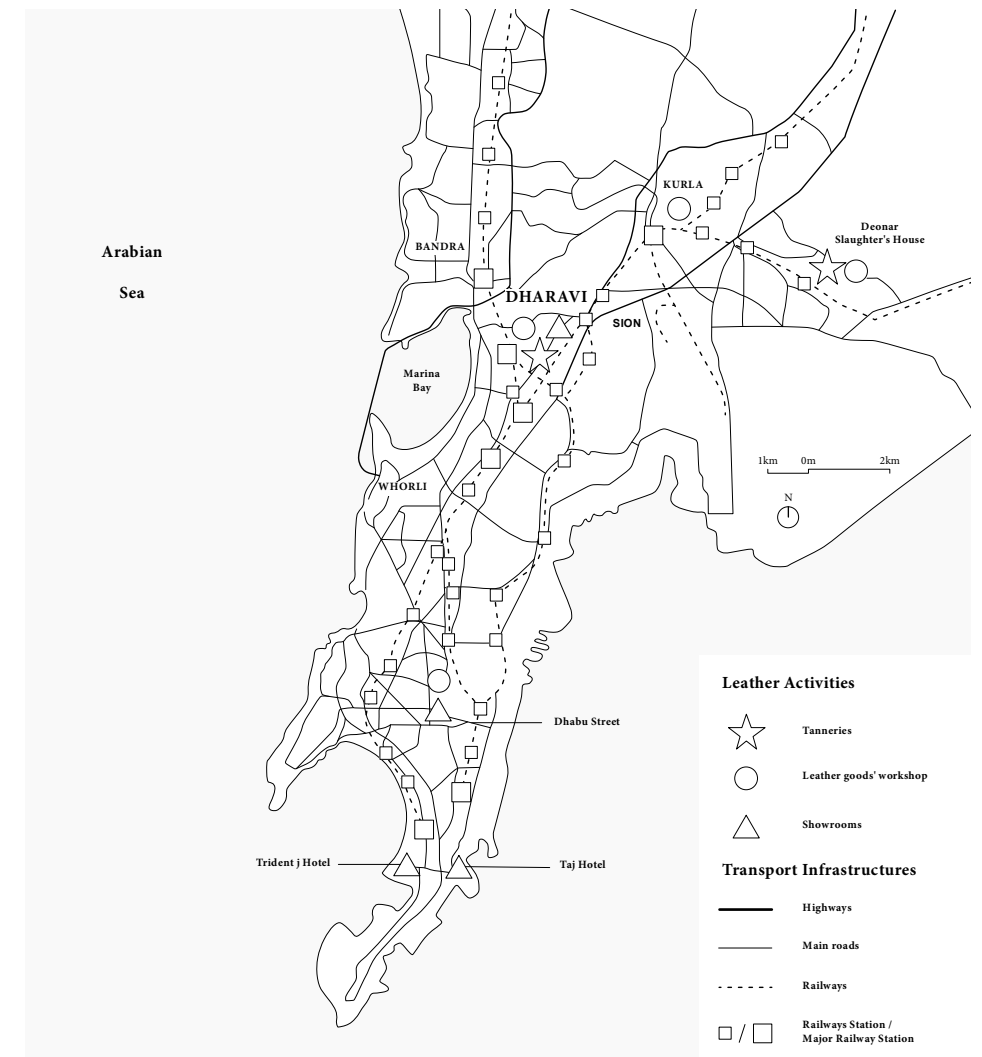
Leather Work

Figure 22 - Mumbai Island

Leather Activities

☆ Tanneries

◯ Leather goods' workshop

△ Showrooms

Transport Infrastructures

▬ Highways

— Main roads

---- Railways

□ / ▢ Railways Station / Major Railway Station

History in Dharavi

As it has been stated previously, Dharavi's development is closely linked with the rise of the leather industry. In the early days, one could find an abundance of tanneries in the region. The area around the fishing village that Dharavi used to be became populated by them since the late 19th century, when they were deemed too dirty and polluting for the city where upper class citizens lived.

