

# REHABILITATING CHINA'S CRUMBLING HIGH-RISES



RESEARCH REPORT || ANNE VAN STIJN || DELFT 2016

Research report  
As part of the ExploreLab (MSc) Graduation Studio

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# **LITERATURE**





SMILEACE  
KEEP ONOR





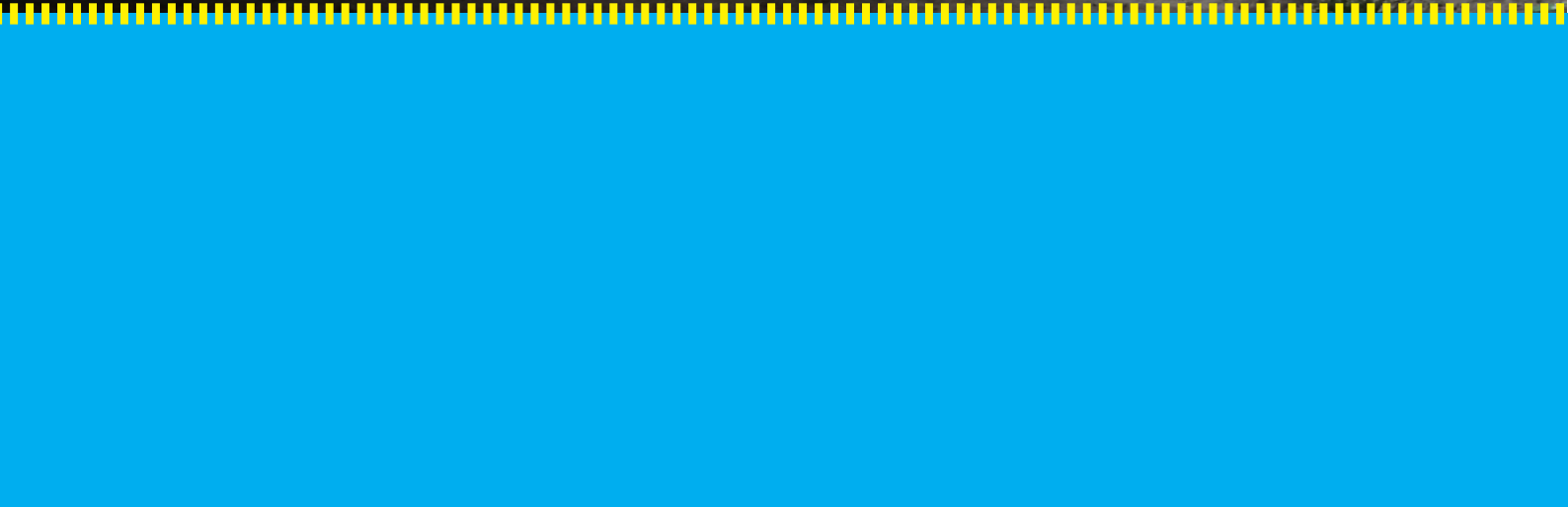
INTRODUCTION

# I T R A P





0.0







**ABSTRACT**



## 0.0 REHABILITATING THE EARLY HIGH-RISE HOUSING OF BEIJING Abstract

*The first high-rise housing in Beijing appeared in the 1970's, at that time regarded as a beacon of modernity. Since the 1980's, due to land regulations and the growing urban population, the high-rise became the mainstream typology of mass housing. The first generation high-rises, found in the heart of Beijing, is now visibly approaching the end of its intended lifespan.*

*The high-rises are deteriorating rapidly due to initial development policies: they were built with low quality standards, poor quality materials, and low budgets. Additionally the severe deterioration is a legacy of the lack of governmental maintenance during the public housing period and little maintenance after the transition to the planned market housing system. Furthermore this transition, resulting in new and diversified high-rise housing estates, has accelerated a process of socio-spatial segregation in the housing stock. This process and the continuing physical deterioration have initiated a negative spiral in the early generations of high-rises.*

*Physical intervention, in the form of rehabilitation, to prevent further deterioration of the high-rise housing, is necessary in the coming decade(s). To find a workable rehabilitation strategy, the research part of this thesis aims to answer the research question: "Can a hands-on, integral strategy be developed to deal with the rehabilitation of the early high-rise housing of Beijing?" To develop the strategy an extensive historical, typological SWOT analysis of the early high-rises typology and status quo was made. Together with the analysis of their stakeholder's, needs, interests and possibilities in the rehabilitation process prerequisites for the strategy were defined. By investigating case studies suitable strategic tools could be identified. From the determined prerequisites, and researched tools a rehabilitation strategy could be developed.*

*The rehabilitation policy consists of three phases. Based on the cycles of the value oriented neighbourhood theory, these phases guide an upward socio-economic cycle. They help bridge from alleviating problems with down to earth interventions within the current reality, to solving them with optimal propositions within an ideal (socio-economic) context. The strategy consists of the partial bottom-up rehabilitation on the scale of the dwelling by residents combined with a top-down approach on the scale of the building and the da-yuan. Residents are offered a catalogue with different home improvement products, which are easy, cheap and demountable infill systems. To be able to catalyse the bottom-up rehabilitation, the top-down rehabilitation needs to commence. Investments in the rehabilitation come from the public parties, and private market parties. To entice them to invest in the rehabilitation a merger of interest needs to be reached between the stakeholders, in which profitable business cases and two-birds-one stone approach makes rehabilitation for both public and private parties interesting and (economically) feasible. With the considerations of representatives from the residents, public parties can choose tools from the two birds-one-stone toolboxes, which aim to rehabilitate whilst reaching national political goals, such as expanding or improving affordable housing, and increasing the sustainability of the living environment. Private market parties will be allowed to choose tools from the compensation toolbox, which propose profitable densification with (high-value) housing and commercial spaces, if they invest in rehabilitating the existing buildings and communal grounds.*

*Keywords: rehabilitation; early high-rise housing; former public housing; Chinese housing policy*





1.0





# INTRODUCTION



## 1.0 INTRODUCTION

### 1.1 What's up? A brief introduction to the challenge of the crumbling high-rises of Beijing

The first generations high-rise housing, found in the heart of Beijing, are visibly approaching the end of their intended lifespan. They are showing signs of continuing aesthetic, functional and technical decay (Hui, 2012).

After the housing reform, newer and luxurious housing estates were built in the periphery of the city. The middle and higher income groups are moving out of the earlier high-rises into the new estates. As they are soon replaced by less affluent renters who are attracted by the affordability of the early generations of high-rises, this is leading to a process of social decay (Ye et al., 2010, Hui, 2012). The new residents, unable and unwilling to maintain their temporary domus, together with a complex whole of mismatching interests of different stakeholders have prevented any significant re-investment in the crumbling high-rises. This financial impasse, the social deprivation and the continuing physical decay have initiated a negative spiral (see figure 1.1) in the early generations high-rise housing.

### 1.2 What to do? Rehabilitation versus conventional renewal

Action is needed to break the induced negative spiral in the early high-rises of China. How to respond, what to do, is the question. When it comes to renewal of sub-standard, decrepit housing China has used a conventional physical renewal approach in the past. The old, decayed housing would be demolished, residents relocated, and new housing would be erected. This model, which has been the motor of China's GDP (Ye et al., 2010), has proven to be very profita-

ble for developers over the past decades. It is possible to identify several motives why renewal might be preferred (Van Stijn 2015):

Firstly the early generation high-rises are located at prime real-estate locations in Beijing. During the seventies the government pushed to save arable land, causing most housing development to be done within the existing city limits (Lü et al., 2001, p.172-173). In Beijing the first high-rises are therefore located around the second ring road and the transitional period high-rises between the second and fourth ring road. Although the newer estates have slowly been absorbed and are becoming vital parts of the growing city (Zhou, 2012), the earlier high-rises in fact enjoy better locations, connections to (public) infrastructure and amenities. Their prime location is one of the main reasons why they are demolished, as they are not equal to the worth of their location.

Even though the current policy climate seems to focus less on short term profit (Deng et al., 2014), the influence of short term financial profit is very important in the final decision process. As the government attempts to reheat the sluggish housing market by releasing market restrictions, government and developers will more likely prefer conventional renewal in order to maximise short term financial profits.

Finally the existence of the land-lease system might let the demolition approach prevail. In China virtually all urban land is owned by the government (Hui, 2012, p.105-108, Anglin et al., 2014). Since the opening up, after successfully experimenting in Shenzhen<sup>1</sup>, land leasing became the common manner of distributing land. Within the lease system the local government will retain its ownership over urban land and offer land use rights in the form of

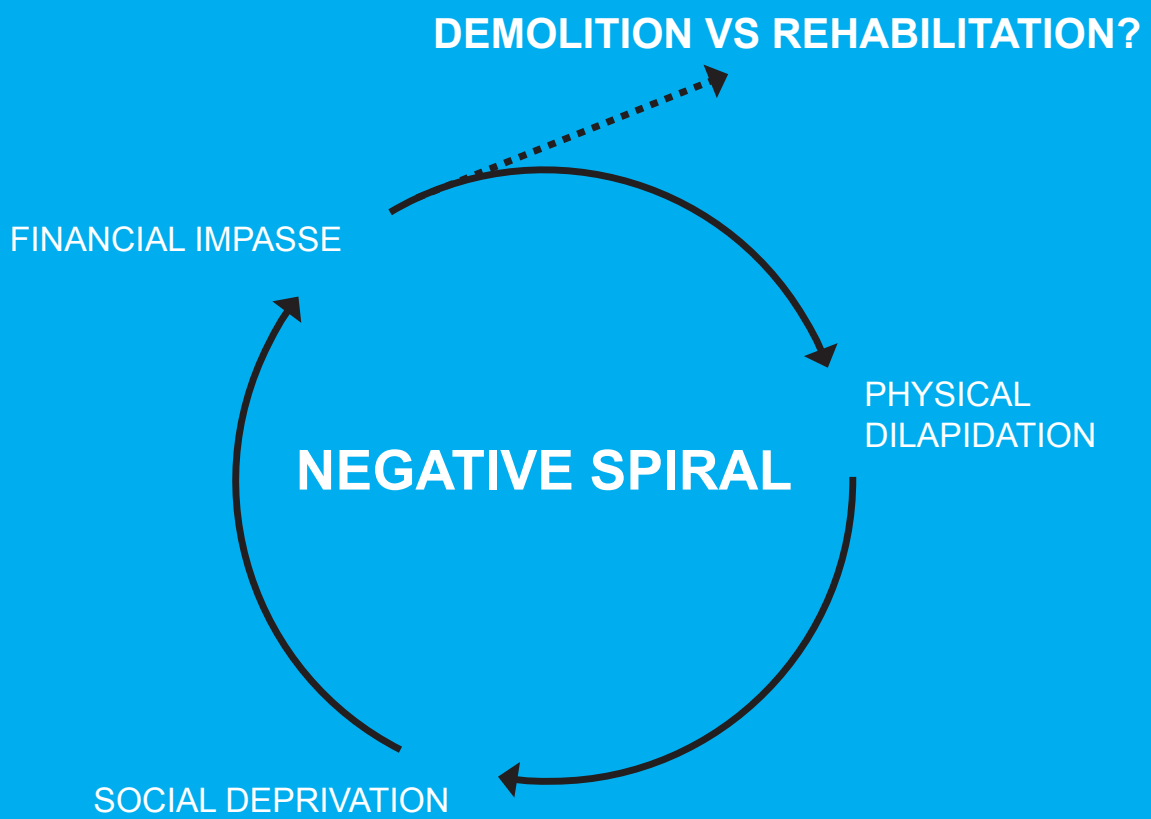


Figure 1.1: Negative spiral

*In the conventional way renewal meant , widely applied practice of wholesale demolition and rebuild processes.*

# RENEWAL

VS.

1. CHEAPER ON SHORT TERM?
2. RENEWAL USED TO BE GDP MOTOR OF CHINA
3. LAND-LEASE COMPLICATED SYSTEM MAKES RENEWAL EASIER THAN REHABILITATION

ground leases which allow the developer to build on the land. When the lease term ends, 70 years in case of residential use, 40 in case of commercial use and 50 in case of industrial use, the land becomes property of the lessor: the Chinese government (Anglin et al., 2014, p.1). Although any buildings on the land will stay property of the (expired) lease owner(s) the

expiration of land-use rights actually implies the expiration of ownership of the entire building. This land lease system could in fact greatly influence the future of the dilapidated (transitional) high-rises as part of them have been leased. The high-rises that have passed half of their lease will be harder to rehabilitate<sup>2</sup>. It is much harder to financially justify reinvest-

*Urban rehabilitation physically indicates the area-based, gentle and step-by-step urban renewal (without wholesale demolition) to improve the quality of living (Hui, 2012, p.56).*



# REHABILITATION

1. MONUMENTAL VALUE
2. MORE SUSTAINABLE TO RE-USE THE OLD BUILDING
3. HIGH DENSITY AND HIGH PRIVATE OWNERSHIP RATE PREVENTS RENEWAL AS INTERESTS ARE TOO DIVERSIFIED
4. RETAINS (+ OPTION TO CREATE) AFFORDABLE HOUSING
5. MORE FEASIBLE IN CURRENT REAL-ESTATE MARKET

ment if the future tenement is too short for a return of investment (Anglin et al., 2014, p.1). Although it has been stipulated in 2007 in the property law of the PRC (article 149) that the possibility of renewal of the lease will be guaranteed for residential construction, no real procedure has yet been formulated. Precedent can only be found in the renewal of the shorter

20 year leases signed in Shenzhen prior to 1990<sup>3</sup>. Upon the ending of the lease owners were offered a renewal of the lease at payment of 35 percent of the land value. If the renewal of residential leases for the early high-rises will be similar to the precedent, renewal might be preferred. The first high-rises are located on prime locations in the heart of the city and

land value will probably be unreflective of the value of the apartments. However the current uncertainty might prove equally destructive as investing becomes unfeasible when the repayment period of the investment is unclear.

Even though there are still plenty of incentives to practice conventional renewal methods there are several reasons why the method is undesirable and moreover unsuitable to deal with the challenge of the decaying early high-rises.

Firstly, demolition of the early high-rise housing is undesirable as it will result in a significant reduction of the rental stock which currently provides an alternative to the unaffordable market homes within the city. Developing more affordable housing options is an important aim since the late 2000's, when policy focus shifted from economic growth to social inclusion (Deng et al., 2014). Developing (affordable) rehabilitation strategies could not only help maintain part of the rental stock, it could offer an opportunity to provide more affordable housing in the centre of the city (Hui, 2012).

Secondly, it would be undesirable if the early generation of high-rise housing made in the late seventies and partially early eighties, were to be demolished. Like Qiansanmen residential district in Beijing, some of these early high-rises are amongst the first high-rises made in modern China and represent important achievements in modern architectural development. Demolition would mean a significant loss of architectural history.

Thirdly conventional renewal is undesirable as well as unfeasible as the amount of low quality high-rises in China's is vast. Even though the first generations are approaching their designated lifespan of 50 years on paper, they will not automat-

ically disappear when they hit their 50th birthday. Lifespans, are often defined on paper according to financial or tax reasons, but the high-rises only become obsolete if there is a need to replace them for a new development. However the amount of the high-rises is vast and a slowdown in China's economy and real-estate market has become apparent. In January of 2015 China's GDP growth had declined to 7.4 percent, the lowest growth rate in the last two decades. The current real-estate crisis and the slowing overall development rate might result in a serious decrease of overall building investments in the foreseeable future.

Even though the buildings are reaching the end of their lifespan, it does not mean that every part of the building has decayed so severely that it needs to be demolished. Construction usually has a longer individual lifespan than technical infrastructure. So replacing all these concrete structures whilst it is in fact not yet necessary would result in huge construction waste. Waste from demolished buildings is already piling up (Qian, 2010). Even though sustainability issues have not yet changed practices in housing redevelopment it is becoming a more important evaluation criteria for the political leaders in richer regions.

Finally the renewal of high-rise buildings following conventional renewal practices would just be nigh impossible. The renewal of the hutong areas and former public mid-rise apartments were possible due to the lower densities of these areas, the lower ownership rate, and the harsher policies regarding eviction of residents. Nowadays private property is becoming more sacred (Anonymous, 2013). Most of the (social) dwellings, including those in the early high-rises have been commodified post reform. In



2005 up to 75.72% of homes were privately owned (Hui, p.270). Moreover it has proven impossible to get all the owners to agree to sale off their dwelling. Several cases of former public housing which were to be renewed decades ago have not, or partially been renewed for this exact reason (Hui, 2012, p.640-643). Residents who have become well aware of the profits made by real-estate development and the value of the land in the cities, are making high compensation demands. Becoming rich in a day through buyout, for real-estate or infrastructural developments is the dream of many homeowners. In high-rises due to the high-density of the typology the amount of owners involved and their different individual interest in their living environment make it high-impossible to use conventional rehabilitation processes to break the negative spiral in the high-rises.

To deal with the rapidly privatised, speculative and decaying former public housing, Hui (2012) suggests to instead use an integral rehabilitation approach: A socially oriented, adapted renewal approach aimed to realistically improve the living conditions step by step. To develop this rehabilitation approach: a workable and understandable, method which can successfully break the negative spiral and offer a future to the crumbling high-rises will be the main focus of this research.

**Notes:**

1. On September 1987 the first official leasehold contract in modern China was signed in Shenzhen.
2. This argument is only relevant for some of the high-rises made in the transitional period or later generations (see chapter x) as the ground of the first high-rises and several of the transitional period has not been leased out and a form of joined ownership exists between government and residents. More on the ambiguity of ownership can be found in chapter x.
3. The year lease term and land use were linked by law.



2.0







## METHODOLOGY

## 2.0 METHODOLOGY

### 2.1 Research question + design question

This graduation thesis aims to answer the main question: Can a rehabilitation strategy be developed to deal with the challenges of the early high-rise housing in Beijing? The thesis will be formed by “two sections”: research and design. The design and research will be used complementary to each other. In the research a generic strategy will be developed to deal with the rehabilitation of the early high-rises. The research thesis will focus on answering the research question:

***“Can a hands-on, integral strategy be developed to deal with the rehabilitation of the early high-rise housing of Beijing?”***

The design will show how the strategy can be implemented in reality, and consequently offers new input to the strategy. Within the design following question will be answered:

***“How can the developed strategy be implemented on an architectural scale and what are the implications on an urban scale?”***

### 2.2 Research + design relevance

A continuing negative spiral has been onset in the early high-rise housing. Currently there has not yet been much research done to monitor the emerging problems or finding solutions for the challenges. By generating knowledge on the topic and by developing a strategy to rehabilitate these high-rises within this explorative research, the living conditions of many could be improved.

Moreover this exploratory research might prove to transcend its preliminary scope. By focusing on “a merger of interests” the rehabilitation might be beneficial to a variety of ambitions and interest outside of the direct scope. This includes aiding the improvement on many major challenges nationwide. Such as stimulating a more long-term oriented real-estate market, development of affordable housing, and addressing pressing sustainability challenges.

Finally, although the scope of the research has been limited to the decaying early high-rise housing within the third ring-road of Beijing, the strategy might offer a better future to more high-rises. Early high-rises in other Chinese cities will have much in common. Moreover the future of the early high-rises might transcend to be a foresight for the future of later generation high-rises built during the building frenzy of the early market period. In these high-rises, similar conditions and signs of rapid physical deterioration can already be observed (Minter, 2008, Foster, 2010). By developing a rehabilitation strategy for the early high-rises of Beijing, the vast challenge of China’s crumbling high-rises could be brought to attention, remedied and even prevented.

**DIRECT**

**1**


EARLY GENERATIONS CRUMBLING HIGH-RISES



*"Finding realistic strategies will improve the living conditions of the residents, many of who are vulnerable groups of society."*

**TRANSSCENDING**

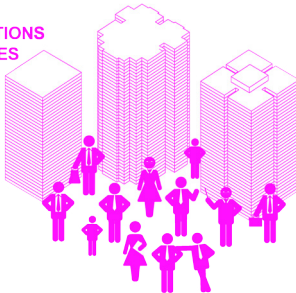
**2**



*"Finding a solution to such a large scale challenge could offer an opportunity to incorporate solutions for other national challenges: such as fulfilling housing affordability needs and matters concerning the need for a more sustainable housing development."*

**3**

LATER GENERATIONS HIGH-RISES



*The early high-rise housing's future is a foresight for the future of later generation high-rises. By designing a strategy to deal with the rehabilitation of the early high-rises, the vast challenge of China's crumbling high-rises could be brought to attention, remedied and even prevented.*

Figure 2.1: Infographic research and design relevance



### **2.3 Research + design methodology**

The research and design question will be answered by using mixed research and design methods. The research method and design method will be explained in the following paragraphs. A summary of the research and design methodology and their correlation to find an answer to the main question can be seen in the info-graphic (figure 2.2).

#### **2.3.1 Research method**

To be able to generate the generic strategy to rehabilitate the early high-rises as an answer to the research question posed above, several sub-questions need to be answered:

*1. Is it possible to form an understanding of the origin, development and status quo of the early high-rises in Beijing?*

To be able to solve the challenge of the crumbling high-rises a better understanding of where we need to rehabilitate is necessary. Through the use of literature survey a historical analysis on the origin of the high-rises will be discussed. Following the typological development of the high-rises will be analysed through the use of typological SWOT analysis. Then a literature analysis will be made to explain their development from origin to now. The question will be concluded with the development of status quo of the high-rises, through the use of literature survey. This knowledge will form the theoretical framework of the exact nature of the challenge and the opportunities to which the rehabilitation strategy can respond.

*2. Who are the involved stakeholders and is it possible to identify their interests, needs and possibilities in the rehabilitation process of the early high-rises?*

This sub-question aims to clarify the stakeholder's interest in the physical, social and economic realm of the rehabilitation of the early high-rises as well as an identification of the possible role of set stakeholders within the rehabilitation process. This sub-question will be answered through the use of scientific stakeholder analysis methods, such as: a basic stakeholder analysis, power versus interest method and the common good method. Due to the exploratory nature of the research, the input for the analysis will only be gained through literature survey on the (generic) roles and interest of stakeholders in building processes adjusted to the Chinese realities and challenges in housing rehabilitation. The result of this sub-question will be a set of recommendations or prerequisites to which the rehabilitation strategy needs to respond.

*3. Which policy and design tools can be used to find a solution to the defined financial, social organisational, and physical challenges in the early high-rises?*

This sub-question will develop knowledge on what we can use to rehabilitate the crumbling high-rises and how we can do it. The focus will lie on forming a theoretical framework on the possible design and policy tools available to guide the rehabilitation of the early high-rises according to the prerequisites found in the results of sub-question 1+2.

As the challenge of the crumbling high-rises is both physical, social-economic, and engraved by complex urban housing problems (such as the housing affordability issues, speculation, and urban renewal practices) it will be insufficient to solely make a physical re-design strategy. The rehabilitation needs to address both issues on the financial, social organisational, and physical (Hui, 2012). Therefore



this sub-question will be split into three research domains to find policy and design tools to deal with the rehabilitation in each domain. Each of the three domains will be researched through the use of literature survey and case study analysis. Note that the aim of this research question is not to give an overview of all possible rehabilitation strategies in each domain and make an inspirational large toolset. The tools researched are directly responding to “the prerequisites” defined in the above sub-questions and will give a smart toolkit from which the “hands-on” strategy can be formed.