Leather work has been essential in Dharavi's growth. The centrally located slaughterhouse in Bandra, displaced to Deonar in 1971, invited tanners from around Mumbai, later from Maharashtra and the rest of India, to install their factories in the area. However, due the negative environmental impacts that tanneries had on the local environment by releasing chemicals into the Mahim river (Engqvist & Lantz, 2009) and the government's desire to make Mumbai a world class city by favouring, among many other elements, the manufacture of goods with added value, polluting and hazardous activities became more and more regulated, culminating in their ban in 1993. Little by little tanneries were forced to relocate or, in most cases due to the lack of financial means to do so, shut down. By 2010, tanning activities had almost entirely ceased, with only the smallest units carrying out only a few specific steps of the process. The remaining steps to transform the raw hides into the finished product are executed in other cities, such as Chennai or Kolkata. It is common for the raw hides acquired from the Deonar slaughterhouse to be washed and salted in Dharavi, exported to Chennai for treatment, and be brought back to Dharavi in a finished or semi-finished state for colouring and transforming into leather goods.

Today, the industry is dominated by finished or semi-finished fine leather goods manufactures. The increasing need for flexibility has influenced the market and

Figure 23 - Standardized leather work in Dharavi

pushed workshops to rely more on sub-contracting. As sub-contracting became a standard practice, more and more small workshops emerged, resulting in the great number of single room leather goods producing industries throughout Dharavi. The workers do not deny that competition is getting tougher.

The industry

The leather industry is one of the first to have established itself in Dharavi. The first tanneries go back as early as 1887. Because leather work is to be in contact with "*sullied matter: blood, carcasses and hides of dead animals*" (Saglio-Yatzimirsky, 2013:131), which is considered impure and polluting, the workers of the industry are in general low-caste Hindus or Muslims. As the leather production

process advances from organic matter to an inorganic material, so does the status of the worker. The closer the worker is to the dead animal, the more impure he is, and the lower is his caste: skinners are at the lowest social level, followed by knackers, after which are tanners and curriers and finally manufacturers.

Most of the leather in workshops is imported from Chennai, Kolkata or Agra since there are almost no tanneries left in Dharavi. It is brought into shops which wholesale it to smaller workshops, who will turn the material into products. A majority of leather factories are part of the informal sector. If they were to register themselves, they would gain financial support from the government for future investments and benefit of a social recognition. However, they would also be subject social welfare laws and working regulations, which would affect the businesses' flexibility - necessary for sub-contracting - negatively.

Figure 24 - Chennai, Kolkata, Agra & Mumbai

1000 km

Figure 25 - A worker in a single room factory, Dharavi

Workshops

Shop owners precisely rely on the sectors informality and, in many cases, wish to remain in it, so there is a tendency to keep workshops at a small scale. Large scale workshops do not exist in Dharavi (Saglio-Yatzimirsky, 2013). If needed, workshop heads will divide bigger units into smaller ones, with an average of three to ten workers per workshop. This way, they can elude regulations and retain their flexibility.

In her extensive study of Dharavi, Saglio-Yatzimirsky (2013:175) distinguishes two main categories of workshops: the family unit and the extra-familial workshop. Both can stem from the other. She describes the family unit as follows:

Figure 26 - A single room factory and its workers, Dharavi

     The huts are generally divided into a first room where the family lives and works, and the kitchen - the household's private and sacred place […]. The work space is sometimes developed as an autonomous area on the first floor or mezzanine, when the house is big enough. The reverse is also true, with the family working on the ground floor, with a direct connection to the outside world, and sleeping upstairs. Living on the ground floor, well-suited to residential life, is an asset for the productive rationale. In most small tenements, the multiplicity and flexibility of space and usage is unique. Inside activities are also extended into open spaces outside the main structure, in the small open areas lying between houses or the courtyard, which can be used as a space for negotiations and small-scale business, or for storing certain material (hides, tools, etc.).

While practicing their craft, workers tend to keep inside, when there is enough

room. This is due to the practicality of having an easy access to every material and tool they need. In addition, working outside is perceived as sign of lower hierarchical status. During the year, working conditions, although harsh, are bearable. However, summer months prove to be difficult.

In the case of extra-familial workshops that grew from single family units, it is common for the working space and the home and living space to overlap with each other. However, most extra-family workshops are separate and located in rented spaces, leading to more working space. As far as fine leather goods production goes, besides their size, there is not much difference in the works spaces themselves.

This showcases how workshops are as much social interaction spaces as they are workspaces meant for economic activities, and are an important part of the production chain of Dharavi's economic network.