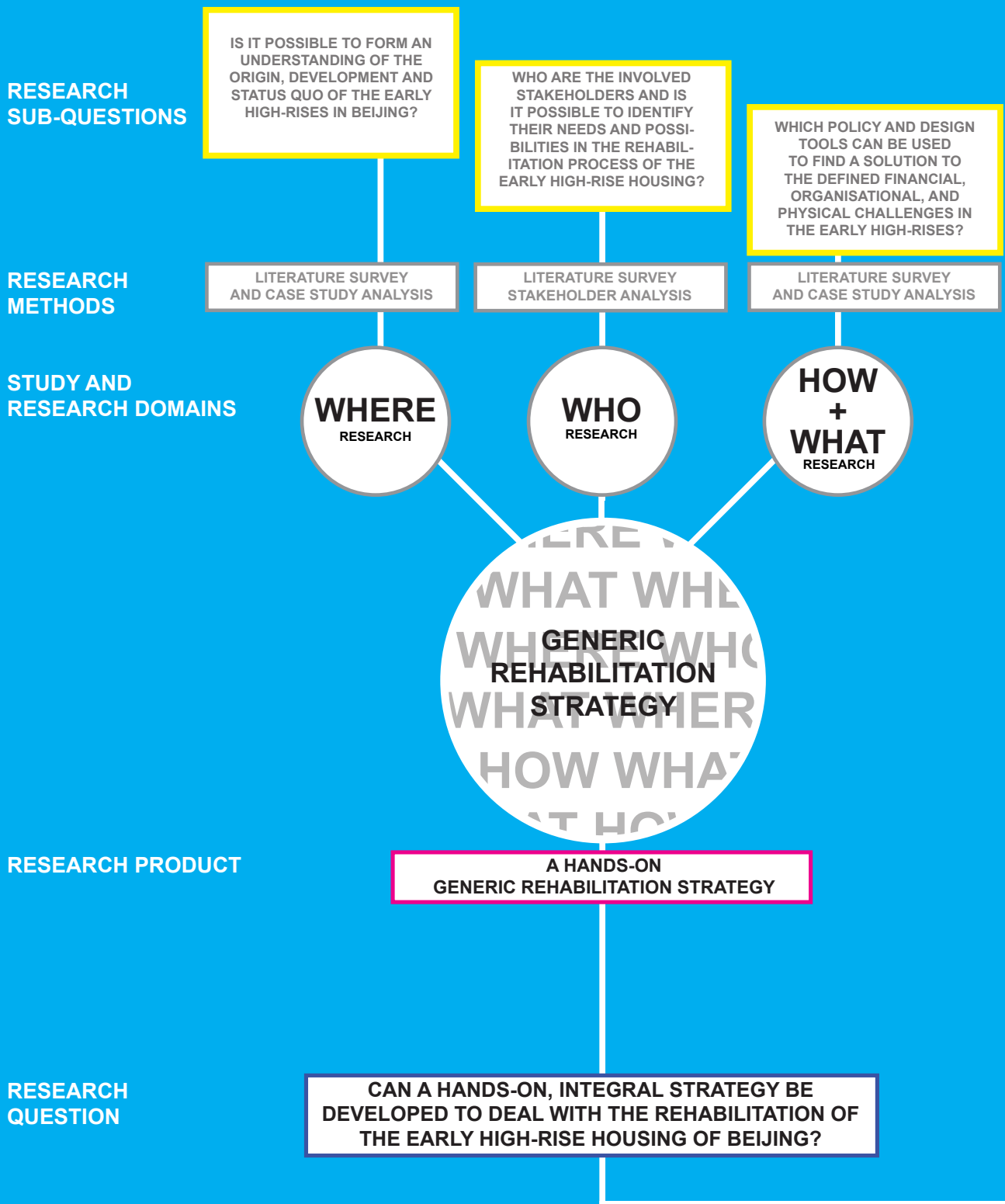
Finally the identified policies and policy tools to rehabilitate the early generation high-rises will be combined so that they fit the needs and possibilities of all the different stakeholders and are able to solve the challenges and respond to the opportunities of the crumbling high-rises. In the development of the integral rehabilitation strategy, special attention is

given for ensuring the workability of the strategy. The goal is not only to make it realistic to use, but also to make it understandable, useable to start improving the status quo from today, or in short: to make the strategy hands-on!

### **2.3.2 Design method**

In the design the developed generic strategy will be implemented “in reality” to illustrate the strategy in a specific setting. The specific design will occur by implementing the generic strategy in a large scale (all of the early high-rises within the third ring-road of Beijing) and in a case (one, or a cluster of high-rises). The design within the specific realm will form not only a more concrete design vision of the future of the crumbling high-rises but can also feed the generic strategy.

# RESEARCH



# MAIN QUESTION:

# + DESIGN

# METHODOLOGY

Figure 2.2: Infographic research and design methodology



DESIGN PRODUCTS

DESIGN  
SUB-QUESTIONS

DESIGN  
QUESTION

ILLUSTRATION OF THE STRATEGY IMPLEMENTED ON THE EARLY HIGH-RISE HOUSING IN BEIJING

RE-HABILITATION OF A (CLUSTER OF) HIGH-RISE(S) HOUSING ACCORDING TO THE DEVELOPED STRATEGY

HOW CAN THE GENERIC STRATEGY BE IMPLEMENTED ON THE SPECIFIC XL SCALE TO ILLUSTRATE THE REHABILITATION STRATEGY OF THE EARLY HIGH-RISE HOUSING OF BEIJING ON AN URBAN SCALE?

HOW CAN THE GENERIC STRATEGY BE IMPLEMENTED IN A SPECIFIC SITE TO ILLUSTRATE THE REHABILITATION STRATEGY OF THE EARLY HIGH-RISE HOUSING OF BEIJING IN AN ARCHITECTURAL CASE?

HOW CAN THE DEVELOPED STRATEGY BE IMPLEMENTED ON AN ARCHITECTURAL SCALE AND WHAT ARE THE IMPLICATIONS ON A URBAN SCALE?

**CAN A REHABILITATION STRATEGY BE DEVELOPED TO DEAL WITH THE CHALLENGES OF THE EARLY HIGH-RISE HOUSING IN BEIJING?**

### **2.3.3 Description circumstances, limitations**

The thesis has one limitation valid for the whole research: the research has an exploratory nature. This means that there is still little research available on the topic. This is understandable, of course, as problems in the high-rises are relatively young. Furthermore the lack of information is engraved by the fact that (original source) information is often not available in another language than Mandarin. As an alternative literature sources available in English were consulted supported with information gathered from consults with experts, and observations through site visits.

Next to this general limitation valid for the whole thesis, the stakeholder analysis and case studies know specific limitations:

#### *1.Limitations stakeholder research*

Ideally, the stakeholder analysis done by literature survey would need to be tested and confirmed. Normal practice would be to conduct interviews or workshops with the different stakeholders to validate the assumptions made and add (more specific) information. However the validation of the results with stakeholders will not be part of the scope of this research. Firstly because there is no availability to the actual stakeholders. The challenge of the crumbling high-rises has not received significant attention amongst stakeholders yet, meaning that although many of the future stakeholders can be identified, they are not yet concerned or the corresponding group within the institutions do not actually exist yet. Moreover conducting surveys in Chinese context without assistance and alliances with government or university associations proves to be difficult (Cao et al., 2007).

Not conducting the interviews will not greatly influence the relevance of the research. The research aims to generate a policy applicable to a vast amount of high-rise housing. Therefore identifying the more generic needs and interests of the stakeholders, might be more beneficial to generate a relevant policy framework within a more explorative stage.

Ideally, if the policy will need to be applied in the coming decade(s), a survey to control and refine the interests and needs of stakeholders will need to be conducted. To ensure the validity of the results (and prevent generalising too specific outcomes) a wide variety of the high-rise housing stakeholders will need to be surveyed. An alternative would be to validate the research results through the use of a participatory design process in which all of the stakeholders are represented (as proposed by Hui (2012)).

#### *2.Limitations case study analysis*

Considering that this is the first generation of high-rises to face the end of its lifespan in China, it might prove impossible to find precedents dealing with the exact same challenge and share similar constraints or contexts. Instead of finding these exact precedents, precedents that share similar variables will be used.

### **2.4 Outline**

This paragraph will elaborate on the outline of the thesis. Firstly a rough division of the thesis can be noted. This thesis is be divided in 6 parts. Part 1 to 4 will be part of the research. In part 5 the design will be shown. Part 6 will give room to conclusions and reflection on both.

The set-up in more detail: Part one forms



the introduction to the thesis in which chapter 0.0 gives the abstract. Chapter 1.0 briefly introduces the challenge of the crumbling high-rises and chapter 2.0 explains the research and design question and methodology. Part two will focus on researching the “Where and Who” in order to form the prerequisites to which the strategy needs to respond. Chapter 3.0 aims to generate an understanding of the origin, development and status quo of the early high-rises in Beijing. Chapter 4.0 defines the stakeholders and identifies their interests, needs and possibilities in the rehabilitation process of the early high-rises. In part three the policy and design toolkit which can be used to find a solution to the defined financial, social organisational, and physical challenges in the early high-rises will be developed. Chapter 5.0 will focus on finding the strategy’s tools for the social organisational dimension. Chapter 6.0 will do so for the physical dimension and chapter 7.0 on the financial dimension. In part four the hands-on strategy will be developed, as a conclusion to the research question. The integrated strategy will be explained in chapter 8.0. As the design is not included in this report it also forms the final chapter of this thesis.





In the chapters of part two we aim to understand the current status quo, and how it came to be. With this understanding constraints, conclusions and prerequisites for rehabilitation strategy will be developed.

# THE CRUMBLING HIGH-RISES IN REVEIW

# PART II





3.0





## THE EARLY HIGH-RISES OF BEIJING

### 3.0 THE EARLY HIGH-RISES OF BEIJING

#### 3.1 The emergence of high-rise housing in modern China

To understand what the definition of early high-rises is, we take a closer look to the emergence of the high-rise in China.

The emergence of the high-rise housing in Chinese context took place at the end of the 1970. The urban housing deficit became more and more problematic due to the urban population growth. Although rural to urban migration has been controlled since the explosive migration during the Great Leap Forward (1958-1961), urban population was still increasing rapidly. The criticism on the family planning policy, and the improvements in healthcare had resulted in a population boom and put extreme pressure on the urban housing stock (Lü et al., 2001,

p.171).

Following the Great Leap Forward and Great Chinese Famine (1959-1961), there came a strong pressure to save arable land from the Chinese government (Hui, 2012, p.136). Ever since, the preservation of arable land through multiple story, high-density construction was pressured by China's leaders.

The increase of urban population, housing- and land shortage asked for another way of housing the growing masses than the standardised dormitories and mid-rise designs which were conventional practice in the decades before. As an answer the first high-rises appeared at the end of the 1970's. In the centre of China, along the Qianmen Avenue, the main street under Tiananmen square in Beijing: Qiansanmen residential district was constructed in



**FIRST GENERATION**

**EARLY TRANSITIONAL GENERATION**

**LATE TRANSI**

**EARLY GENERATIONS**

**PUBLIC HOUSING PERIOD**

**TRANSITIONAL PERIOD**

1970

1980

1990

**1978  
OPENING  
UP**

The early high-rises are those high-rises build during the first generation (1975-1980), or the early (1980-1990) and late transitional period (1990-1998).

1. The crumbling high-rises are early generations high-rises that are showing signs of severe physical and socio-economic decay

## CRUMBLING HIGH-RISES?

### THE EARLY HIGH-RISES?

1975-1976. These experiments planned and constructed from 1975-1980 form the first generation high-rise housing in China.

With the opening up of China in 1978 a period of transition commenced. Although housing reform to a market housing system would wait until 1998, the socialist market and welfare was slowly, in a controlled manner transitioning to a (planned) market system. The experiments of high-rise housing of the seventies soon led to much bigger developments in the eighties. High-rise housing built in this early transitional period from 1980-1990 would experience the teething problems of transition.

Due to the (profitable) preparation for the urban billion and the continuing pressure on urban land, high-rises have since become the housing ty-

pology for urban mass housing in China. It is during this period 1990-1998 of mainstream and diversified high-rise that the late transitional high-rises were made. A period just before the radical housing reforms of 1998.

### 3.2 Crumbling and early high-rises: a definition

Prior in this research the terms: the early generations high-rises and crumbling high-rises have been used. The first, early transitional and late transitional high-rises, together make up the early generations high-rises (see figure 3.1). Many (see paragraph 3.7) of these early generations high-rises are now showing signs of physical and socio-economic decay. Those buildings can be defined as the crumbling high-rises.

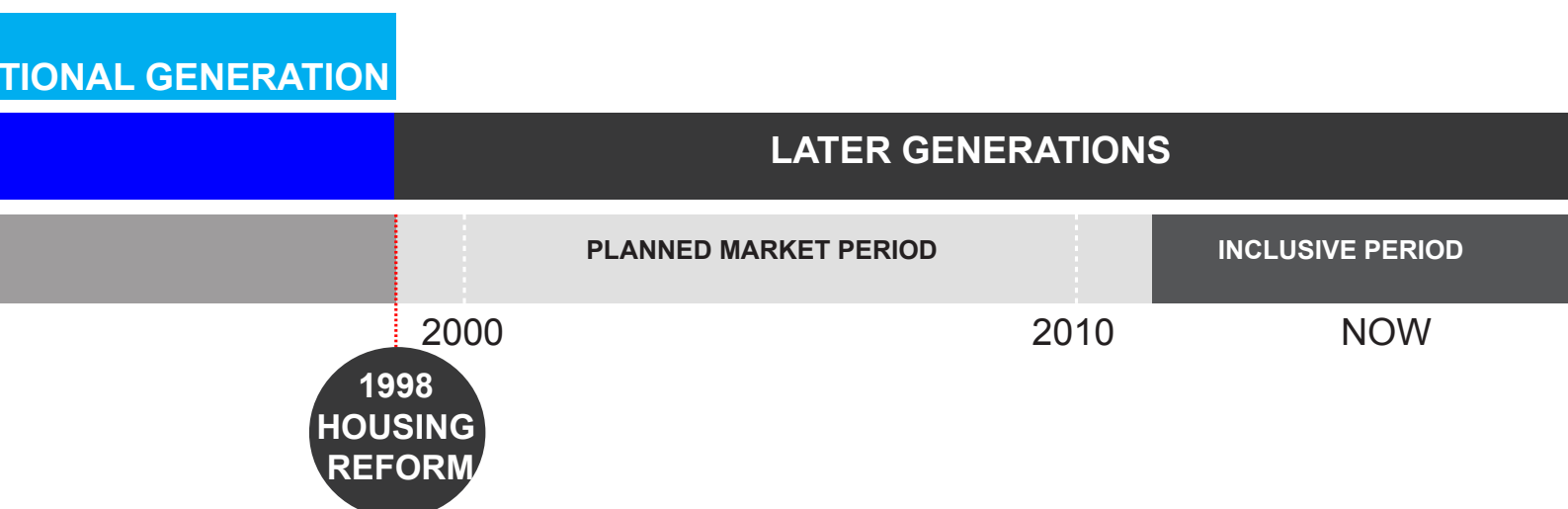


Figure 3.1: Timeline of the high-rises



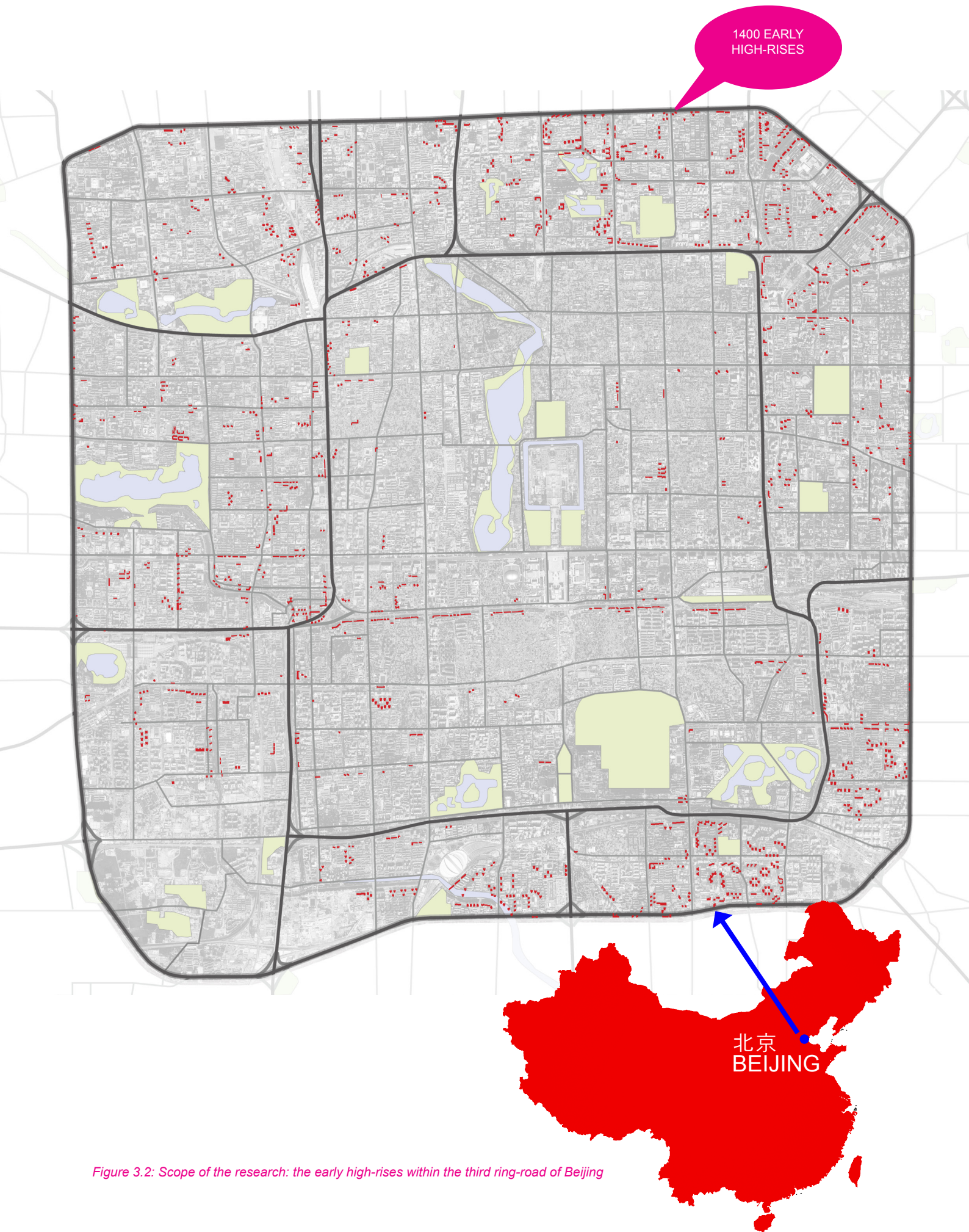


Figure 3.2: Scope of the research: the early high-rises within the third ring-road of Beijing

### **3.3 Location of the early high-rises of Beijing: research scope**

The actual challenge of the crumbling high-rises in China is vast, exact numbers on how many buildings are affected do not exist. However to limit the research to a feasible whole the early high-rises within the third ring-road of Beijing have been chosen as the scope of this research.

Beijing as political centre of China, and one of the cities to have developed first, is of course an ideal case. High-rise construction was experimented on there and became mainstream in Beijing before it was a rule in cities which developed later.

The particular choice for high-rises within the third ring road can be explained by the historical development of the high-rises in relation to their location and to limit the scope of the research. Due to the pressure to save arable land due to urban sprawl, most housing development was done within the existing city limits (Lü et al., 2001, p.172-173). In Beijing the first high-rises are therefore located around the second ring road and the transitional period high-rises between the second and fourth ring road, whilst the estates from after the market reform can mostly be found outside of the fourth ring road. Therefore the chosen perimeter will give a good representation of all the different generations belonging to the early generation high-rises and so of all the challenges and opportunities in the crumbling high-rises. The map (in figure 3.2) shows all the high-rises within the third ring road of Beijing which belong to the early generation high-rises (in various stages of decay) and are the subject of this research.

### **3.4 The high-rise as a beacon of modernity**

Although the high-rise typology is the norm nowadays, at the time the first generations high-rises were made, they were the most luxurious housing available till then. The early housing construction in the PRC was characterised by a period where too luxuriously constructed housing would be allocated to multiple families<sup>1</sup> (Lü et al., 2001, Hui, 2012). After the break with the Soviet Union much lower housing standards<sup>2</sup> were used, reflecting on the reality of Chinese housing standard. A policy which found its climax during the Cultural Revolution, resulting in many poor quality and even unsafe housing to be constructed. In 1973 the State Construction Commission issued the “proposals for revisiting the building standards of apartments and dormitories” significantly raising housing standards (Lü et al., 2001, p.176). It is during this time of raising housing standards that the first high-rise housing was constructed. When they were completed, the high-rises were a true beacon of modernity.

All the high-rises typologies offered the similar luxury of: (one family) apartments accessible by an elevator, large floor areas, modern facilities such as access to water, drainage, heating, a small kitchen, and own toilet. Even though all high-rises offered a luxury unavailable until then differences exist between the different (urban and architectural) typologies of the early high-rises as they developed over the decades.

### **3.5 Urban compositions for high-rise housing: neighbourhood scale**

When analysing the high-rises within the third ring-road Beijing we can see different urban compositions of the high-rises within the urban fabric.

On a neighbourhood scale the high-rises can be part of a da-yuan, residential area or public housing patchwork (Hui, 2012, p.179-186).

As a spatial unit the da yuan would be the most physical representation of the Danwei system. The Danwei would form the workunit which provided for every aspect in an individual's life in society. Literally translated as "big yard" in the da-yuan public housing, work and public facilities to support the resident's life were combined, and formed a self-sustaining community. The Danwei area did leave their mark on the urban fabric as they were walled and separated the city into island. Also the Danwei's (self) construction proved unable to provide enough housing for the growing population. As a response the municipal government found OUHD (office of unified housing design). Instead of Danwei's constructing their housing the OUHD would stimulate the integral development of (large-scale) residential districts. These districts, usually developed between 1970 and 1990, were designed according to the 3-level planning of residential district-quarter and cluster and were also (with exceptions to residential districts that were never finished) equipped with public facilities and amenities. The difference with the da yuan areas are that the residential districts are rarely walled, do not house the residents of one Danwei, and do not belong to one Danwei. Developed by the entrepreneurialised OUHD or other large real-estate development company, their housing would then be sold to a Danwei (as common during the transitional period, where Danwei self-construction was no longer allowed and housing distribution became forbidden).