Distribution
Direct orders from Mumbai boutiques
The majority of leather goods produced in Dharavi are intended for the local market, manufactured on order of for small traders, shops and boutiques in Mumbai. Each shop has its own network based on the desired product and the skill of the artisan. Whether they are luxury boutiques, strategically located in the shopping arcades of big hotels, who sell the goods to wealthy clients and international tourists, or shops on Dhabu Street or in Colaba, many orders are placed directly to the artisans, who have their workshops in Dharavi. Each shop has its own network based on the desired product and skill of the artisan.

Showrooms in Dharavi

Originally, showrooms were large workshops which received excessive orders from traders, but who still managed to produced them by sub-contracting the orders to other manufacturers. The owners who sensed business opportunities would start producing their own line of goods, "*often crude copies with western brands affixed on the item*" (Saglio-Yatzimirsky, 2013:199) and sell them independently from their orders. Showrooms provide direct retail sale possibilities to the shop owner. Many of them work for direct export.

Sub-contracting

It is common that goods are manufactured for bigger companies of the formal sector, who sub-contract their orders to smaller factories of Dharavi. There usually two distinct periods with different work. During the high season, the sub-contracted workshop acts as extra labour force to be able to satisfy the high demand. At other times, the larger companies sub-contract specific tasks, requiring specific manual skills, that do not correspond to their industrial logic.

Sub-contracting happens through two channels, the dallals and directly through the artisan himself. Dallals are the middle-men. Their work happens in the hide market and in the fine leather goods market. Saglio-Yatzimirsky (2013:201) explains the process:

> *In the hide market, they buy squared-off pieces of hide and supply them along with the raw materials to the few tanners still remaining in Dharavi. [...] In the fine leather goods market, [they] work for exporters or traders, often for two or three at a time, and pass on orders to the artisans.*

Small artisans rarely access the direct market, but when they do, two ways of pro-

ceeding arise. The first one consists of selling their goods on the pavements, on side-roads. In these cases, the sold products are usually of lower quality. Furthermore, artisans rarely have the time to act as manufacturers and sales responsible, so this method is not favoured. The second system is canvassing boutiques, where retailers are the clients. However, since the artisans products have not been specifically ordered, the client does not have a need for them. This is used as a leverage to negotiate lower prices, which sometimes go as low as the price of the raw material itself, which is not viable for the artisan. From the retailer's perspective this is not a durable option either, as they cannot depend on an irregular supply.

Pottery
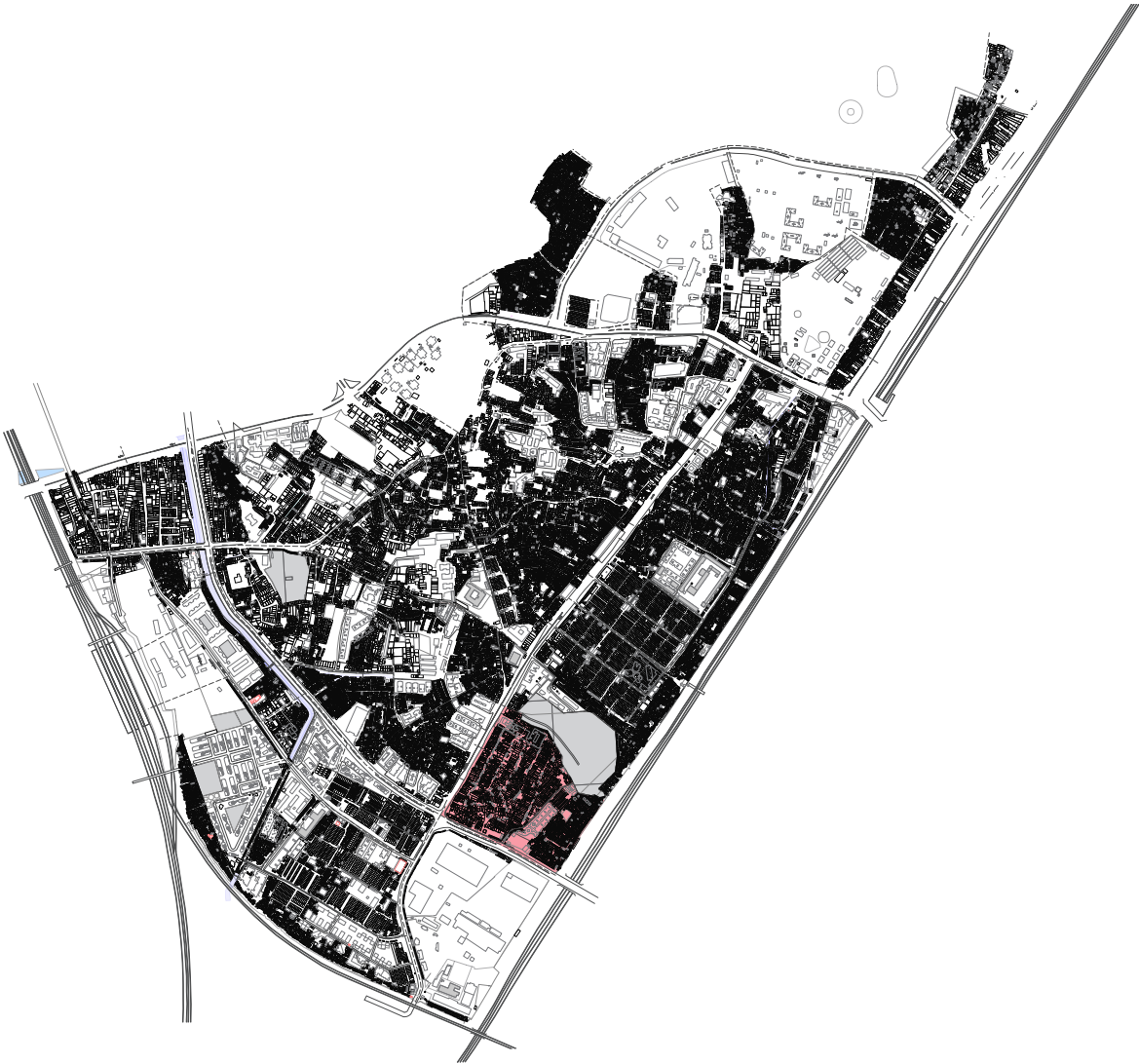
"To many, the Kumbhar potters are the heart and soul of Dharavi. Their special status derives not only from their decades-long residence but also from the integrity of their work.

Mark Jacobson (Jacobson, 2007)

"The potteries have a special place in this community, their businesses are as old as Dharavi itself. The clay comes from pits in the area. The houses here have an interesting design, they are long and have two entrances: one goes to the yard where production takes place and the other entrance faces the street where the goods are displayed and sold.

Not only has the pottery its own history, so have the houses and the outdoor spaces in the area. Every family has a house with two functions: a workshop and a home. In one end the craft, in the other the family. In the part where the pottery is created, there is a common yard where the goods can be finished and fired together with the neighbours' pots, cups, bowls, plates, and urns."

Stina Ekman (Engqvist, 2009)

Kumbharwada - origins and organisation

Dharavi's potters live in one of the oldest and biggest potter settlements in Mumbai. It is known as *Kumbharwada*. The term is a contraction of two terms: *Kumbhar*, which means "potter", and *wada* which means "colony" (Chandan, 2013). Most potters, or kumbhars, originate from the state of Gujarat, who migrated to Dharavi due to their homeland being affected by poverty and drought. In 1895, the community was granted a 99-year land-lease in southern Dharavi by the colonial government, acknowledging their presence and their occupancy. Although they are an important community in Dharavi, they retain strong links and cultural ties with their respective home-villages. Some go back on a regular basis, others wish to return permanently.

Kumbharwada residents form a strong, united community, who have passed their techniques and craftmanship from one generation to the next. They spread on an approximate 12 acres of land. It is divided into four main sectors, wadis, where different types of pots are made. In first, they make planter pots, in second they make *dias* and *garbas*[1] , in third wadi they make *firni*[2] pots and in the fourth, they make water pots, through tapping. In each wadi, there are approximately 20 kilns, which are shared by neighbours during the baking process. Often businesses are family based, where each member has a part to play. In contrast to other parts of Dharavi, housing is more spacious, averaging between 90 and 230 square meters.

Production process

Pottery in Dharavi has been described as a poetic meeting of the elements (Osrin, 2014). Kumbhars use traditional methods, local red and grey clay, bake moulds

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1   Small, single use vessels.