The housing patch can be found in the his-

torical centre of Beijing, where patches of high-rise housing appeared between the hutong (traditional housing) areas. This was the result of Danwei's who wanted to densify their housing supply and replaced low density construction with high-rises. High-rise housing as part of a patch are only from the first or early transitional generation as building high-rises in historical areas became illegal later on.

### **3.6 Urban compositions for high-rise housing: plot scale**

If looked at it from a plot scale we can distinguish different urban compositions (see figure 3.3).

Firstly, the high-rises can occur in single, twin, multiple, mixed typology and mixed function set-up. In the first three there are only high-rises within the property boundary. In the fourth option: mixed typology, the high-rises are combined with other types of dwellings (usually mid-rise or dormitory style housing. In the latter case: mixed function, the high-rises are combined with not only different housing types but also different functions such as industrial or office buildings (reminding us to the Danwei da yuan model).

Another parameter is the presence of (semi-private) communal grounds around the high-rise(s). In some cases, there is no closed off grounds belonging to the high-rise but in the majority of cases there is. This idea of communal ground is immediately associated with the Danwei-da yuan model. However it does not necessarily mean that if there is a communal grounds to which only the residents have access, that the high-rise is part of a Danwei-da yuan. Living in a da yuan has since the socialist period been associated with a more "luxu-



**MATRIX 1: LOCATED ALONG MAIN INFRASTRUCTURE**

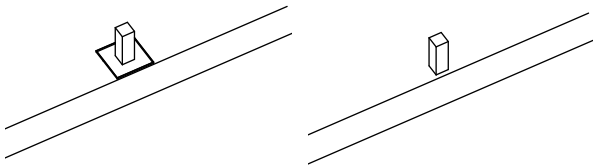
**MATRIX 2: LOCATED WITHIN URBAN BLOCK**

**WITH COMMUNAL SPACE**

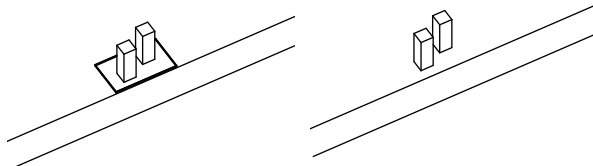
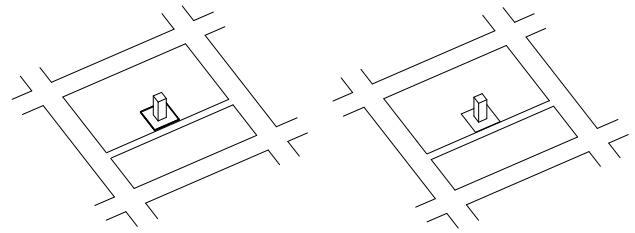
**NO COMMUNAL SPACE**

**WITH COMMUNAL SPACE**

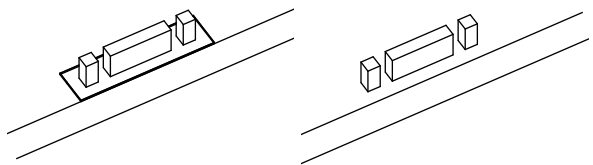
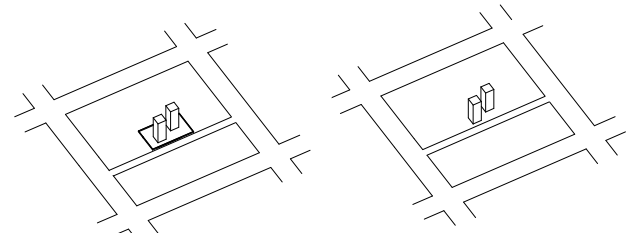
**NO COMMUNAL SPACE**



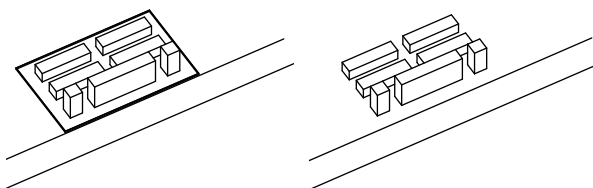
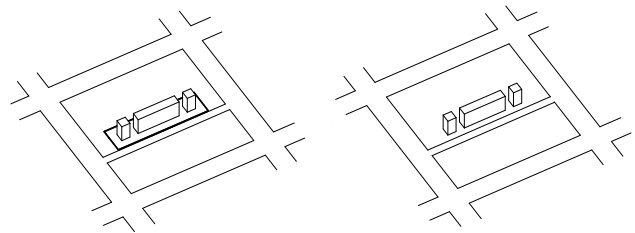
**SINGLE**



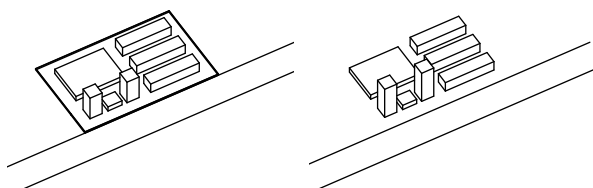
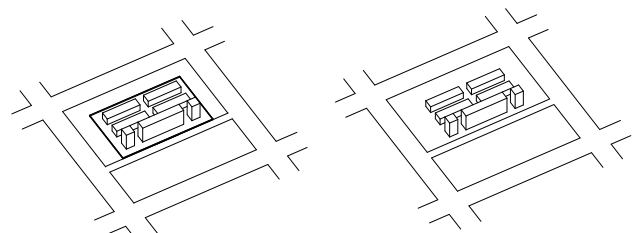
**TWIN**



**MULTIPLE**



**MULTI-TYPOLOGY**



**MULTI-FUNCTION**

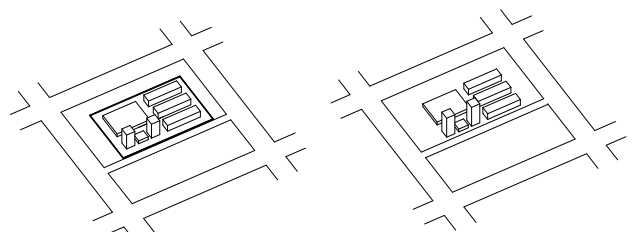


Figure 3.3: Urban compositions for high-rise housing on a plot scale

rious" lifestyle. In the socialist period only (wealthy) state-owned Danwei's were allowed to construct housing (usually in with use of a da yuan) for their workers. Small, poorer or non-state owned Danwei's would usually not get permission and funds to construct. Instead their workers would be allocated housing from the existing (sub-standard) housing (Hui, 2012, p.110-111). Even when the Danwei da-yuan was no more, the image of the exclusiveness associated with da-yuan style apartment resulted in the construction of many high-rises with a guarded or gated communal ground. If they are more recent they even have many facilities and amenities (shops, sport facilities, day-care, etc.) for the residents.

The final parameter is the setting of the high-rise in the urban fabric. The plot can either be set on the perimeter of large infrastructure or can be located within the urban block. Often for the former more funds could be accumulated for maintenance, facilities, and cosmetic interventions to uphold a modern image of the city (in case of big political or sport events) (Hui, 2012, p.357).

Of course when viewing the matrix of all the different urban types in figure 3.3, it becomes apparent that the tools suggested in the strategy need to respond to the different opportunities that the types offer. A single tower, located in the middle of the urban fabric with only a small communal ground (or none) has other possibilities, as to physical design or financial feasibility than a multi-function high-rise complex with a big communal ground located next to the main road.

### **3.7 The early high-rise typology**

Within the early high-rise housing it is possible to

distinguish the development of three main categories high-rises: the slab, the tower and the conjoint high-rise tower. The high-rise was mainstreamed during the 80's and 90's and since each of the three categories high-rises evolved over the time. The evolution was always a struggle between improving (or guaranteeing) four design parameters: living standards, building costs, diversification and density. Although housing standards were rising when the first high-rises were developed their design was strictly controlled. Living standards were regulated predominantly in quantity of living surface (Hui, 2012, p.154-155). Municipal architecture institutes would issue standard high-rise designs. From the late eighties the standard designs would be differentiated to comply to the demand for different housing types caused by to the growing commercialisation. But even the differentiated standard designs were still strictly controlled on surface area by the unified housing design standards.

In the following paragraphs the development of the different slab, tower and conjoint high-rise tower typologies will be discussed. As each typology has a different balance between the design parameters, they all cope with slightly different problems and also possess different opportunities. Therefore, for each of the typologies a SWOT (strength-weaknesses-opportunities-threats) analysis has been made. This analysis helps to determine the challenges and opportunities of each typology to which the strategy needs to respond to enabling a suitable solution for each of the different high-rises.

### 3.7.1 The high-rise slab

The first category, the slab, was the predominant building type of the first generation high-rises of China, built in the late seventies (Lü et al., 2001, p.203, Hui, 2012, p.153). The slab high-rises are still the most welcomed typology by residents. This is because of their perpetual north-south orientation which abides to the (somewhat excessively) insisted cultural preference and guarantees a comfortable inside climate and ample sun hours for the residents (Hui, 2012, Li, 2012, p.11). Furthermore the use of the slabs in the first high-rises was also an economic necessity. In this time elevators were extremely expensive elements of construction. Therefore slabs with long corridors, to make full use of the elevators had the initial preference of developers. In the high-rise slabs we can distinguish three main typologies: the outer corridor high-rise



Figure 3.4-3.6: Examples of different high-rises slab typologies

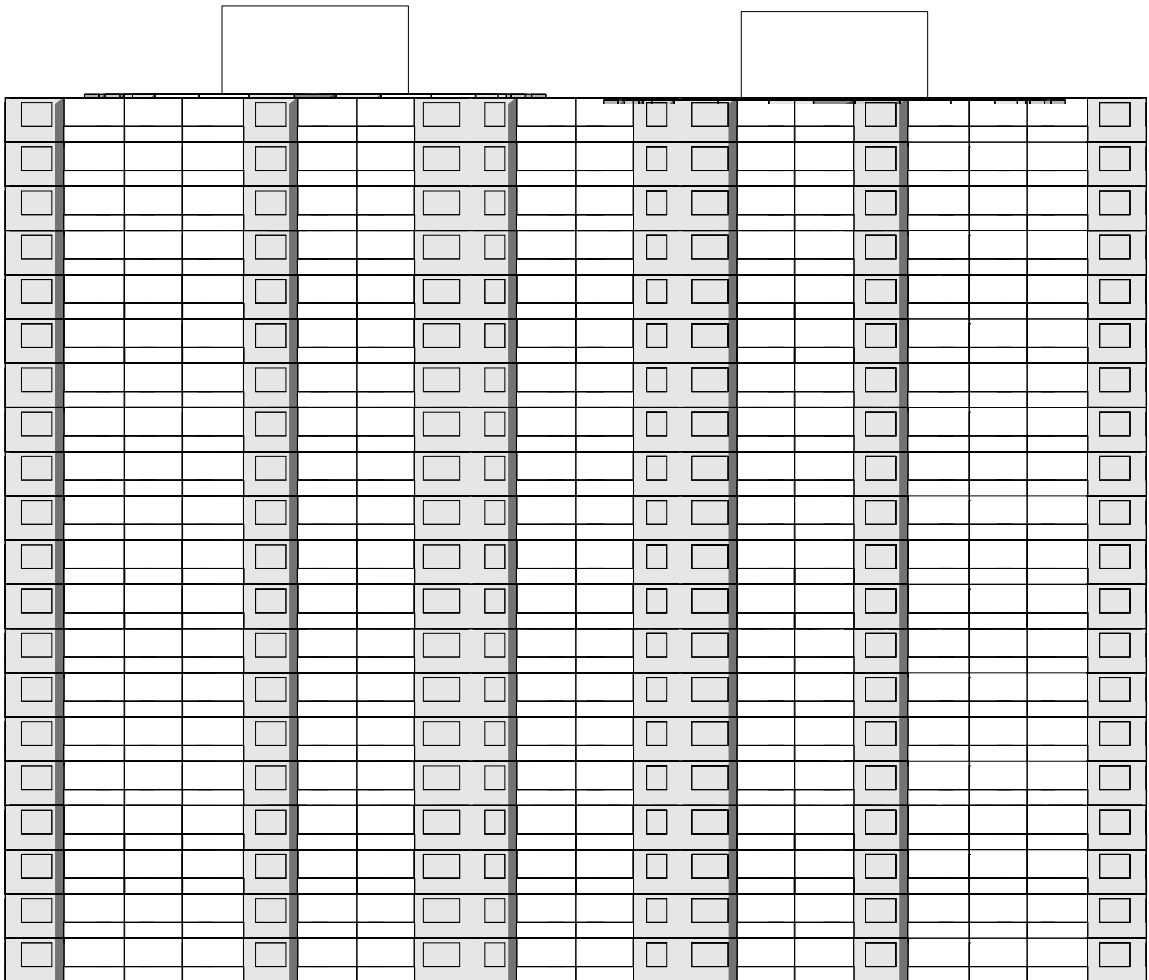
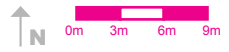
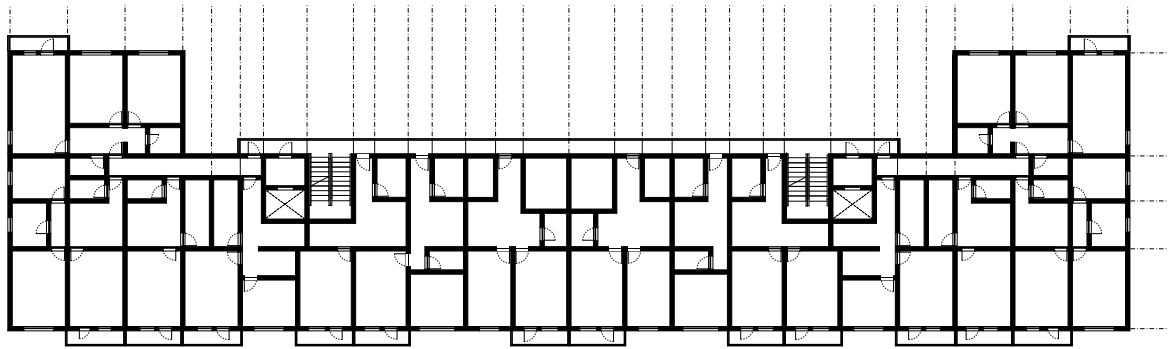
1. Inner-corridor slab in centre south of Beijing
2. Cross-story slab in centre south of Beijing
3. Outer-corridor duplex slab in centre of Beijing



slab, the cross story high-rise slab and the inner corridor high-rise slab (see figures 3.4-3.6).

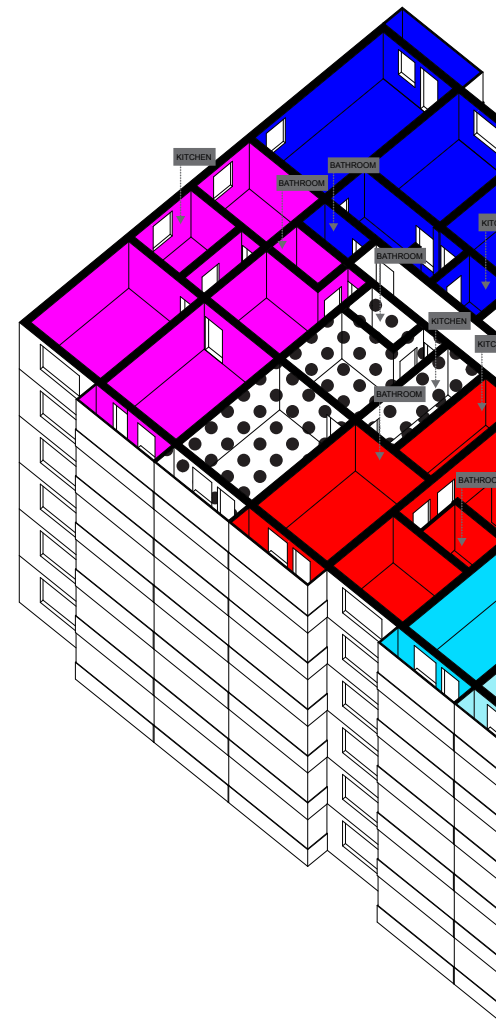
*1. The outer-corridor high-rise slab.*

The outer-corridor high-rise slab (see figures 3.7-3.9) was the original and basic model of the high-rise slab typologies. In most cases the building would be north south oriented with the outer corridor on the north façade. This standard plan of an outer corridor slab: the 81 MG3 from the “80’s and 81 housing series” is a typical example of this typology.



With the use of the outer-corridor all dwellings would have ample sunlight and natural ventilation and all dwellings were spatially rational and had an efficient design. The main problem with the typology is the corridor itself and the compromise on quality of the rooms located on the north corridor. Grease and smoke from the kitchens would pollute the public corridor. The rooms on the corridor were exposed to the eyes of curious passers-by and would only have indirect light. Especially the lack of privacy is a big problem in Chinese context as privacy is an important value in the vernacular housing. To increase the living comfort in the slabs many updated designs were made in the mid 80's. (Hui 2012, p. 232)

The dwelling design leaves much opportunity for additions as the depth of the slab is still thin. Also the no-stairs apartments could be made elderly friendly. Moreover the long corridors could offer



**AMPLE SUNLIGHT  
+ VENTILATION**

**MOST APARTMENTS HAVE A  
SOUTH ORIENTATION**

**RATIONAL + EFFICIENT  
FLOORPLANS**

**STRENGTHS  
OPPORTUNITIES**

**NO-STAIRS APARTMENT CAN BE  
MADE ELDERLY FRIENDLY**

**COMPOSITION OF CORNER  
DWELLINGS OFFERS OPPORTUNI-  
TY TO EXTEND SIDEWAYS**

**NARROW DEPTH SLAB OFFERS OP-  
PORTUNITIES TO EXTEND DWELLINGS  
WITH ADDITIONS**

**LONG CORRIDOR GIVES MUCH  
PUBLIC CIRCULATION SPACE**

**GRAVE IMPAIRMENT OF PRIVACY  
IN NORTHERN ROOMS NEXT TO  
THE CORRIDOR**

**NORTHERN ROOMS NEXT TO  
THE CORRIDOR ONLY HAVE INDI-  
RECT SUNLIGHT**

**BATHROOM OFTEN ON INSIDE OF  
THE DWELLING**

**WEAKNESSES  
THREATS**

**CLUTTERING OF PUBLIC COR-  
RIDOR DUE TO LACK OF SPACE  
IN APARTMENTS**





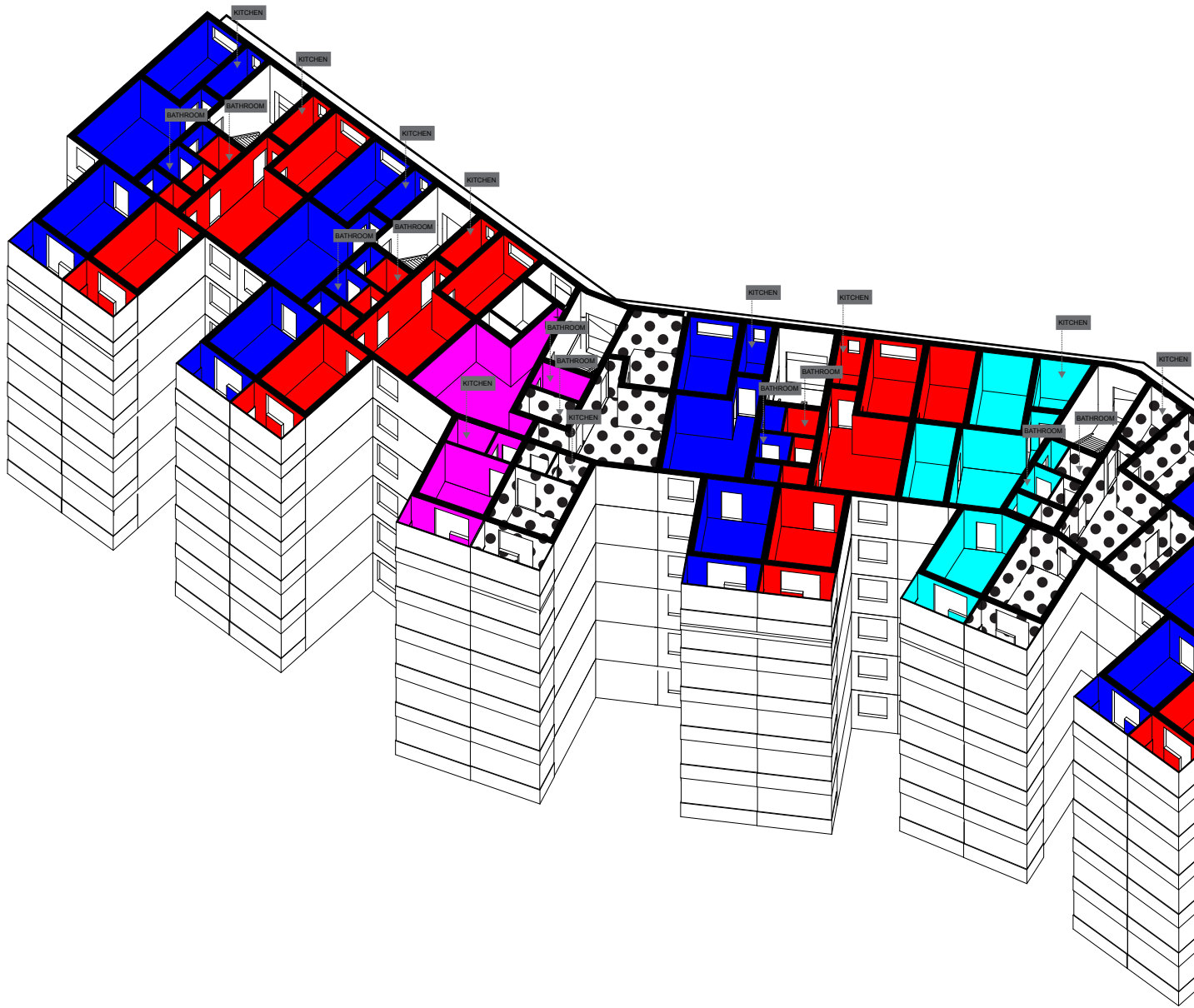
SMELL AND SMOKE POLLUTION IN CORRIDOR

BEDROOM TOO BIG TO MATCH CURRENT DEMANDS

SMALL KITCHEN AND BATHROOM

SMALL DWELLINGS COMPARED TO LATER TYPOLOGIES

Figure 3.9: Axonometric of an outer-corridor high-rise slab typology



**PRIVACY GUARANTEED**

**EVERY DWELLING HAS A SOUTH ORIENTED ROOM**

**STRENGTHS  
OPPORTUNITIES**

**INSIDE LOCATED BATHROOM**

**SMALL WINDOWS ON NORTHERN ROOMS**

**MONOTONE DWELLING LAY-OUT**

**WEAKNESSES  
THREATS**

**NO DIFFERENTIATION IN DWELLING COULD LEAD TO LACK OF SOCIAL DIFFERENTIATION**

room to public or other functions, to compensate for the smaller dwellings.