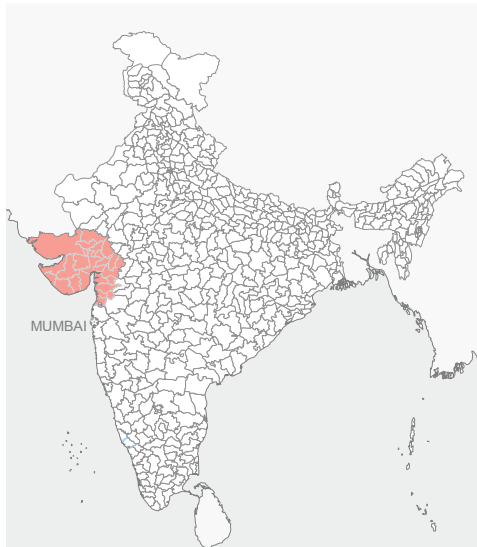2   A traditional sweet, it is similar to rice-pudding.

Figure 27 - Gujarat situation map

1000 km

in traditionnal shared kilns. They produce pots with simple designs, varying in size and shape. During the Diwali season, they make enough lamps "*to light up the entire city of Mumbai*" (Chandan, 2013). From the raw matter to the finished product, various elements have to be taken into account.

The clay

The clay comes from Thane, Kalyan or Bhiwandi, located in the north of Mumbai. It arrives in bulk quantities to local suppliers who distribute it the different homes. To be able to work with it, the clay needs to be humid. To achieve a uniform humidity level throughout the clay it is spread on the ground, water is added to it and it is kneaded thoroughly by barefooted workers. After the kneading, the next step is wedging. This is done by hands to remove trapped air and make the clay compact. Once it has been kneaded and wedged, the clay is thrown on

the wheel, ready to be shaped.

Shaping

The shaping takes place on the shaping wheel, which rotates on a simple wooden bearing. The wheel can be made of stone or wood. Traditionally, momentum is given to it by pushing it with a wooden stick. However, in more recent years, electric wheels have emerged, which eases and accelerates the process. For bigger pots, moulds are used to make different parts which will be joined before the baking. Other types of pots need to be dried until the humidity level of the clay is low and will be shaped by tapping them.

Most kumbhars know how to make a variety of different types of pots, but will prefer to make those that sell and can provide sufficient income. A potter explains (PARI, 2015) that the ones he produces are seasonal and linked to the various festivities around the year.

Baking

Traditionally, baking is done in the kilns. They are big installations made out of bricks and generate their own space. Inside them, a first layer of combustible, such as sawdust, used cotton, sheets of cardboard or waste, is placed under a a layer of tiles. When the combustible will burn, it will heat the tiles, which will provide an even and uniform heat throughout the kiln.

Once the kiln is hot enough, kumbhars will place their pots in it for baking. Smaller pots need more heat, so they will be placed first. Bigger pots will be simply placed on top of them. If the bigger pots are placed too close to the heat, there is a higher risk of breaking. Once pots are safely in the kiln, the heat is slow-

Figure 28 - Kneading the clay

Figure 29 - Shaping pots on the wheel

ly increased to different temperature levels. Once the walls of the kiln turn red, thepots are taken out. Kumbhars do not measure the temperature, they know the different steps by experience, and they will know when the pots are done. However, there is always a breakage percentage (PARI, 2015). He estimates it at 30%.

Kilns need high maintenance, whether it is for their aluminium cover, the raw combustible which is not always at hand or the wages of the workers who manage the heat and keep the furnace burning. This has lead to younger members of the community to explore more modern possibilities, such as gas ovens. They produce less smoke, and so less pollution, and there is a possibility to set and precisely control the temperature, which significantly lowers the breakage rate. They are expensive to build, but there are close to no maintenance costs. However, as they are significantly smaller than the community kilns, they are more suited for a personal production and might not be used by the rest of the community.

*Figure 30 - A street in Kumbharada, with its shared spaces and kilns*

Kumbhars in the 21st century

In the light of the DRP, which would offer a free 21 square meter apartment to eligible residents of Dharavi, kumbhars are strong opponents of the scheme. Although most could be eligible due to their longevity and family history in the area, they would lose much more than what they would gain. Indeed, they live in bigger homes than what they are offered. But most importantly, the new buildings would not be able to accommodate their work and necessary tools and spaces.

But in recent years, industrialisation has grown and labour has become more expensive. The cost of maintaining traditional crafts is becoming harder to bear. Competing with the *Made in China* label is increasingly hard, leading to many members of the youngest generations to quit the trade (Khan, 2016), banking on education or other, more lucrative, forms of business.