## 2. *The cross-story high-rise slab.*

To alleviate the problems of the outer corridor slabs, designs were made to minimise the interference of the public corridor with the dwellings. A popular example of this solution is the “cross story corridor” high-rise slab (see figure 3.10-3.12). In this design the bottom floors would not be using an elevator but would be accessed through staircases. The upper floors would be reached by elevator. But instead of the outer corridor being on the same level as the dwelling it would be placed in the middle of two storeys. The corridor would lead to small staircases which would give access to the dwellings of two floors. The dwellings in the upper level would have high windows and the dwellings from the lower level would have low windows. In this way the interference with the corridor was minimised. The only problem in the dwelling was that the smaller windows on the northern rooms would limit the sunlight and ventilation in these rooms (Hui, 2012, p. 233).

With the development of the high-rise typologies there would be an increasing emphasis on density as pressured to alleviate the housing shortage, but also as a financial profit increaser. This means that over time the depth of the slabs increases, forcing the use of external recesses in the floor plan to ensure lighting and ventilation requirements. It is a feature from which it is possible to identify the later generations early high-rises. As the lay-out has already been densified and made more efficient, the design does leave less opportunities to extend or to adjust the dwelling.

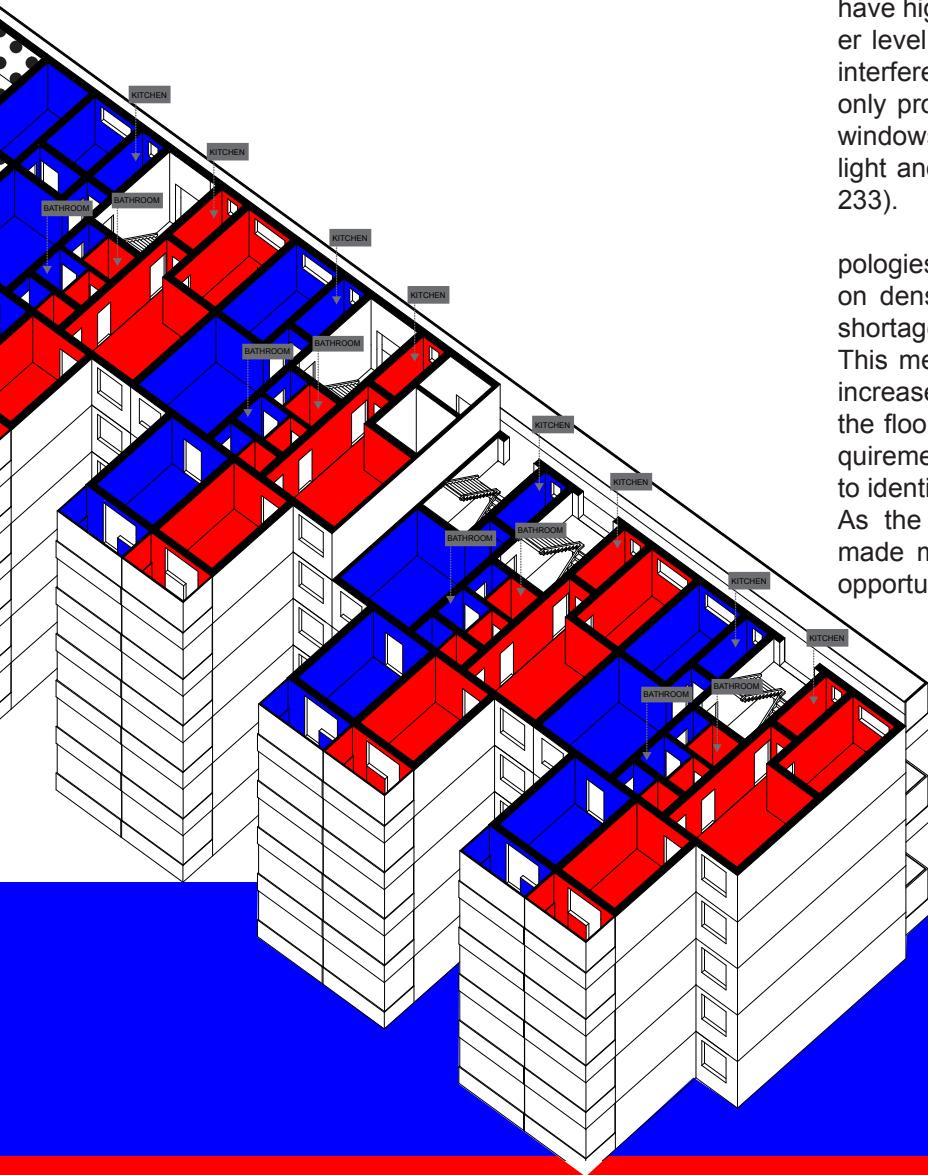
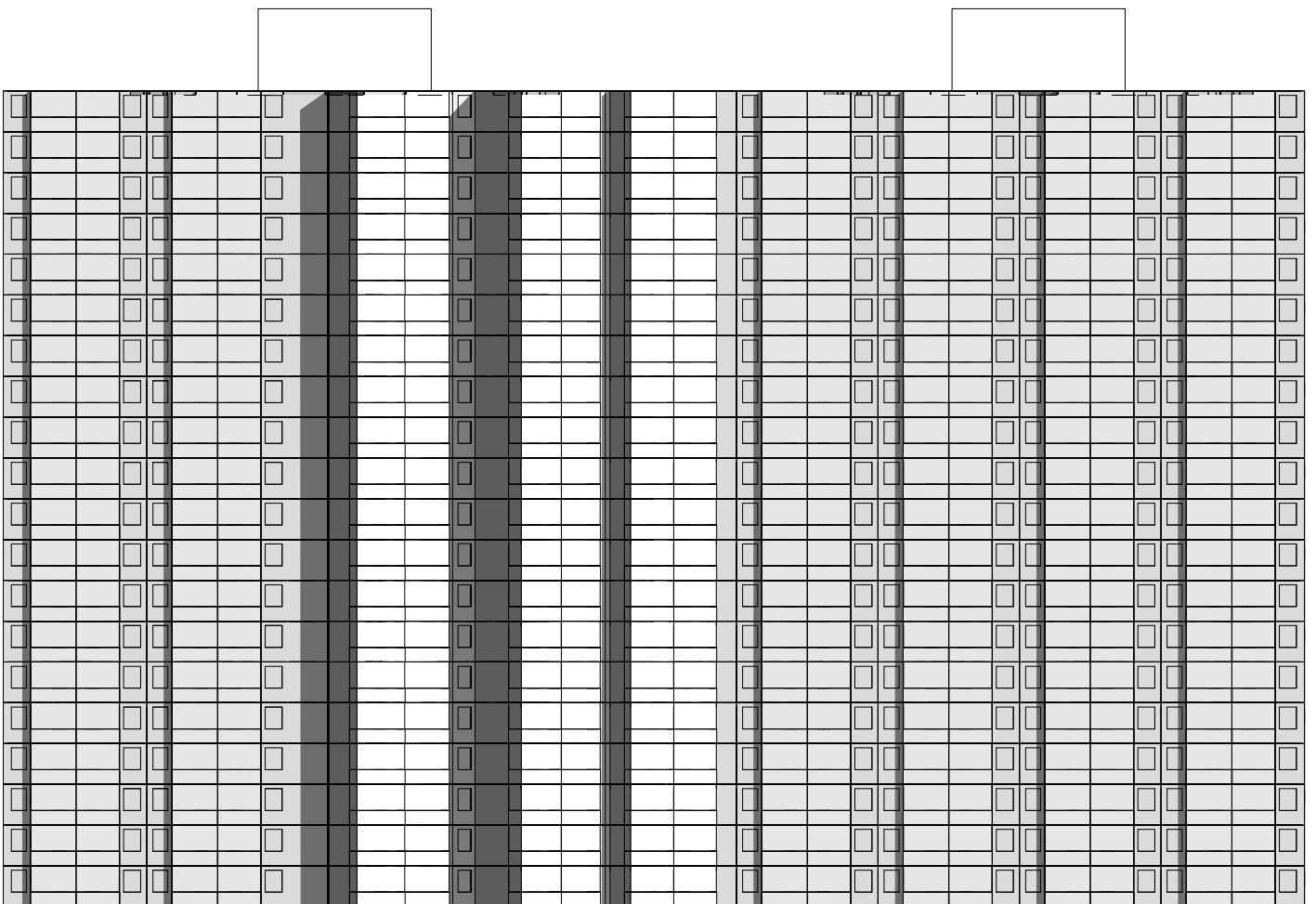
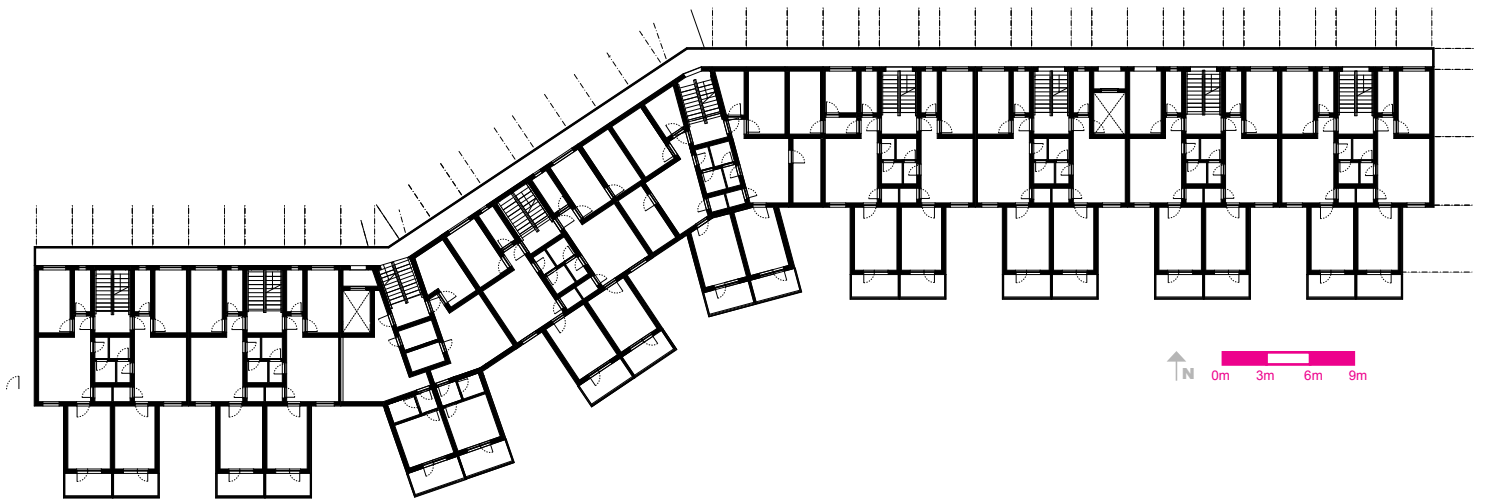


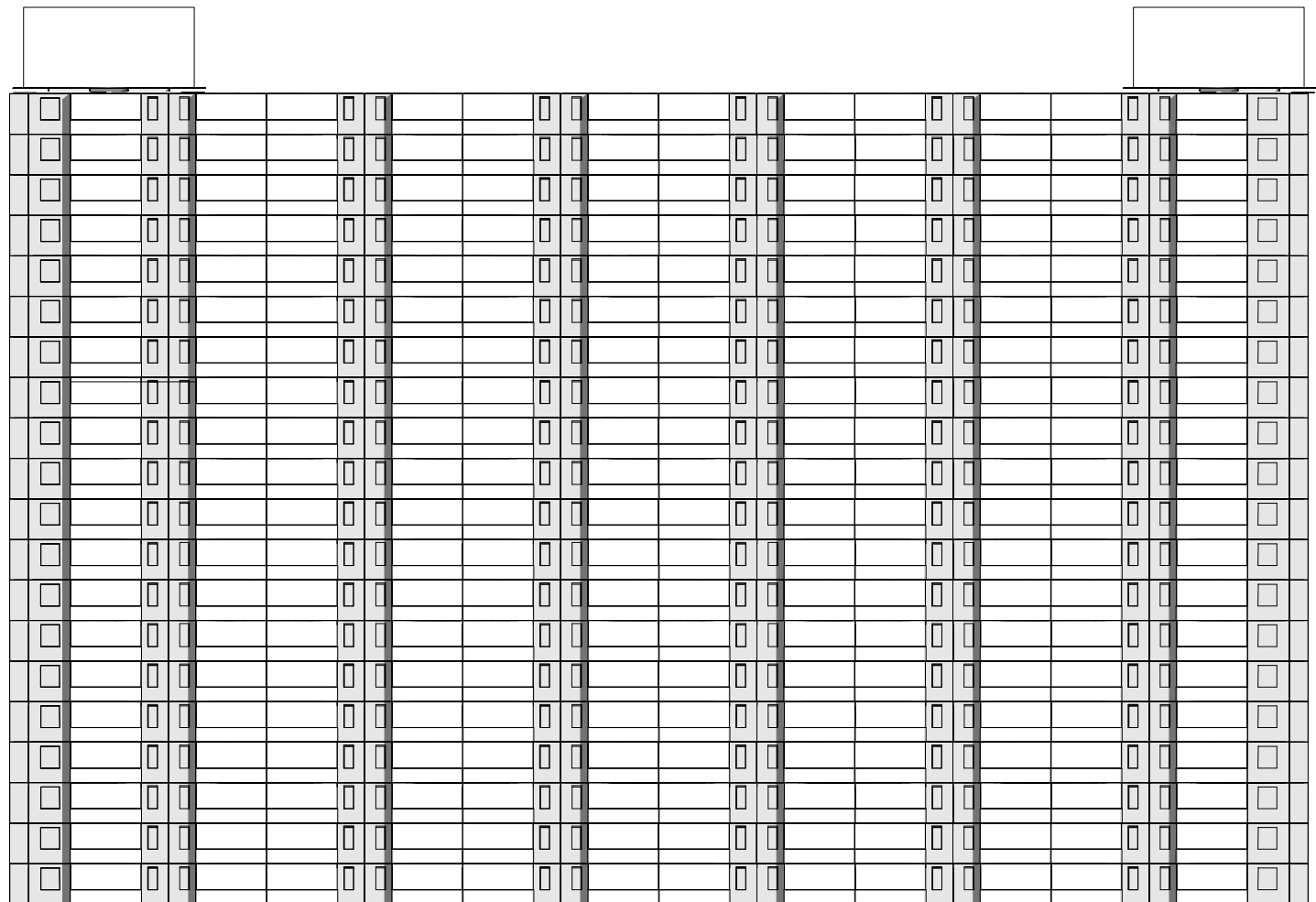
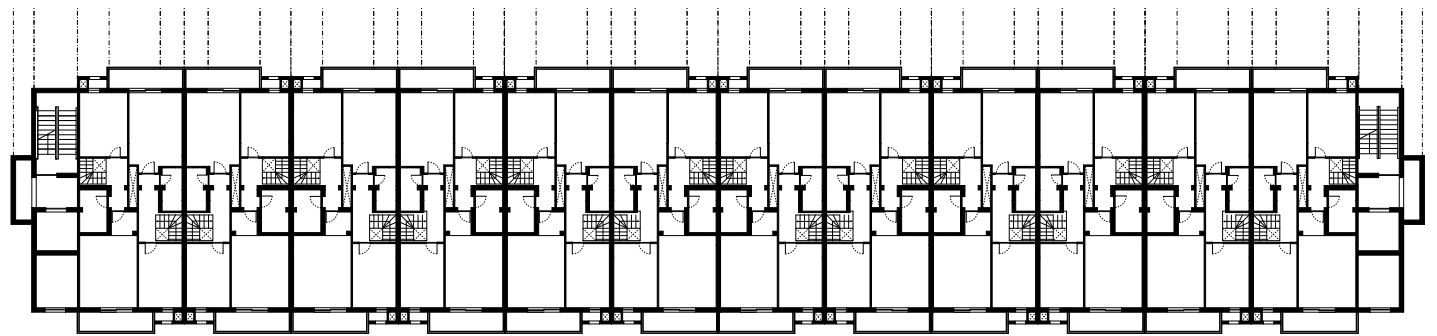
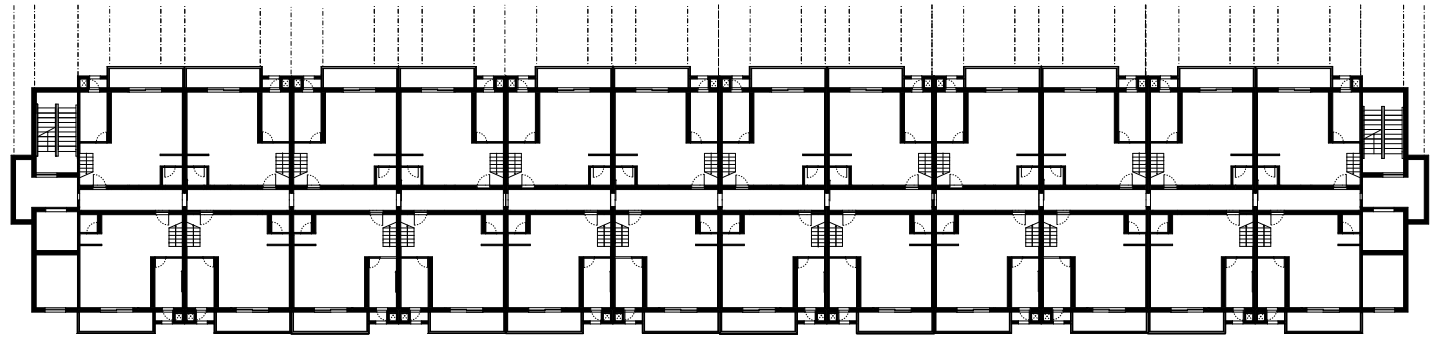
Figure 3.10: Axonometric of a cross-story high-rise slab typology

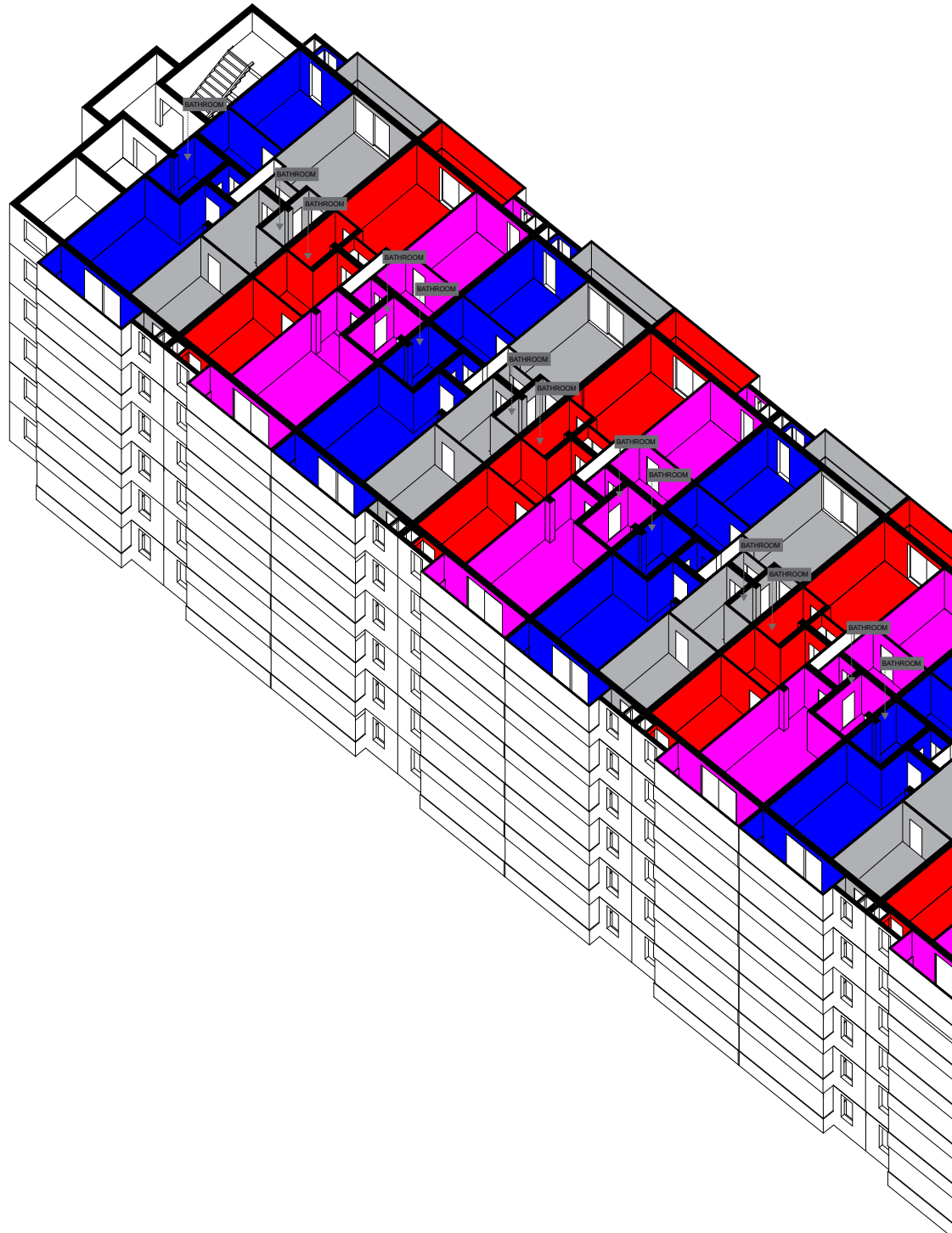
Figure 3.11-3.12: Standard floorplan + elevations of a cross-story high-rise slab typology

Figure 3.13-3.14: Standard floorplan + elevations of an inner-corridor high-rise slab typology









**EVERY DWELLING HAS A SOUTH ORIENTED ROOM**

**INSIDE LOCATED BATHROOM**

**DARK INSIDE CORRIDOR**

**MONOTONE DWELLING LAY-OUT**

**STRENGTHS**

**WEAKNESSES**

**OPPORTUNITIES**

**THREATS**

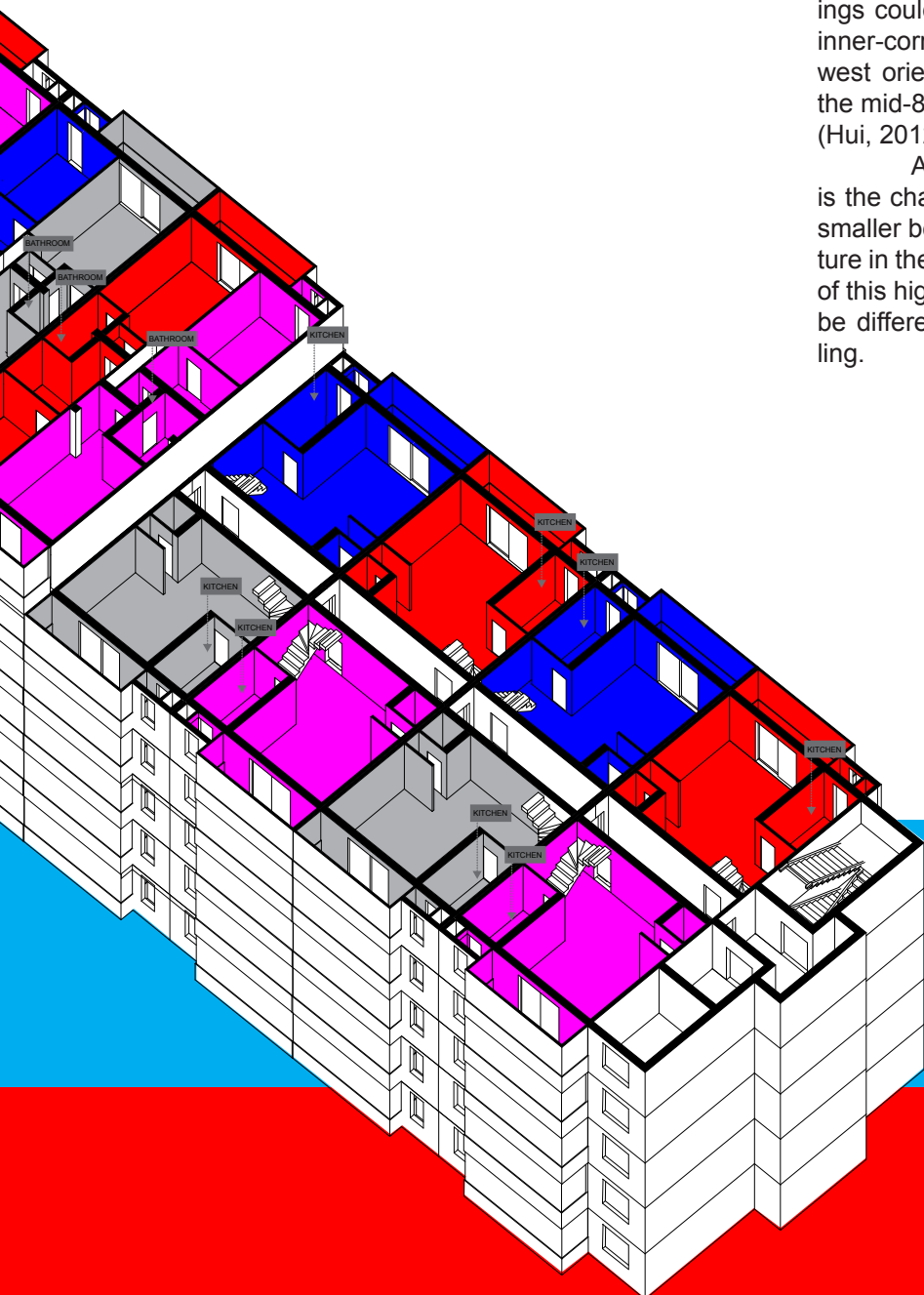
**FACADE AND LAYOUT STILL ALLOW EXTENSION OF THE DWELLING ON SOUTH OR NORTH**

**LAYOUT COULD EASILY BE DIFFERENTIATED**

**FACADE AND LAYOUT STILL ALLOW EXTENSION OF EAST AND WEST**

**NO DIFFERENTIATION IN DWELLING COULD LEAD TO LACK OF SOCIAL DIFFERENTIATION**





### 3. Inner-corridor (duplex) slab

Next to the outer-corridor designs, the inner-corridor slab (see figure 3.13-3.15) was also developed. The problem with the inner corridors and its one-story housing would be that not all dwellings could have a south oriented room. Therefore inner-corridors were used for (less popular) east-west oriented buildings or, as became popular in the mid-80's, would be made with duplex dwellings (Hui, 2012, p.234-235).

Also clearly visible in this high-rise typology is the changing preference for "bigger living room, smaller bedrooms" design which is a dominant feature in the late transitional high-rises. The floor plan of this high-rise is extremely monotonous but could be differentiated by additions or internal remodeling.

Figure 3.15: Axonometric of an inner-corridor high-rise slab typology

### **3.7.2 High-rise towers**

The second typology to be developed was the high-rise tower which has, since its introduction, gained popularity with developers. The tower typology offers more flexibility in the urban design with the motive to increase densities: towers can be used on smaller inner-city plots and can be placed closer to each other to comply with natural lighting code (Hui, 2012, p.211 -236). Furthermore the development of the elevator and reduction of their costs would stimulate the future usage of the tower even further, even though they would remain less popular than the slabs.

Also in the floor plan of the tower there is a huge development noticeable (see figure 3.16), even within the first generation of high-rises, to increase the efficiency, profit, and comfort (Lü et al., 2001, p.244-245).



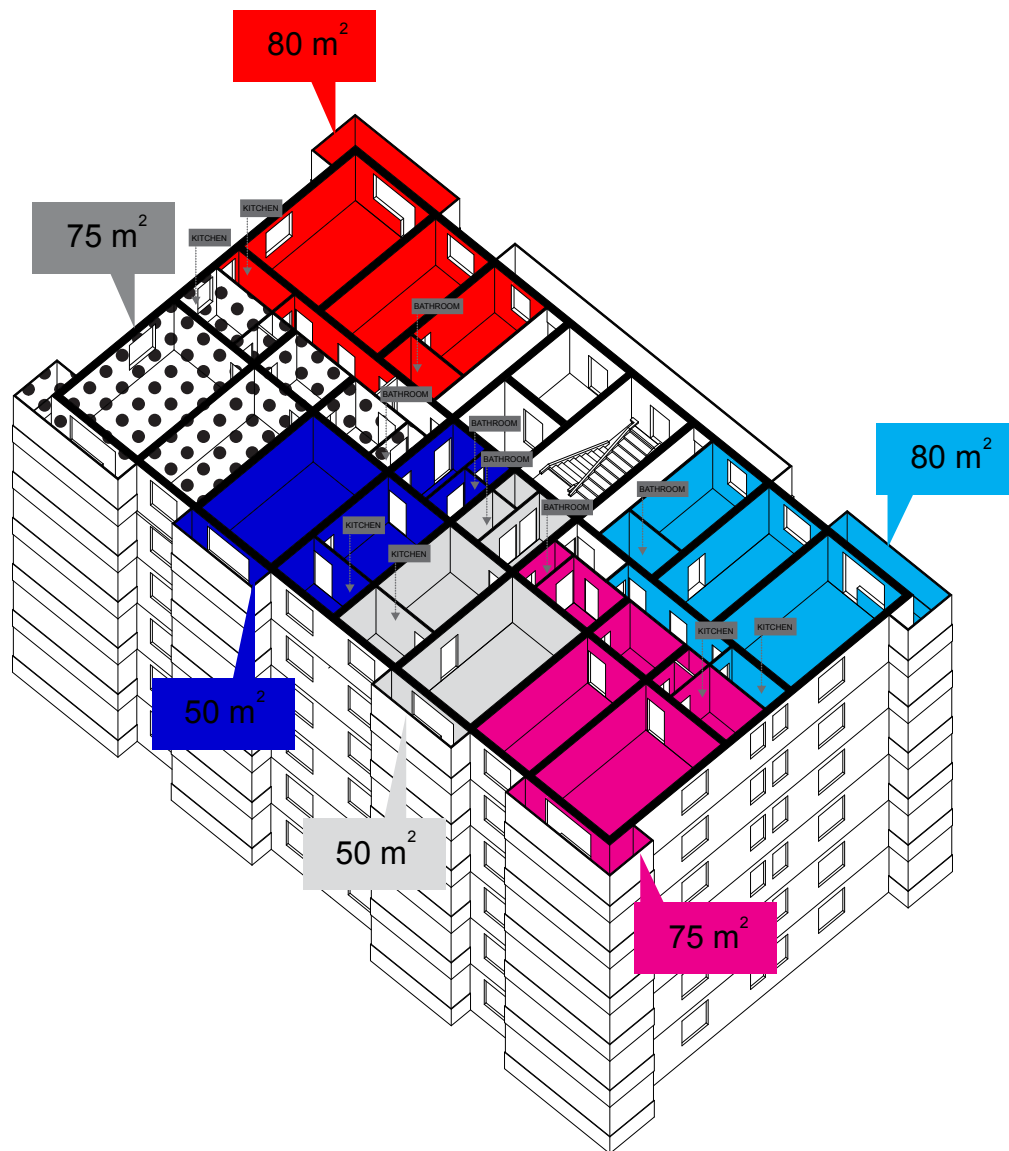
Figure 3.16: Examples of different high-rise tower typologies:

1. Rectangular high-rise tower in north Beijing
2. Z-shaped high-rise tower in centre of Beijing
3. A П-shaped high-rise tower in north Beijing
4. A П-shaped high-rise tower in north Beijing
5. Adjusted cross-shaped high-rise tower in centre of Beijing
6. Adjusted cross-shaped high-rise tower in north Beijing
7. Adapted x-shaped high-rise tower in north Beijing
8. A Y-shaped high-rise tower in north Beijing

9. A Y-shaped high-rise tower in north Beijing
10. A butterfly-shaped high-rise tower in north Beijing
11. A frog-shaped high-rise tower in centre south of Beijing
12. A frog-shaped high-rise tower in north Beijing

- introduced typologies in first generation
- introduced typologies in early transitional generation
- introduced typologies in late transitional generation



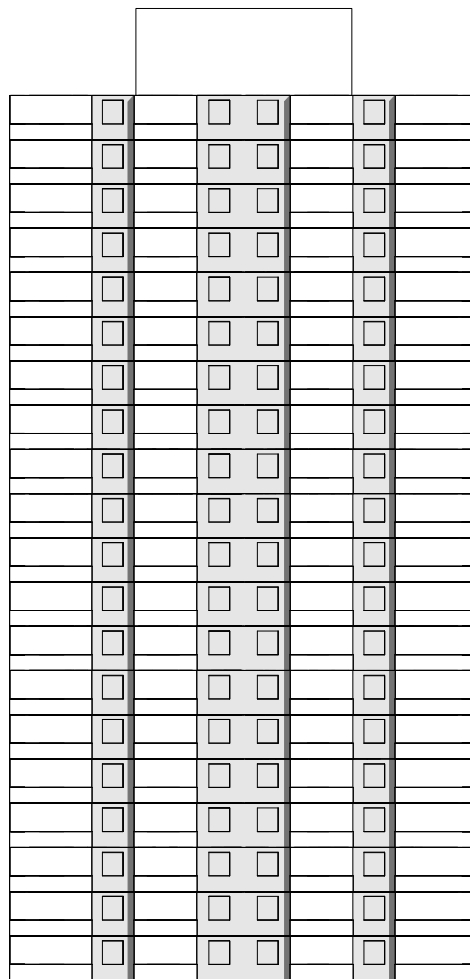
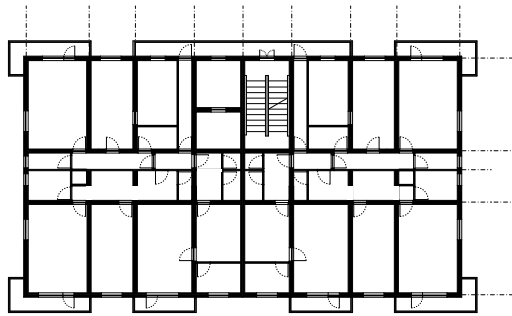


### 1. The rectangular high-rise tower

The most economical floor plan would be the rectangular high-rise tower (see figures 3.17-3.19) with the ratio from 1:1 to 1:1.5. All of the apartments in this type are relatively big but still follow the big bedroom model. Also an issue is the location of the wet cells, as most bathrooms are located on the inside and are poorly ventilated. Furthermore the apartments on the north side of the tower would not have the preferred room on south. This high-rise does offer opportunities to the future as the narrow depth could allow for extensions and all apartments could be made suitable for elderly.

Figure 3.17: Axonometric of a standard rectangular high-rise typology

Figure 3.18-3.19: floorplan + elevation of a standard rectangular high-rise typology



**BIG DWELLINGS**

**INSIDE LOCATED BATHROOMS**

**SMALL KITCHEN AND BATHROOM**

**MANY DWELLINGS DO NOT HAVE A SOUTH ORIENTATION**

**BEDROOM TOO BIG TO MATCH CURRENT DEMANDS**

**STRENGTHS  
OPPORTUNITIES**

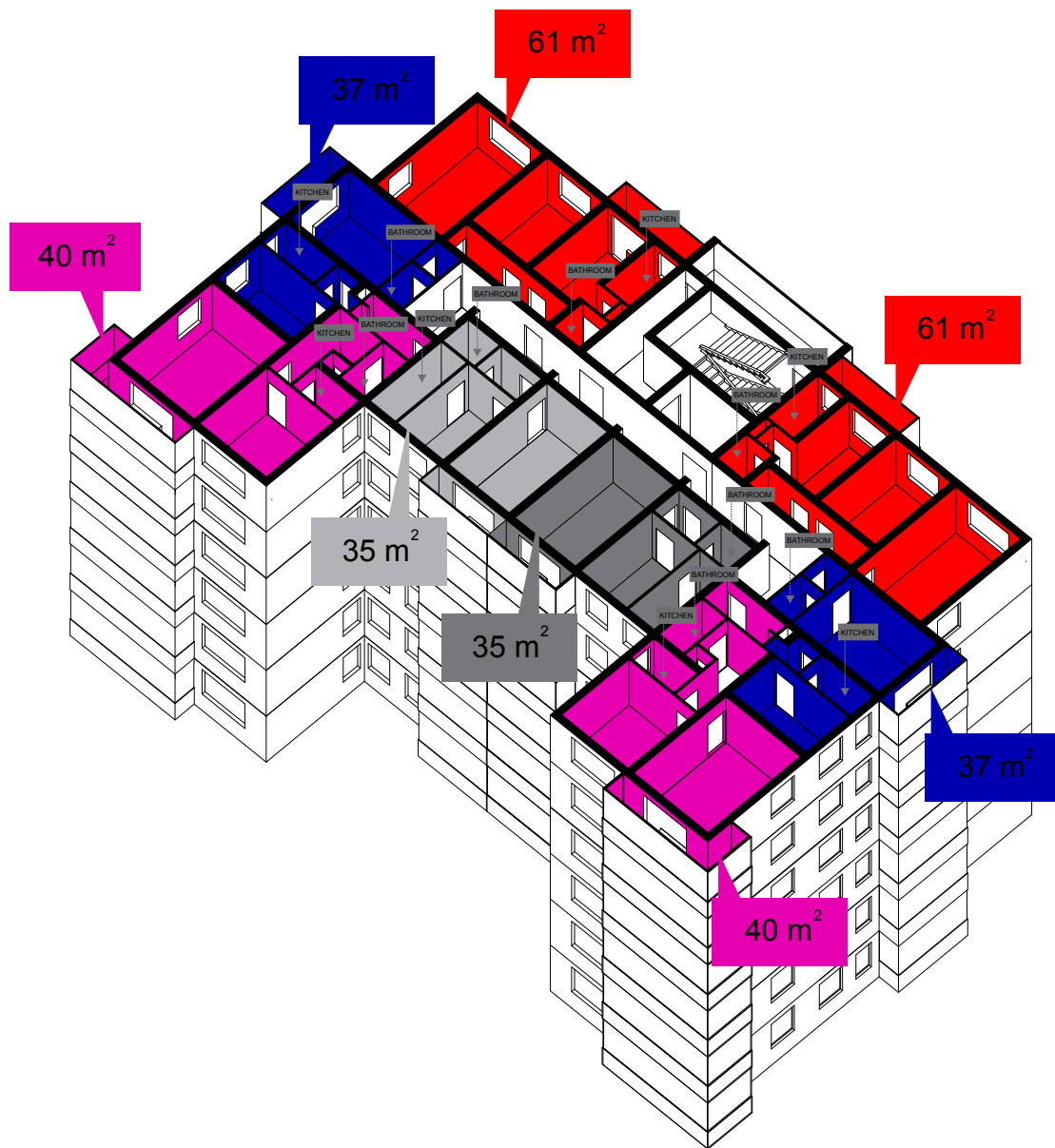
**WEAKNESSES  
THREATS**

**NO-STAIRS APPARTMENT CAN BE MADE ELDERLY FRIENDLY**

**NARROW DEPTH SLAB OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**

**ONLY ONE ELEVATOR COULD BE RISKY WHEN DENSITY INCREASES DUE TO SUBDIVISIONS AND ADDITIONS**

**ONLY ONE ESCAPE ROUTE DURING INCIDENTS**



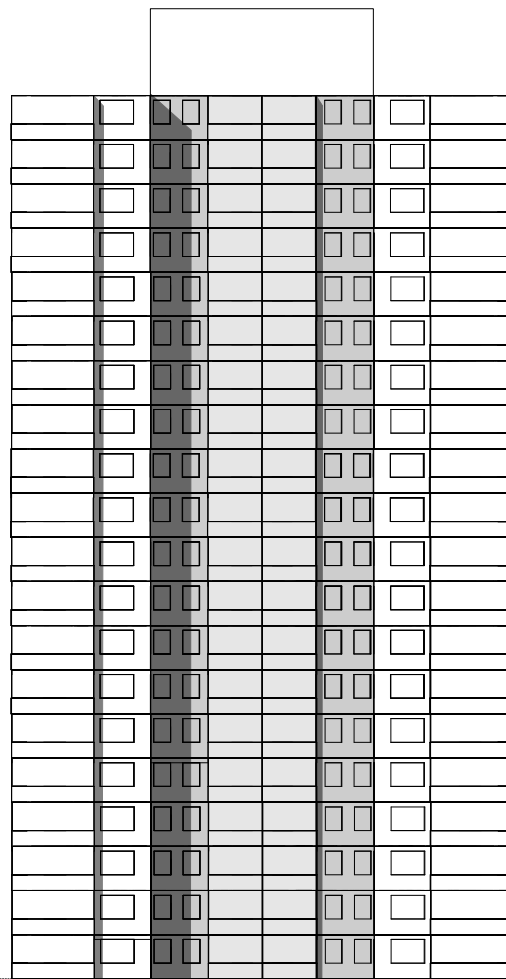
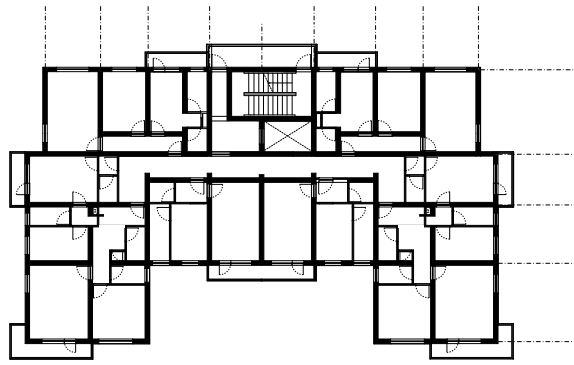
*2+3 The Π-shaped high-rise and the Z-shaped high-rise tower*

Amongst the first generation typologies are the Π-shaped (see figures 3.20-3.22) high-rise and the Z-shaped high-rise (see figures 3.23-3.25). They managed to increase the amount of rooms with a south orientation but still left dwellings without a room on the south or many rooms on east or west. Furthermore many of the service rooms (kitchen, bathrooms) in these typology are located on the inside of the building. Especially with the poorly installed and maintained ventilation systems this becomes more and more problematic. Another

*Figure 3.20: Axonometric of a standard Pi-shaped high-rise typology*

*Figure 3.21-3.22: floorplan + elevation of a standard Pi-shaped high-rise typology*





**DIFFERENTIATION IN DWELLING TYPES**

**STRENGTHS OPPORTUNITIES**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**AMPLE CIRCULATION SPACE COULD OFFERS SPACE FOR OTHER FUNCTIONS**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**

**INSIDE LOCATED BATHROOMS**

**SMALL DWELLINGS COMPARED TO LATER TYPOLOGIES**

**SMALL KITCHEN AND BATHROOM**

**WEAKNESSES THREATS**

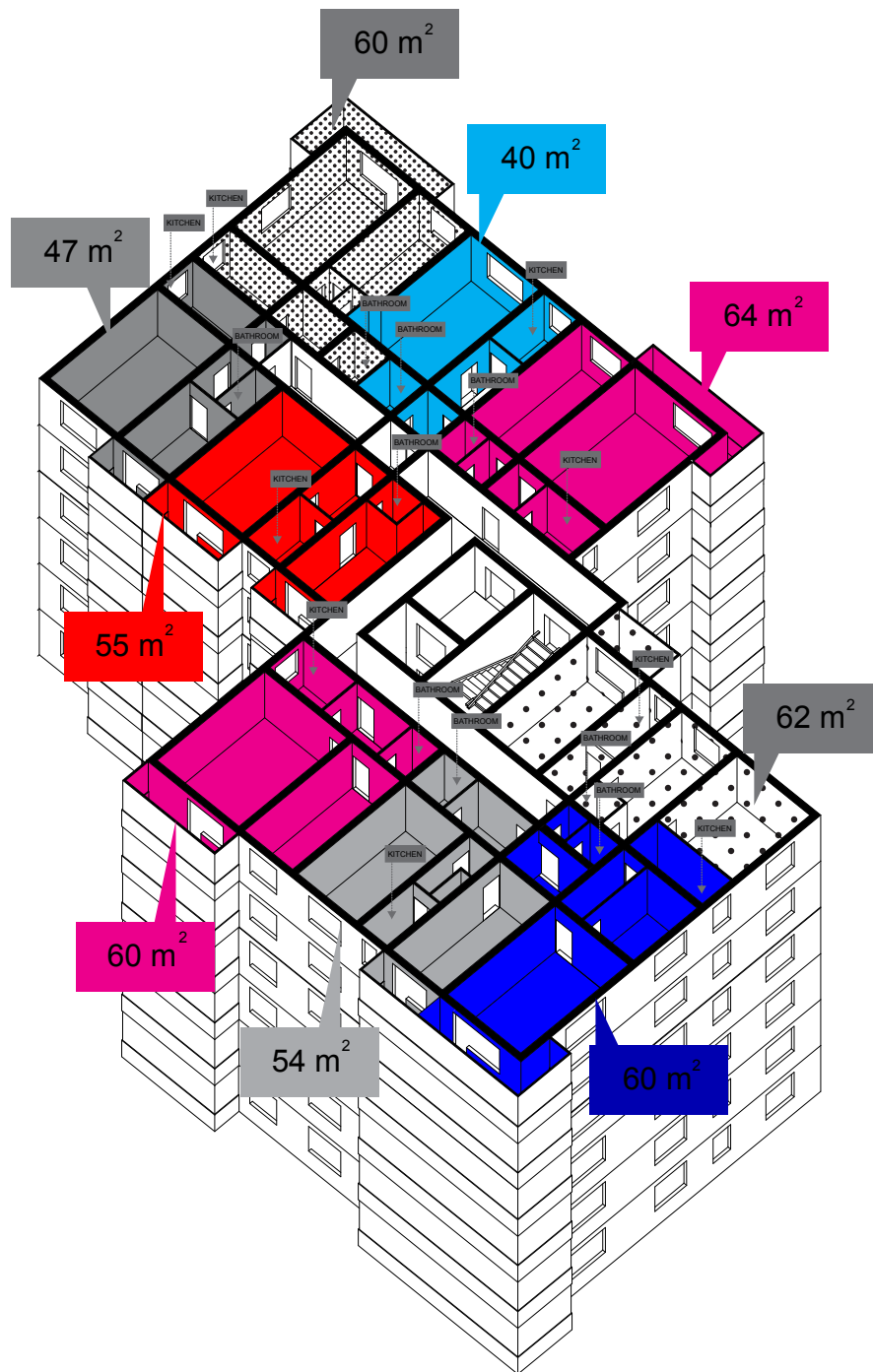
**ONLY ONE ELEVATOR COULD BE RISKY WHEN DENSITY INCREASES DUE TO SUBDIVISIONS AND ADDITIONS**