Residents of Kumbharwada have also expressed their doubts on the place their trade holds in the future because the land from which the clay is imported will be sold to promoters (Hushing, 2008). This would force them to import clay from further, or, if they cannot find a new source of income close to their home, to relocate.

Plastic Recycling
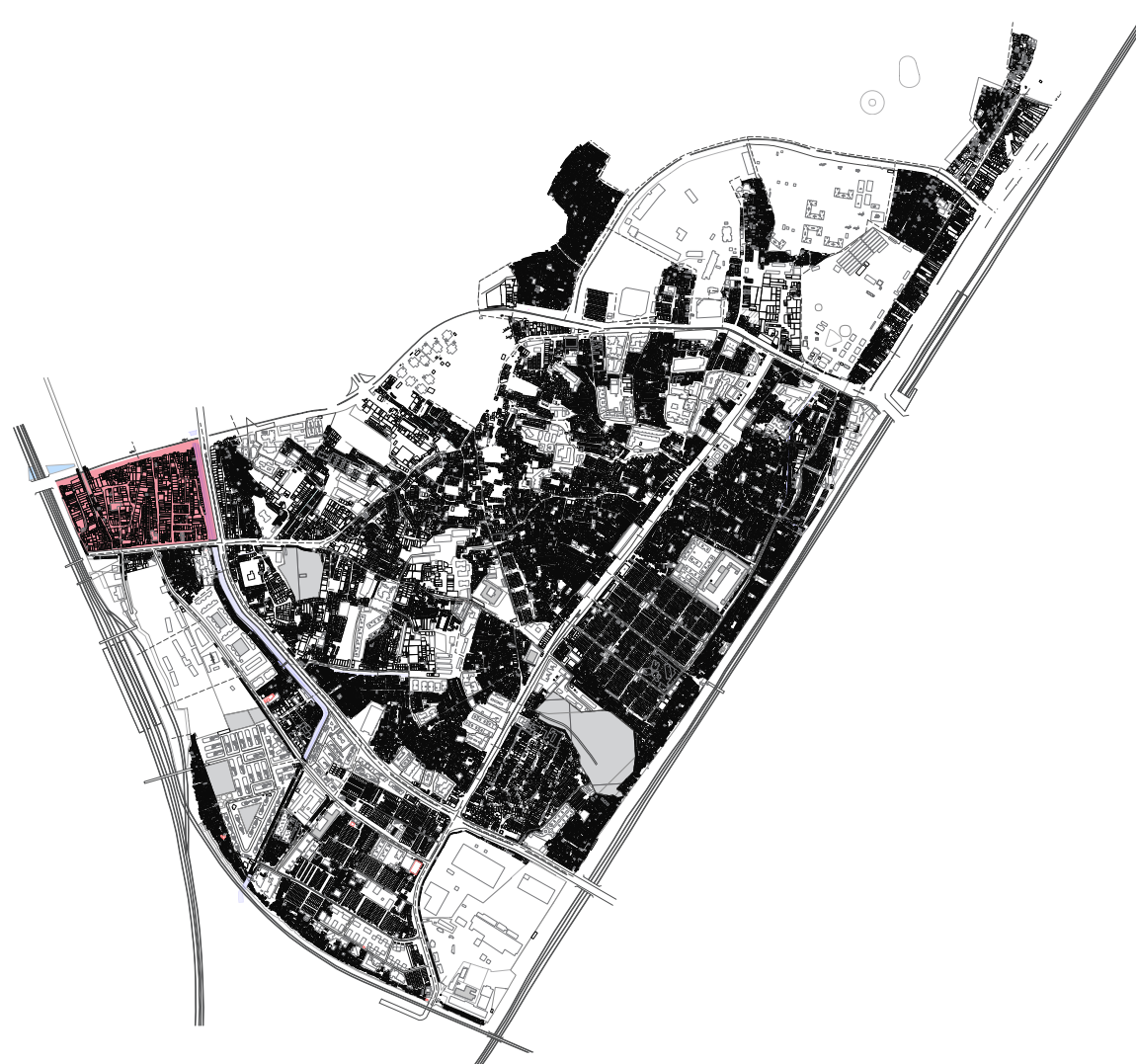
Recycling in Dharavi

Recycling is not a new activity *per se*, but compared with leather work and pottery, it has known a strong development as an industry in recent years. As material technology advances and industries produce more products with a faster obsolescence rate, Dharavi has become one of the most important recycling hubs of India, employing over 5000 people (Day, 2010). As a young industry, many migrants looking for a new life have found a possibility to work in this field. However, it is not by interest of the work, but by lack of other options.