**MANY DWELLINGS DO NOT HAVE A SOUTH ORIENTATION**

**BEDROOM TOO BIG TO MATCH CURRENT DEMANDS**

**ONLY ONE ESCAPE ROUTE DURING INCIDENTS**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**

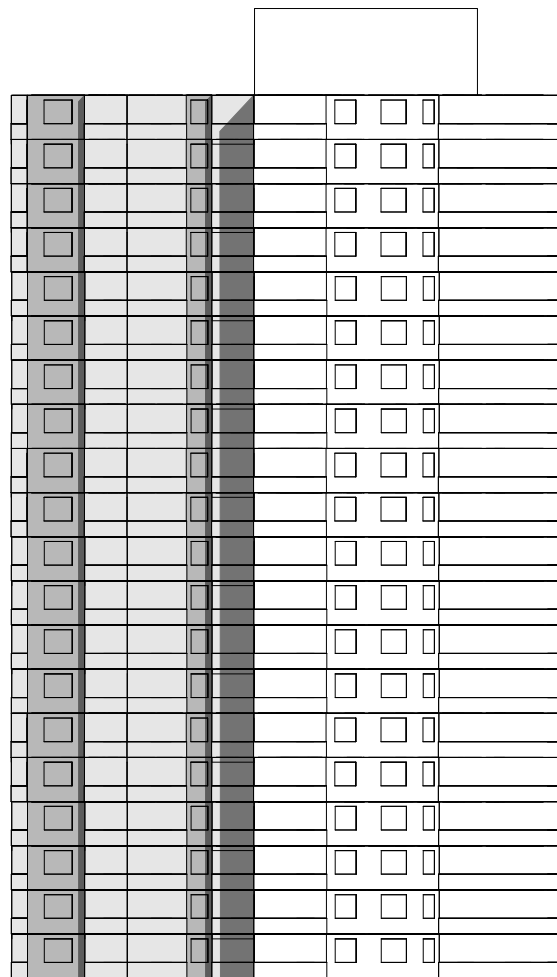
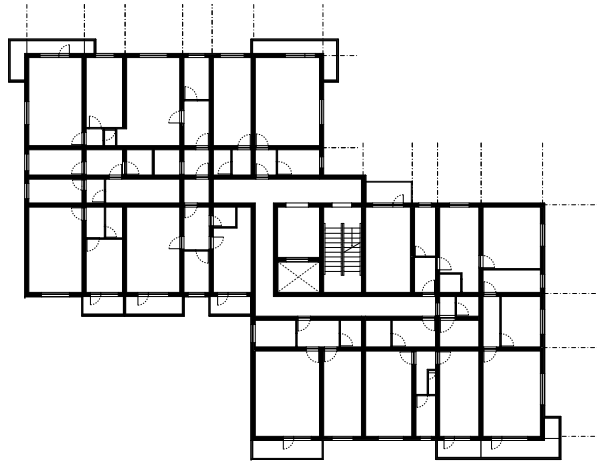


problem, which is true for all the high-rise types in the first generation is the lack of planned escape routes. Especially dangerous if this is combined with cluttered hallways, as people have no room to store in their dwelling. If emergency escape routes have not been added during construction some other route must be added.

Both tower typologies do have much more circulation space which could offer opportunities to create efficient storage or community spaces in the building. This could compensate for the smaller apartments

Figure 3.23: Axonometric of a standard Z-shaped high-rise typology

Figure 3.24-3.25: floorplan + elevation of a standard Z-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**HIGH-DENSITY**

**STRENGTHS OPPORTUNITIES**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**AMPLE CIRCULATION SPACE COULD OFFER SPACE FOR OTHER FUNCTIONS**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**

**INSIDE LOCATED BATHROOMS**

**BEDROOM TOO BIG TO MATCH CURRENT DEMANDS**

**SMALL DWELLINGS COMPARED TO LATER TYPOLOGIES**

**SMALL KITCHEN AND BATHROOMNY DWELLINGS DO NOT HAVE A SOUTH ORIENTATION**

**WEAKNESSES**

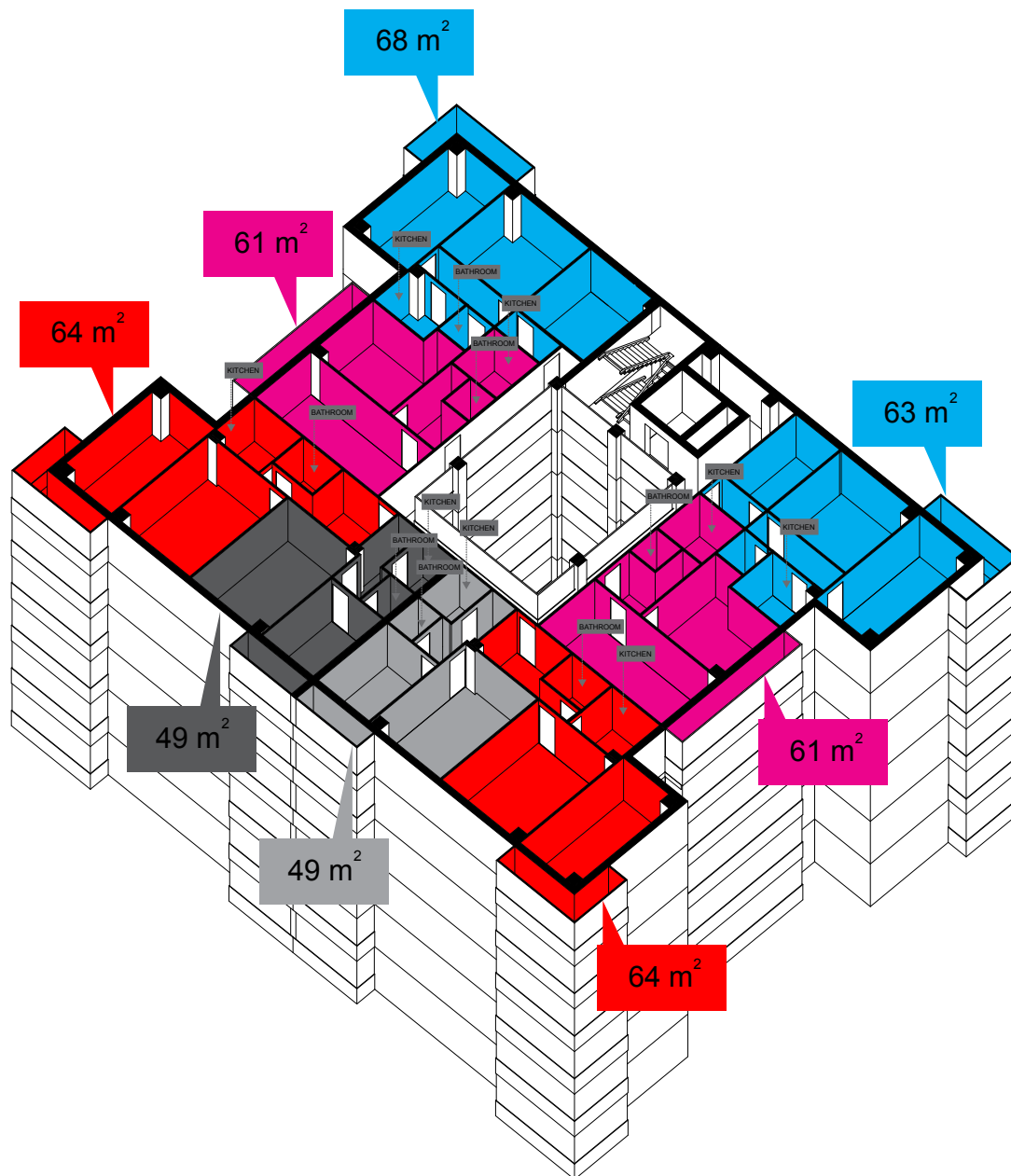
**THREATS**

**ONLY ONE ELEVATOR COULD BE RISKY WHEN DENSITY INCREASES DUE TO SUBDIVISIONS AND ADDITIONS**

**ONLY ONE ESCAPE ROUTE DURING INCIDENTS**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**





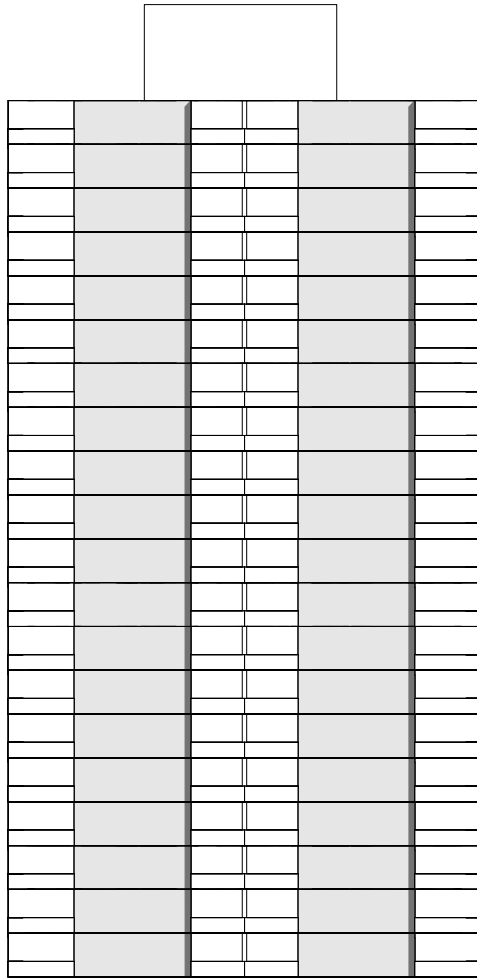
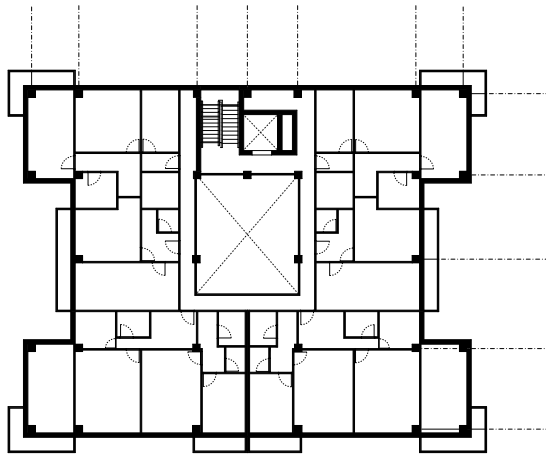
#### 4. Inner patio tower

In the inner patio tower typology (see figures 3.26-3.28) the kitchen, bathrooms and public corridor would be located around the patio. This layout greatly improved the ventilation of the tower typology and the lighting in all the rooms. However, just as the outer corridor slab designs the inner patio and surrounding rooms had problems (Hui, 2012, p.237). The corridor caused privacy issues. The smoke and cooking smell would pollute the corridor and patio. The rooms around corridor would only have indirect light and the lower floors would have almost no light. Finally the inner patios would be poorly maintained and became dirty parts of

the building (Lü et al., 2001, p.206). The patio, although currently an eye sore could be redesigned to give place to other functions and could become the beating heart of the building.

Figure 3.26: Axonometric of a standard inner-patio high-rise typology

Figure 3.27-3.28: floorplan + elevation of a standard inner-patio high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**BETTER LIGHT AND VENTILATION THAN PREVIOUS DESIGNS**

**STRENGTHS**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS AND PLACE ADDITIONS**

**NEGLECTED PATIO COULD BECOME FUNCTIONAL HEART OF THE BUILDING**

**OPPORTUNITIES**

**AMPLE CIRCULATION SPACE COULD OFFER SPACE FOR OTHER FUNCTIONS**

**INSIDE LOCATED BATHROOMS**

**SMALL DWELLINGS COMPARED TO LATER TYPOLOGIES**

**SMOKE AND SMELL POLLUTED CORRIDOR**

**SMALL KITCHEN AND BATHROOM**

**WEAKNESSES**

**THREATS**

**ONLY ONE ELEVATOR COULD BE RISKY WHEN DENSITY INCREASES DUE TO SUBDIVISIONS AND ADDITIONS**

**BEDROOM TOO BIG TO MATCH CURRENT DEMANDS**

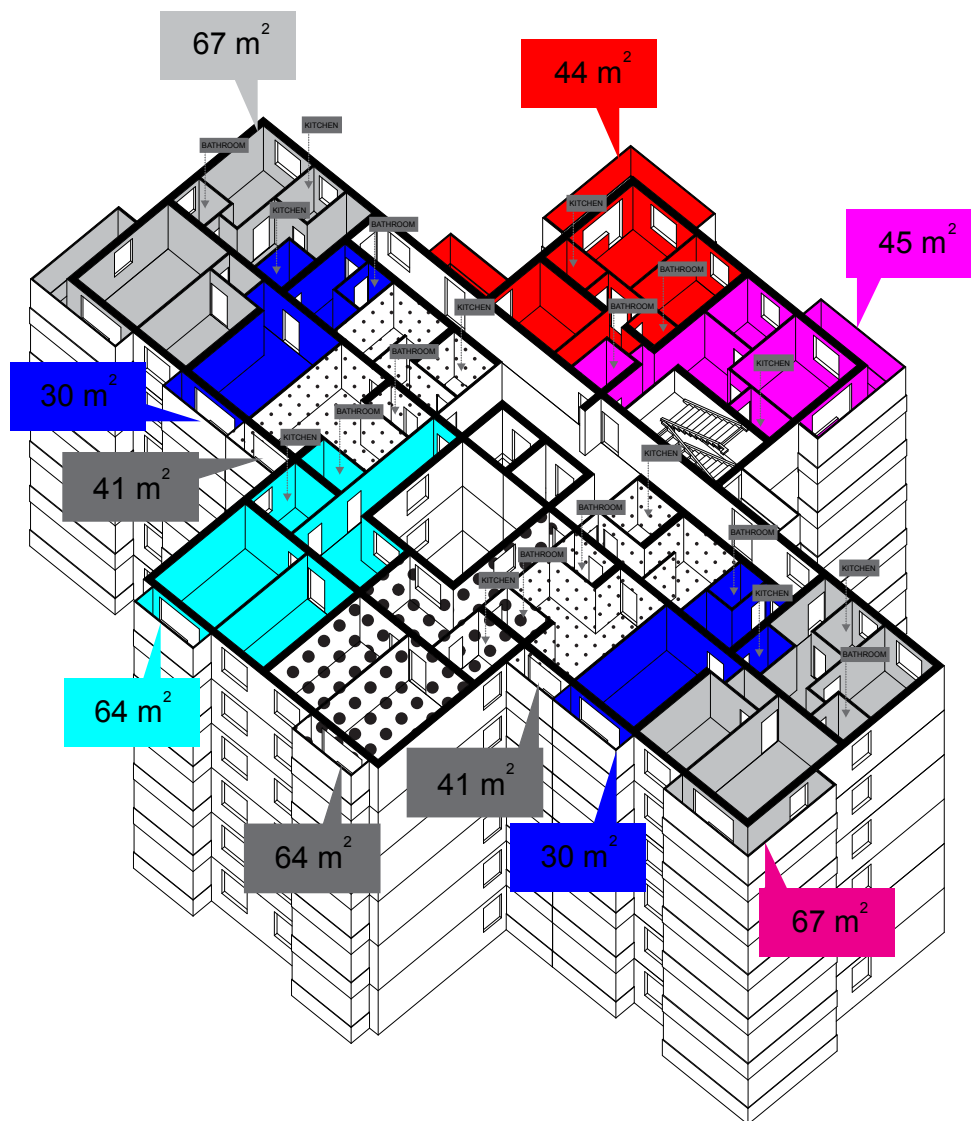
**INSIDE LOCATED ROOMS ONLY HAVE INDIRECT SUNLIGHT**

**LOWER DWELLINGS HAVE NO LIGHT**

**MANY DWELLINGS DO NOT HAVE A SOUTH ORIENTATION**

**ONLY ONE ESCAPE ROUTE DURING INCIDENTS**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**

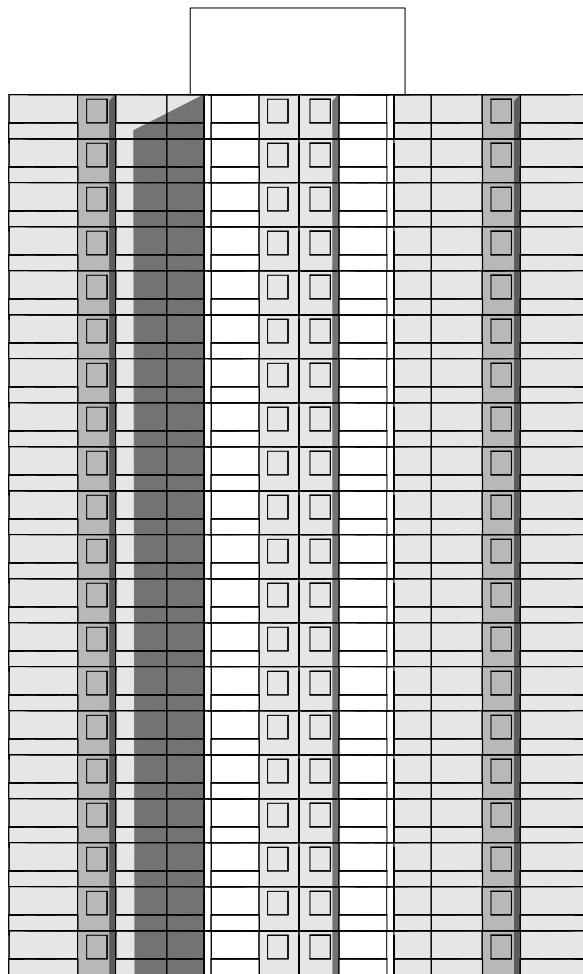
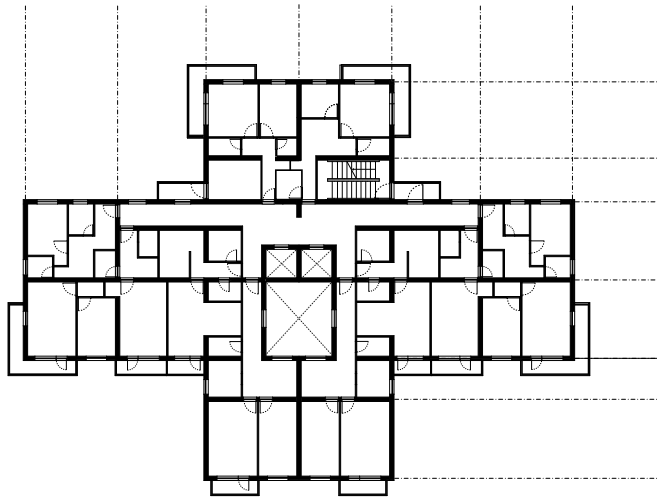


### 5. cross-shaped tower

The cross-shaped high-rise tower typology (3.29-3.31) enlarged the amount of dwellings with direct sunlight (south orientation). Roughly 80% of the dwellings would have at least one room facing the south. Also due to the shape natural ventilation would be ensured for all rooms. However the northern apartments were really disadvantaged as they did not have any room facing south and their windows on the east and west would be in the shadows of the eastern and western wings. (Hui, 2012, p.238).

Figure 3.29: Axonometric of a standard cross-shaped high-rise typology

Figure 3.30-3.31: floorplan + elevation of a standard cross-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**BETTER LIGHT AND VENTILATION THAN PREVIOUS DESIGNS**

**STRENGTHS**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**AMPLE CIRCULATION SPACE COULD OFFER SPACE FOR OTHER FUNCTIONS**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**

**NEGLECTED PATIO COULD BECOME FUNCTIONAL HEART OF THE BUILDING**

**OPPORTUNITIES**

**INSIDE LOCATED BATHROOMS AND KITCHENS**

**SMALL DWELLINGS COMPARED TO LATER TYPOLOGIES**

**SMALL KITCHEN AND BATHROOM**

**WEAKNESSES**

**THREATS**

**ONLY ONE ESCAPE ROUTE DURING INCIDENTS**

**BEDROOM TOO BIG TO MATCH CURRENT DEMANDS**

**PATIO IS DIRTY**

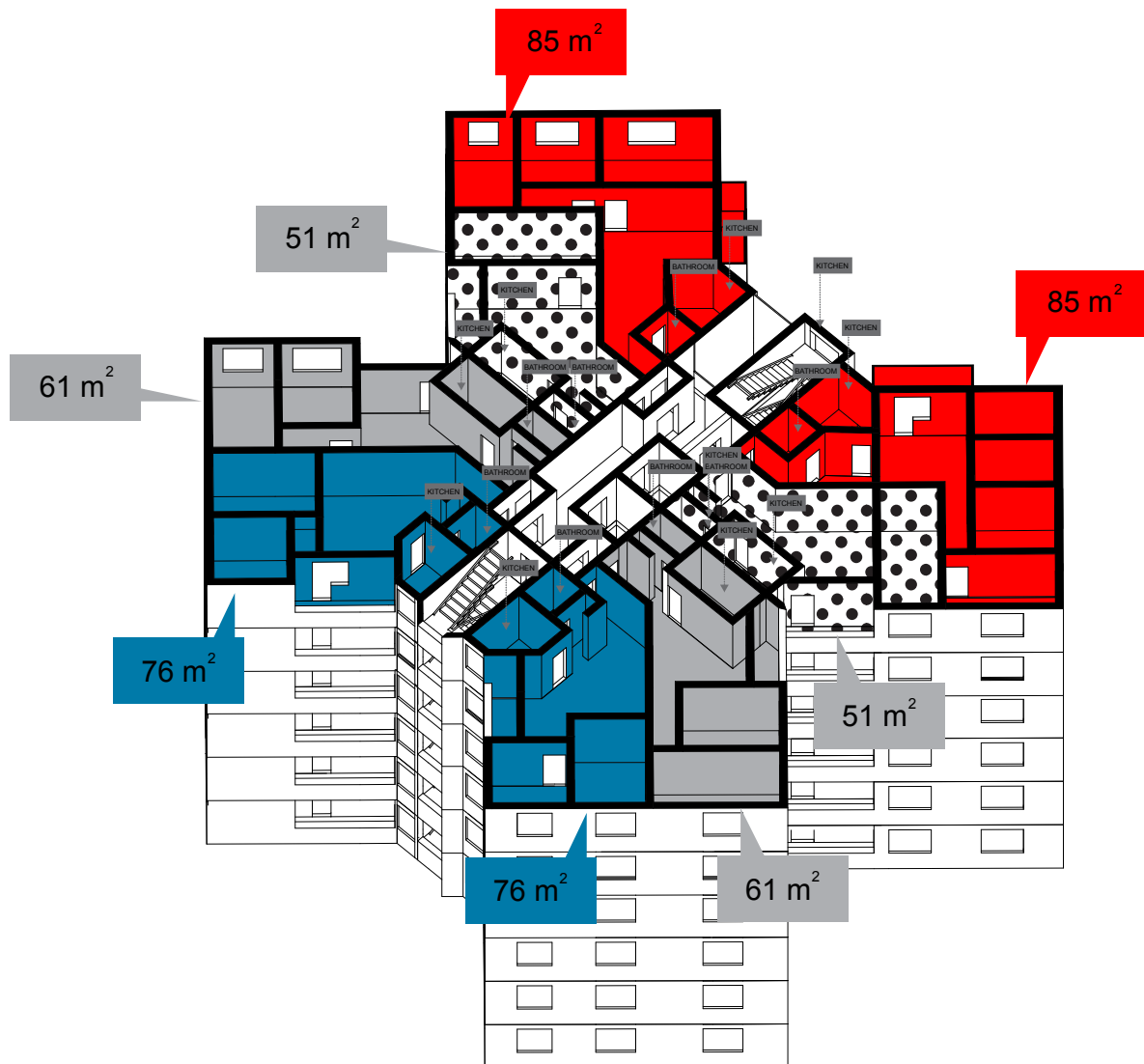
**VISUAL INTERFERENCE THROUGH INNER PATIO**

**LOWER DWELLINGS HAVE NO LIGHT**

**SOME DWELLINGS DO NOT HAVE A SOUTH ORIENTATION**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**





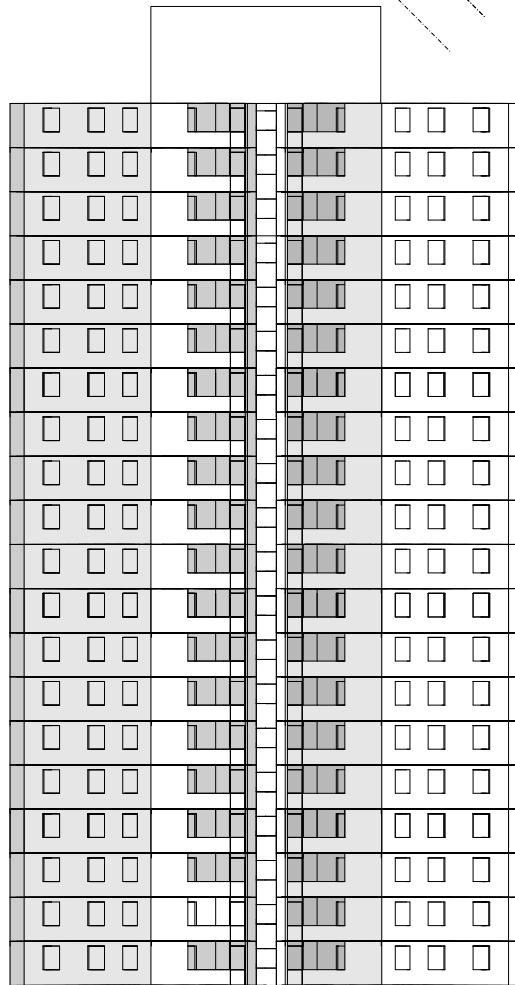
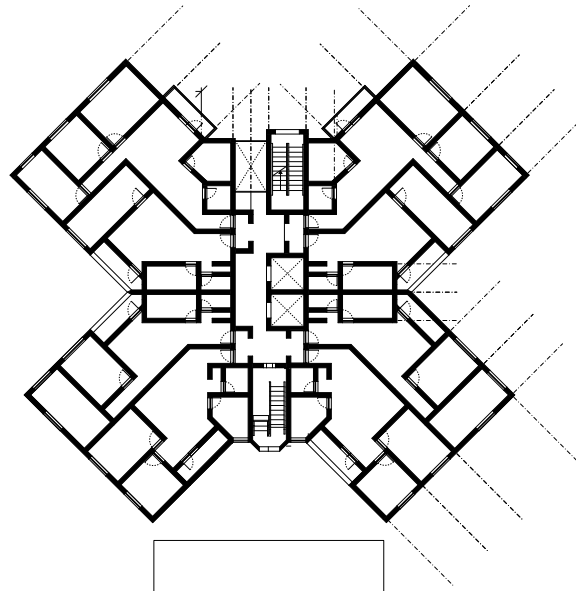
### 6. The x-shaped tower

The x-shaped high-rise (see figures 3.32-3.34) rotated the cross-shape by 45 degrees. All rooms would now have direct sunlight, but none really had the real south orientation. The x-shape did shorten the corridor significantly to the former typologies shortening (wasteful) circulation area.

Typical to note is that development in the types is vast and standards are rising, however systematically the bathroom and kitchen are dimensioned small which results in impractical spreading of kitchen appliances through the house.

Figure 3.32: Axonometric of a standard X-shaped high-rise typology

Figure 3.33-3.34: floorplan + elevation of a standard X-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**ALL DWELLINGS HAVE DIRECT SUNLIGHT**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS ON EACH END OF THE FOUR WINGS**

**STRENGTHS OPPORTUNITIES**

**INSIDE LOCATED BATHROOMS**

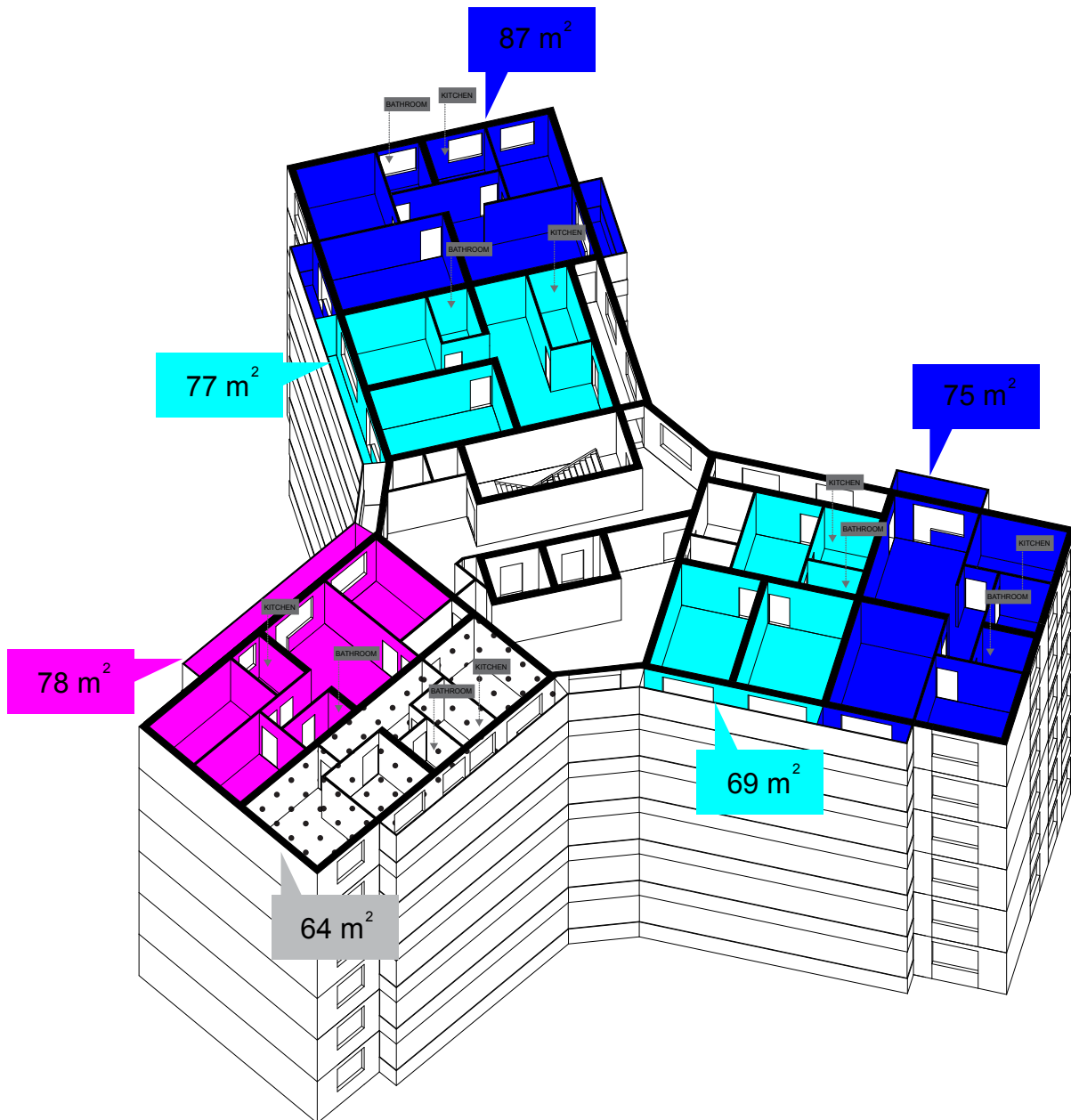
**SMALL KITCHEN AND BATHROOM**

**WEAKNESSES THREATS**

**LIVINGROOM HAS A STRANGE SHAPE**

**NO DWELLINGS HAVE A REAL SOUTH ORIENTATION**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**

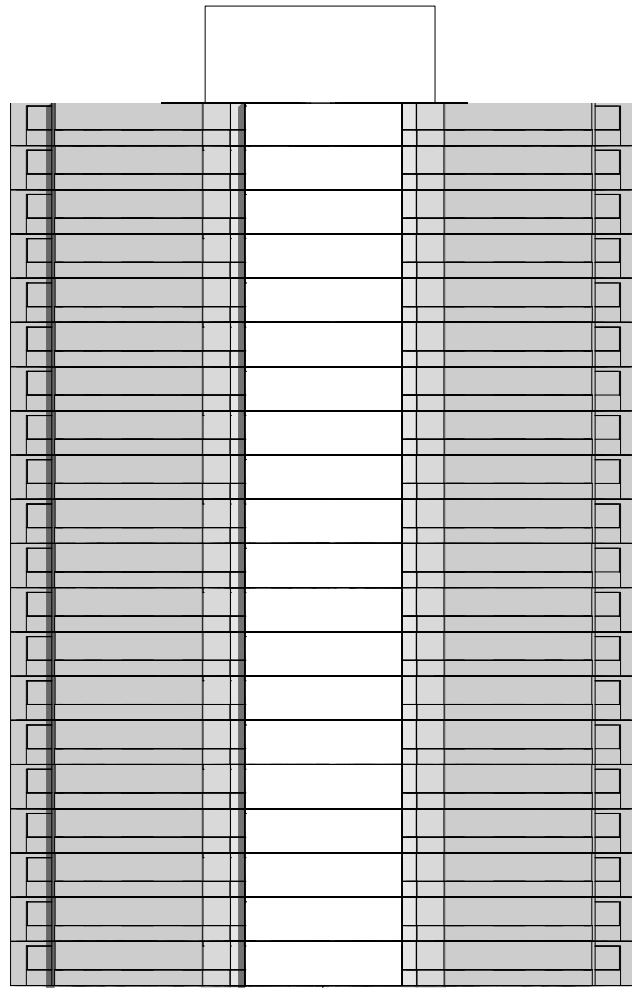
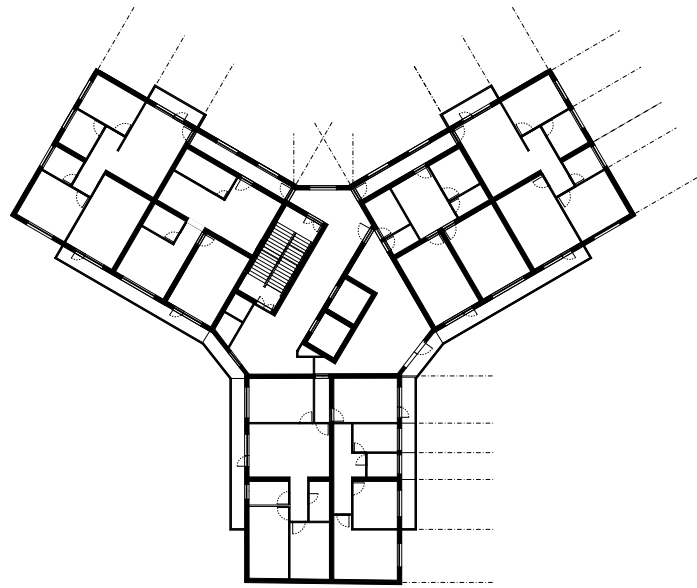


### 7. The Y-shaped tower

The Y-shape high-rise tower (3.35-3.37) was constructed in large numbers between 1980 and 1990. The shape ensured that all dwellings did have the desired southern orientation and ventilation for all rooms would be guaranteed. However the floor plan is much less compact than the other designs and thus was not ideal for saving land and raising densities (Hui, 2012, p.238). Although the typology was discontinued it offers loads of opportunities to adapt the dwellings and remains a good standard until today.

Figure 3.35: Axonometric of a standard Y-shaped high-rise typology

Figure 3.36-3.37: floorplan + elevation of a standard Y-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**BIG DWELLINGS**

**ALL DWELLINGS HAVE DIRECT SUNLIGHT AND SOUTH ORIENTATION**

**REASONABLE KITCHEN AND BATHROOM**

**STRENGTHS OPPORTUNITIES**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**DESIGN OFFERS OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**

**LOW DENSITY COMPARED TO OTHER TYPES**

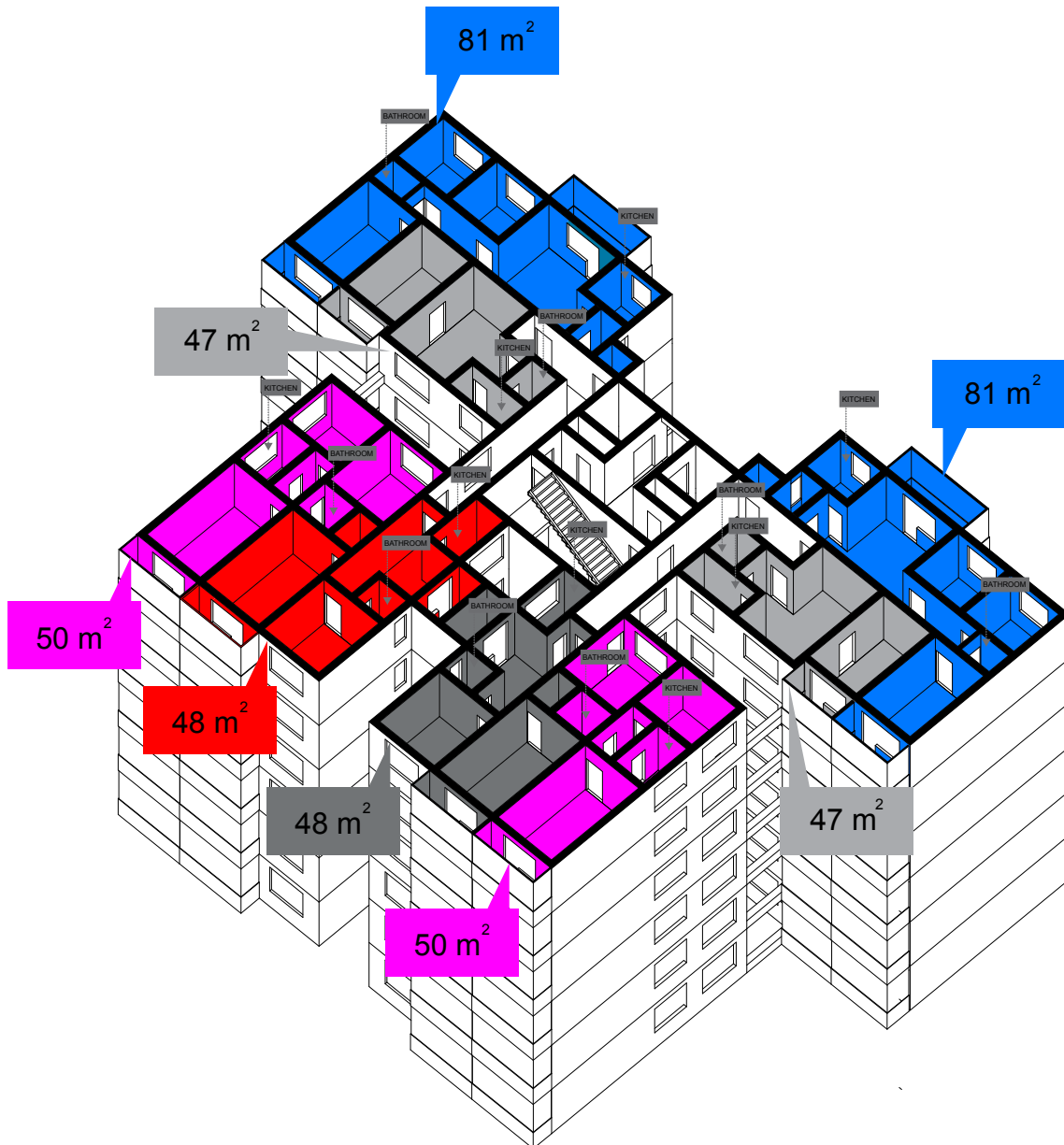
**INSIDE LOCATED BATHROOMS AND KITCHENS**

**WASTFULLY BIG CIRCULATION AREA**

**WEAKNESSES THREATS**

**NEGLECTED PUBLIC SPACE**





### 8. The butterfly shaped tower

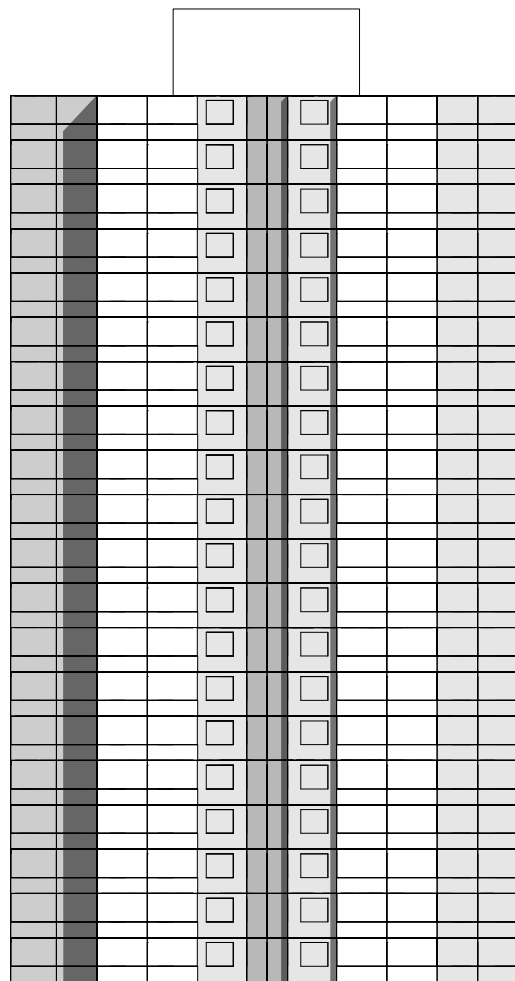
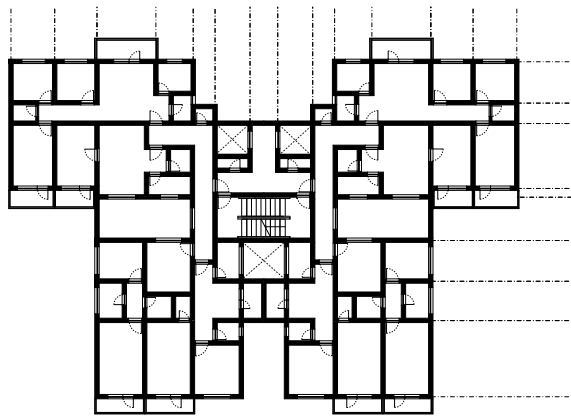
As the pressure on housing density increased, as well as the demand for higher housing standards new typologies would be developed. As with the slabs the “bigger living room, smaller bedrooms” model would be adopted. To raise the density in the towers, the tower depth had to increase, resulting in the need for external recesses. One of the examples is the butterfly shaped tower typology (see figures 3.38-3.40) which became mainstream in the later transitional period (1990’s). The butterfly tower is formed by a composition of four wings separated by external recesses. The back wings would be longer to guarantee a room facing south for each

dwelling. This typology proved to be a great balance between housing comfort, and density and hence became very popular in the 90’s (Hui, 2012, p.238-239).

To enlarge some dwellings extensions could be made or the ample circulation area could be redesigned to accommodate functions which could compensate for a smaller dwelling.