Approximately 11 tons of waste of waste are generated each day in Mumbai only, and a vast majority finds its way to Dharavi's 13th Compound where local waste-pickers manage to sort through 8.5 tons of it (MMRDA) for further processing. It is estimated that roughly 20% of Dharavi's residents work at different

Figure 31 - Dharavi's 13th Compound

levels in this field. Recycling units "*have an informal supply and delivery chain with local rag-pickers at one end and large industrial units at the other*" (Pandey & Sharma, 2014:11). Most of the work is done by hand. Although anything and everything will be recycled in Dharavi, plastic, in its various forms, is the most common material to be recycled.

In their research, Pandey and Sharma (2014) found that most workers, essentially 20 to 30 year old men, originated from Uttar Pradesh and Bihar. They migrated alone from their native places, leaving their respective families behind. After working 8 to 9 months in Dharavi to collect some money, they go back home, until they come back 3 to 4 months later.

As it is the case for leather work, most of the industrial units in Dharavi are unregistered, to avoid working laws and regulations. This way, they avoid paying income taxes too. However, they will not benefit from eventual government funding schemes.

Workflow
The informal supply and delivery chain which was mentioned above can be broken down to separate steps, according to the area in which the work takes place and their respective actors.

Street work - the waste pickers
They are at the bottom of the social ladder, working and living conditions are harsh. These workers are employed by the scrap dealers, or *kabadi walas*, to do rounds on specific local streets and roads. Some waste pickers go to all the way to municipal dumps.

At this scale, it is not only plastic which is collected, but anything which has a potential recycling value. This includes paper, cardboard and iron. In *Slumming It*, McCloud (2011) shows how the waste pickers work: they carry a stick to sort through heaps of mixed waste, and a hamper which is gradually filled with what they find. Once the hamper is filled, they bring it back to their respective shop to empty it. After that, they start a new round. This cycle continues until late at night, only to be repeated the following day. It is a dangerous job where waste pickers compete against each other and where injuries from broken glass and metal shards are common.

Storage and delivery - kabadi walas and specific dealers
A kabadi wala is the owner of the scrap shop, who usually employs an average of 8 to 10 waste pickers (Bhide, 2013). When the waste pickers come to empty their hampers, a preliminary sorting is done. As it is not a traditional craft or trade, this business comprises a variety of different backgrounds.

For *kabadi walas* to be successful, volume is proportional to their income. When they start their business, it is common that the shop owners live in it too. Although it is in a solid construction, it usually starts out as a single room, grows by adding a storey and improves with time.

Middle men of the business forward the different types of waste to larger dealers who are more specialised. The larger dealers, who operate not only in Dharavi, but all over Mumbai as well, deliver the grossly sorted waste to the 13th Compound, where it will be treated and transformed into reusable material.

Figure 32 - Waste being delivered to the 13th Compound

Industrial recycling

In Dharavi, there are approximately 1200 recycling industries, out of which close to 800 are dealing with plastic. Nearly 70% of the units are not registered by the government (Pandey & Sharma, 2014).

When the waste arrives to the 13th Compound through the larger scale network, it is delivered in big bags or containers. A first sorting is done to separate what can simply be cleaned and reused and what needs continue the recycling path further. Often, containers and plastic boxes can be salvaged and be provided a new life as a second hand product.

After the first sorting, a different, more precise sorting is done by type, grade, colour. Next, the plastic is shredded into small pieces and washed. The small flakes are then dried on the roof tops. Once they are dry, they are either melted and

Figure 33 - Plastic delivered in big bags, ready to be processed

Figure 34 - Shredded plastic being washed

Figure 35 - Plastic pellets that we will be exported for further processing

transformed into pellets or they are packed. In both cases, the product is exported as raw material from Dharavi for further processing, with some networks going as far as China (Engqvist & Lantz, 2009).

In the 13th Compound, most of the different processes are done in single room factories, specialising in one or more steps. The biggest investments for entrepreneurs of the plastic recycling industry is the acquisition or construction of the building in which the work will take place, as well as the plastic crushing machine, which can be as high as Rs 100'000 (Pandey & Sharma, 2014).

Impacts

The recycling industry of Dharavi has many impacts, whether it is on the city of Mumbai or the residents themselves. At the moment, waste is collected and redirected towards Dharavi and the 13th Compound where it accumulates and is treated. It is an advantage for the city of Mumbai. If waste was not recycled the way it is, it would end up in landfills, in the rivers or on the roads and railway tracks, while generating even more pollution than there already is. There would be a higher risk of creating even more health hazards too.

In the 13th Compound, the situation is less enviable. Besides being in the vicinity of important and almost constant noise pollution created by the plastic shredding machines, workers are not safe from various other dangers. Indeed the recycling of plastic encompasses its sorting, washing, crushing and pelleting. When it is delivered to Dharavi, traces of harmful or hazardous chemicals can be found. These chemicals will dissolve in the water that is used to wash the plastic, which is not disposed of safely due to the absence of appropriate treatment plants. In addition, the plastic will be handled by the workers, without any protection, these

chemicals will come directly into contact with them and can lead to health issues.

Recycling plastic in Dharavi is cheap and efficient. Yet, from a technical and environmental point of view, there is plenty of room for improvement. But at the same time, this system allows the employment of many workers at every level. If the system were to evolve, there is a strong possibility that many people would not find another job.

IV. CONCLUSION

Housing

The strategy of Quinta Monroy was successful, because it was at a small scale and situated in a prime location. But most importantly, the project was supported by the government, which was willing to help them in their emancipation. Before the development, although residents did not have decent housing, they still had jobs in the city allowing them to subsist. Once they acquired a home, it brought them a stability on which they could rebuild themselves.

With the *Villes Sans Bidonvilles Programme*, results vary from case to case. From a housing perspective, it is quite successful. Home spaces are improved and living standards have increased. On a larger scale however, in cases of relocations and resettlements where important displacements towards the peripheries occur, improvements are still needed. In addition to urban comforts such as parks and other social amenities, the necessity for a better access to the city has to be taken into account. In newly built areas it is difficult to find new jobs, so income earners will tend to keep their previous ones. This can lead to feeling disconnected because of greater transition distances. Unfinished road networks need to be completed and proper public transportation systems need to be implemented.

So far, rehousing strategies in Dharavi have not been successful because its place as a micro-industrial production hub, its essence, has not been taken into account. Each failed attempt has increased residents' distrust of government propositions. The feeling is strengthened by the indefinite suspension of the DRP, causing inhabitants to rely, even with an uncertain future, on their traditions and independently continue their incremental, almost vernacular, growth.

Working

From the outside, Dharavi is perceived as a slum on the brink of being destroyed. But its residents have a different story to tell: many constructions are solid and the strong employment capacity generates a constant activity. It has been shown that the work and production system is largely based on the important informal networks that have developed with time, and traditions. Long-established techniques are still passed on from one generation to the next and specific organisation of work is often caste-related. However, in today's world, it is precisely this tradition which is being questioned, as workshops struggle to meet the quality level of global standards and demands. The fact that most factories are non-automated, and favour manual labour and artisanal methods contribute to this struggle, due to the limitations they induce in large scale production. International competition, specially China, is greater than ever and more difficult to withstand, even if the workshops have a high degree of flexibility.

Space in Mumbai and Dharavi is becoming rarer by the hour. When redevelopment will eventually take place, there will not be enough space to host each industry. Technology is advancing as well, making traditional techniques obsolete. Some industries will be eradicated, while others will emerge. Plastic recycling is growing, so is the recycling of electronic waste. Due to the growing pace of technological evolution, can traditional values and craftsmanship be considered, if not only imagined, in the future development of Dharavi?

Towards a project

In conclusion, this study showcased the intricacies of the housing and economic ecosystem in slums. As the pressures of real estate and living quality increase, slums are bound to evolve. The case-studies constitute a non-exhaustive bank of examples concerning the various directions that can be taken according to the involvement of the government and the importance given to the needs of the inhabitants. The study of Dharavi has allowed to extract the main issues of the current situation while demonstrating the versatility and the strong adaptability of its residents. Finally this study prepares the ground for a future development project focussing on Dharavi as place that will accommodate the future high-end products manufactures and enhance a forward economic transition.

Indeed the transition of the city of Mumbai towards small, non-polluting industries that manufacture high-end products will push the activities of the 13th Compound further away from the centre, thus freeing land for other uses. The issue is to propose a project where the inhabitants could adapt to the new economic situation on the land they have occupied for generations.

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