Figure 3.38: Axonometric of a standard Butterfly-shaped high-rise typology

Figure 3.39-3.40: floorplan + elevation of a standard Butterfly-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**ALL DWELLINGS HAVE DIRECT SUNLIGHT AND SOUTH ORIENTATION**

**RATIONAL DWELLINGS WITH BIG LIVINGROOM + SMALL BEDROOMS**

**SOME INSIDE LOCATED BATHROOMS**

**SMALLER DWELLINGS**

**SMALL KITCHEN AND BATHROOM**

**STRENGTHS**

**WEAKNESSES**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

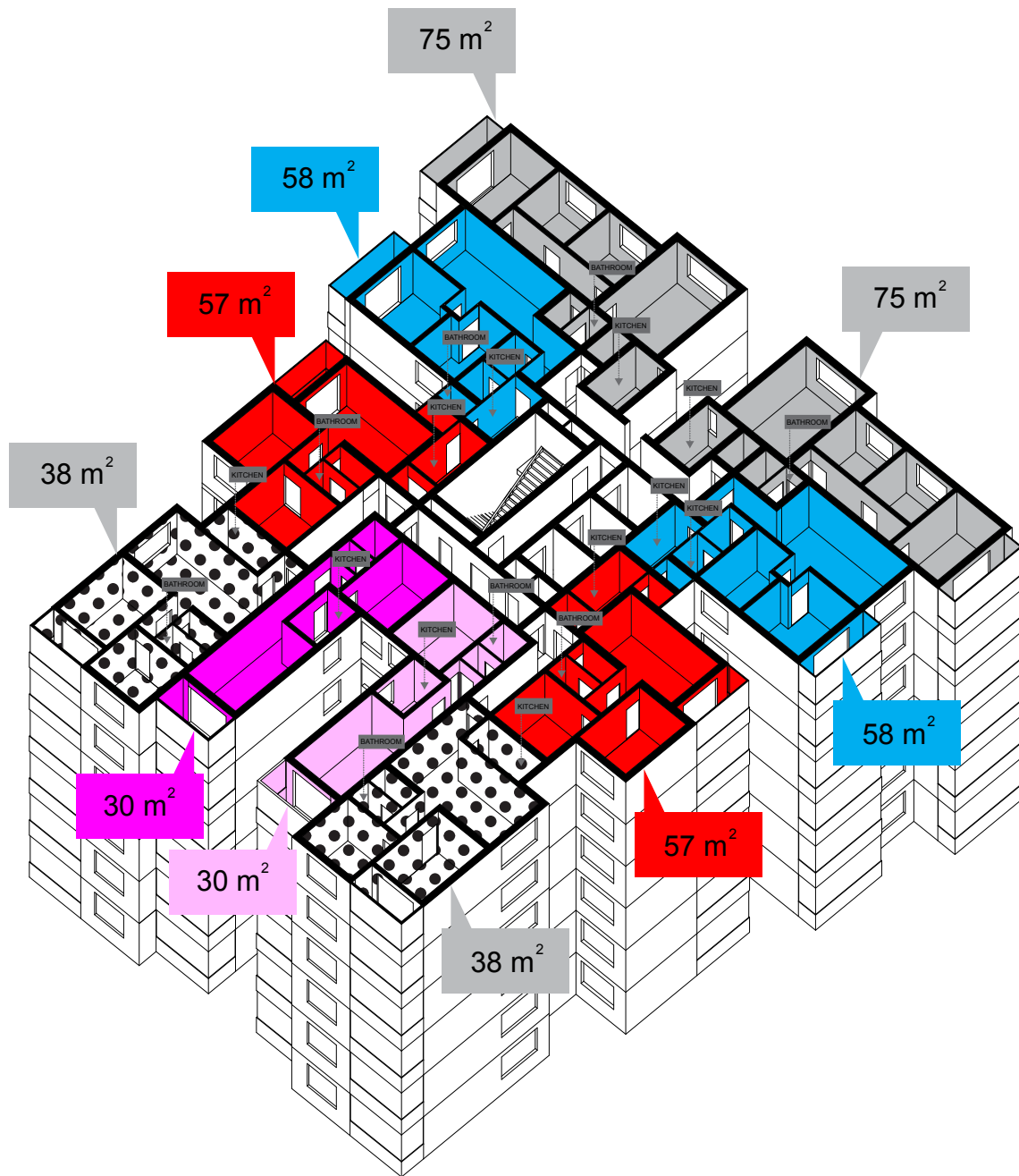
**OPPORTUNITIES**

**THREATS**

**CIRCULATION SPACE COULD OFFER SPACE FOR OTHER FUNCTIONS**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APARTMENTS**

**DESIGN OFFERS (LITTLE) OPPORTUNITIES TO EXTEND DWELLINGS WITH ADDITIONS**



### 9. Frog-shaped tower

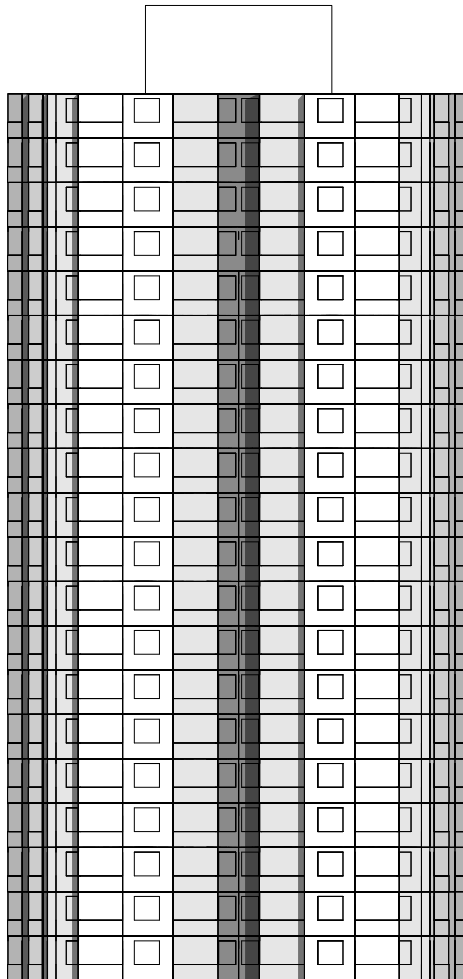
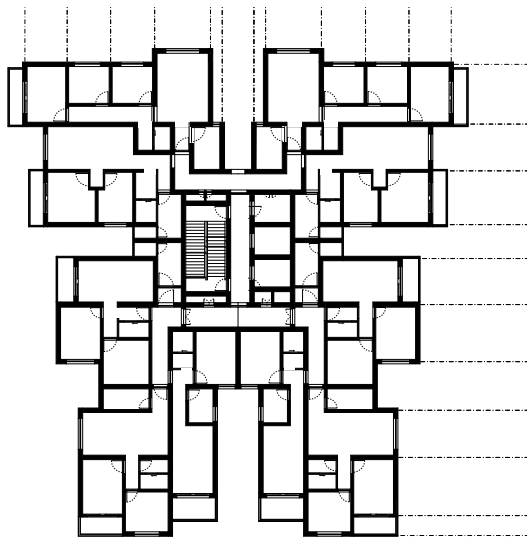
As housing commercialisation increased in the 90's, the pursuit of housing density would commence to dominate the designs of high-rise typologies. Up to the development of Y-shaped high-rise tower the housing size and standard would steadily increase. With the butterfly tower the size decreased slightly and with the frog-shape towers the size and standard decreased significantly. An example of one of the hyper-dense high-rise towers, with ten apartments per floor, is the frog-plan typology (see figures 3.41-3.43).

It greatly compromises housing comfort as it does not guarantee sunlight and ventilation requirements (Hui, 2012, p.239).

The problem with these super dense towers is that they also leave little opportunities to improve the living standard afterwards by change or extension.

Figure 3.41: Axonometric of a standard Frog-shaped high-rise typology

Figure 3.42-3.43: floorplan + elevation of a standard Frog-shaped high-rise typology



**DIFFERENTIATION IN DWELLING TYPES**

**RATIONAL DWELLINGS WITH BIG LIVINGROOM + SMALL BEDROOMS**

**NO-STAIRS APARTMENT CAN BE MADE ELDERLY FRIENDLY**

**STRENGTHS OPPORTUNITIES**

**SOME INSIDE LOCATED BATHROOMS AND KITCHENS**

**TOO HIGH DENSITY TO GUARENTEE VENTILATION AND LIGHTING IN THE DESIGN**

**SMALL KITCHEN AND BATHROOM**

**WEAKNESSES THREATS**

**NOT ALL DWELLINGS HAVE SOUTH ORIENTATION**

**SMALLER DWELLINGS**

**CLUTTERING OF PUBLIC CORRIDOR DUE TO LACK OF SPACE IN APPARTMENTS**



### **3.7.3 Conjoint high-rises**

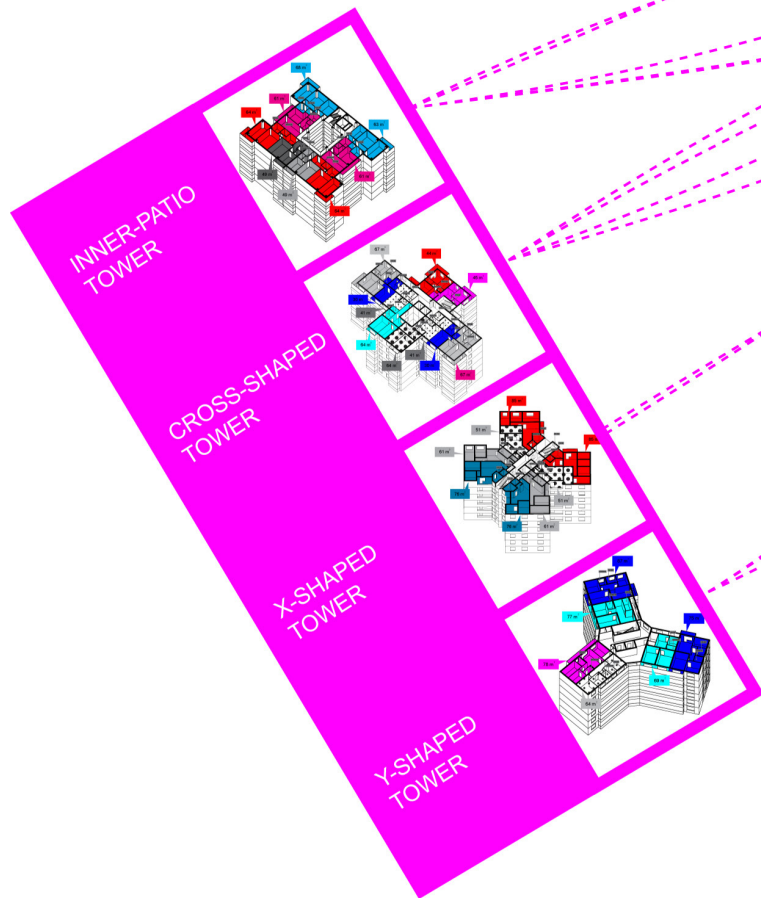
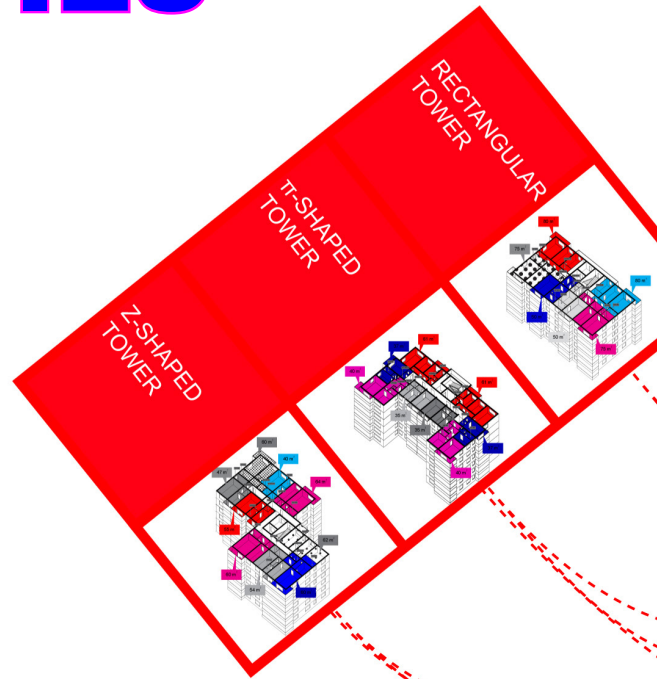
The third typology, conjoint high-rise tower, emerged in the pursuit of balancing housing standards and densities due to commercialisation. The typology creates slab buildings but uses the stipulations for natural lighting and required separation distance of the high-rise towers. However the balance would be aimed mostly at gaining housing density and most housing comfort would be sacrificed (Hui, 2012, p.240). The conjoint-towers have therefore remained the least favourite typology amongst residents and would eventually be forbidden. Therefore they are also the least constructed typology of the three.

*Figure 3.44-3.49: Examples of conjoint-high-rise towers  
3.44-3.46 Connected Cross-shaped towers in the centre south of Beijing  
3.47-3.49 Connected Y-shaped towers in the centre of Beijing*

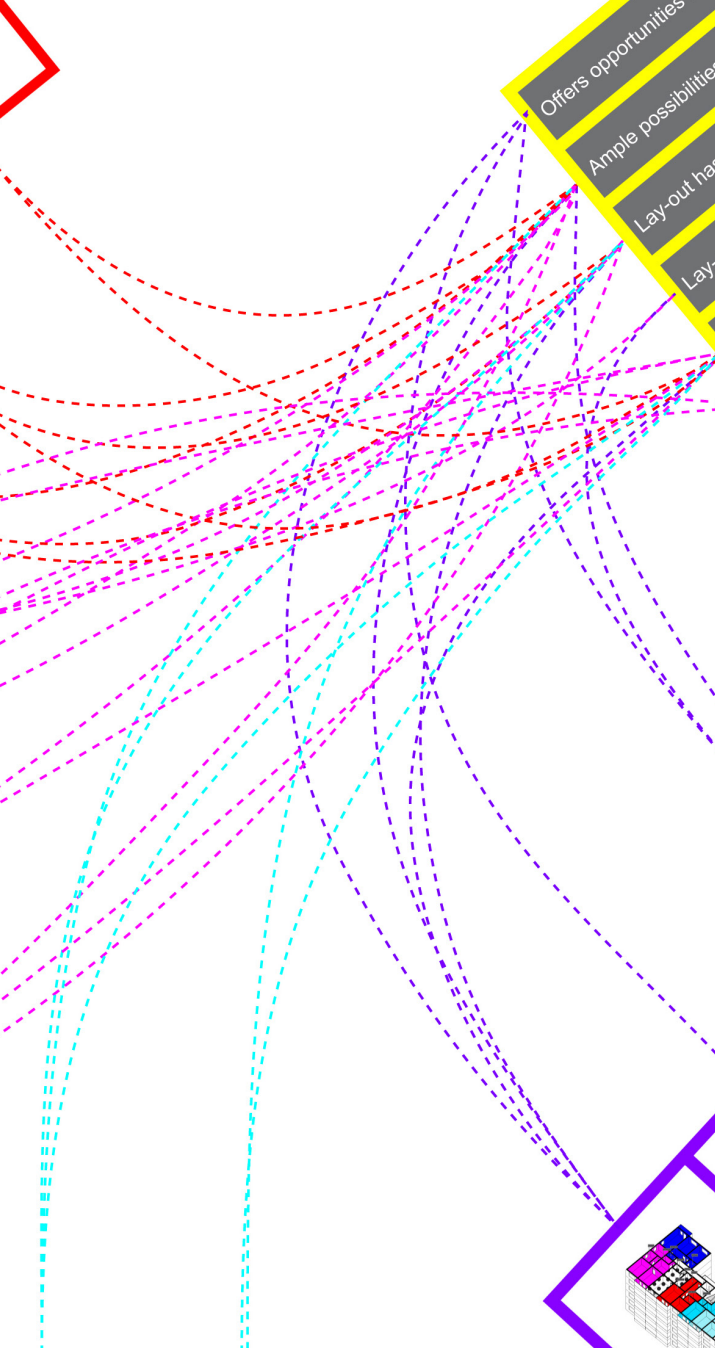
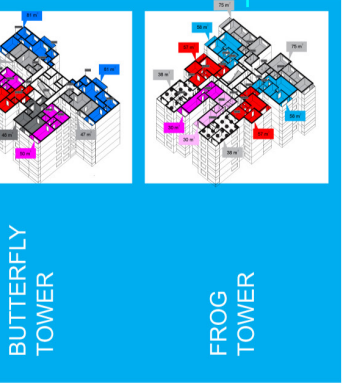
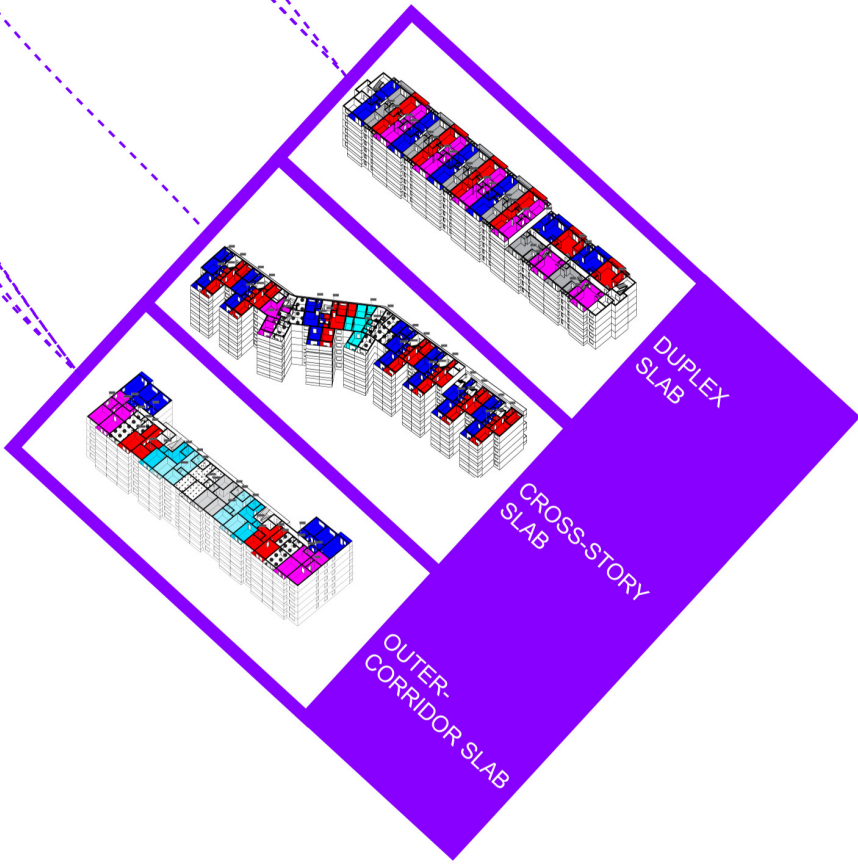




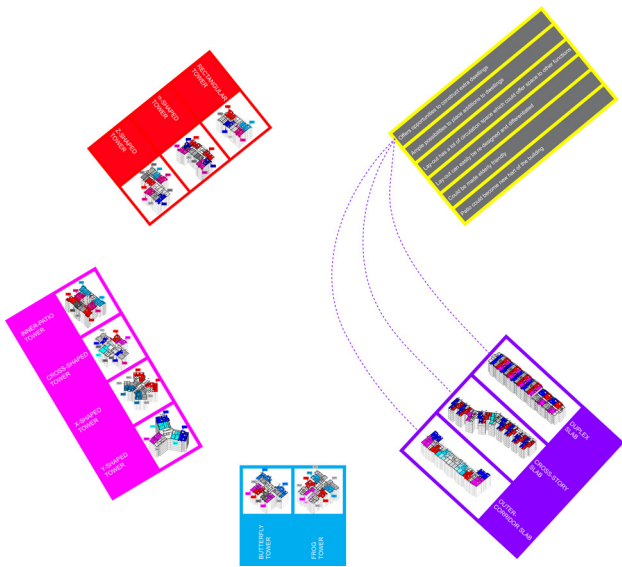
# OPPORTUNITIES PER TYPOLOGY



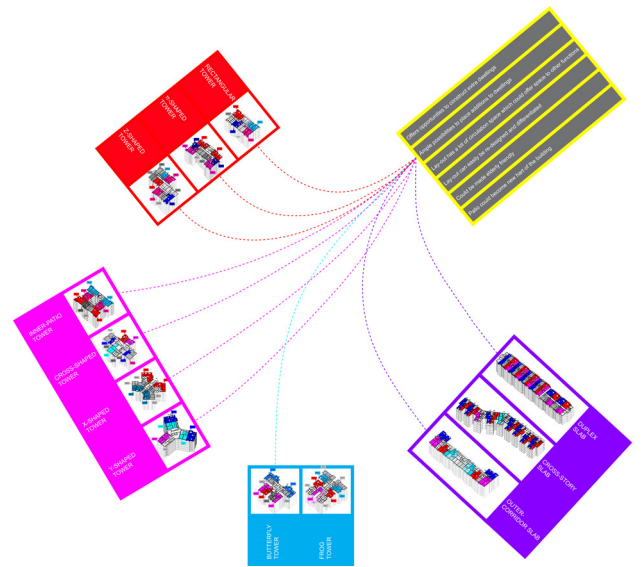
- Offers opportunities to construct extra dwellings
- Ample possibilities to place additions to dwellings
- Lay-out has a lot of circulation space which could offer space to other functions
- Lay-out can easily be re-designed and differentiated
- Could be made elderly friendly
- Patio could become new hart of the building



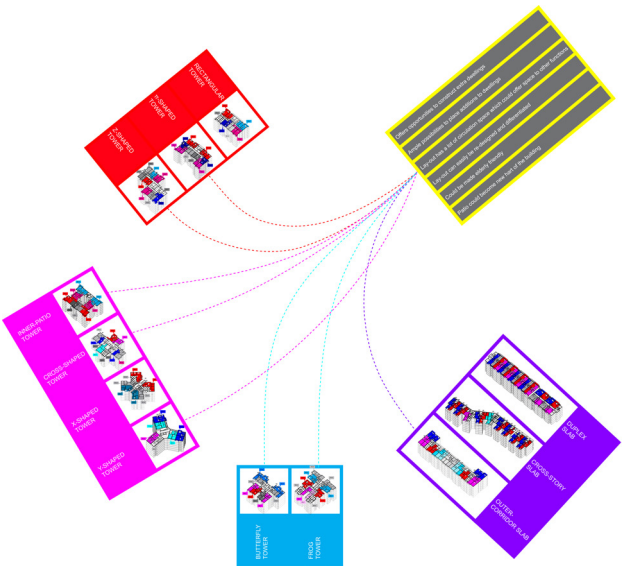




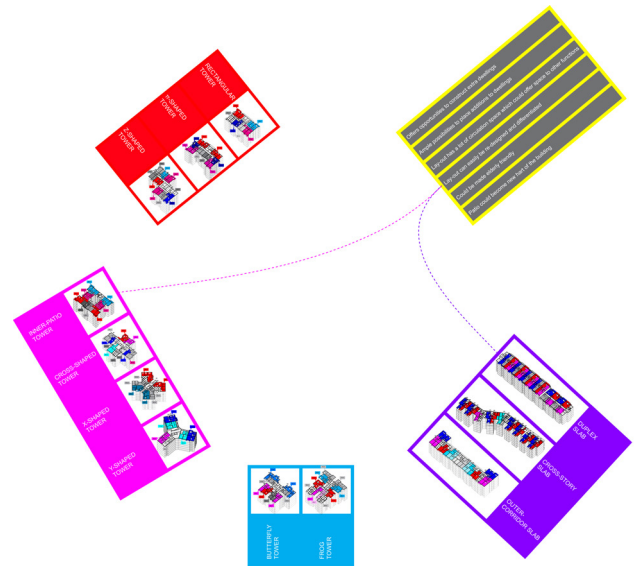
**x.1 Offers opportunities to construct extra dwellings**



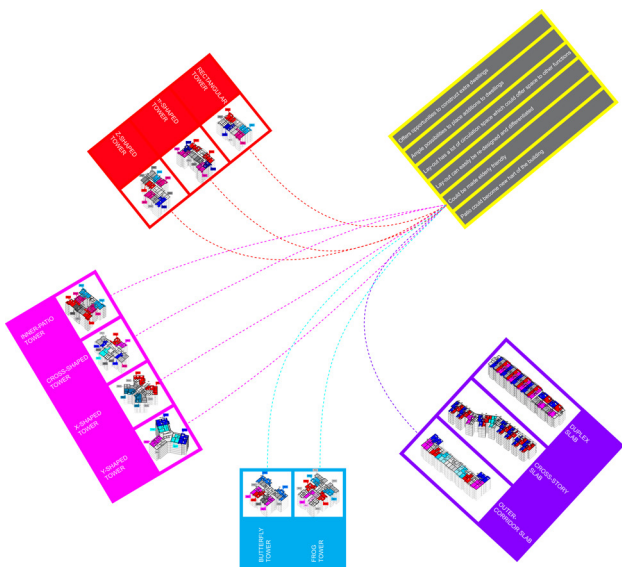
**x.2 Ample possibilities to place additions to dwellings.**



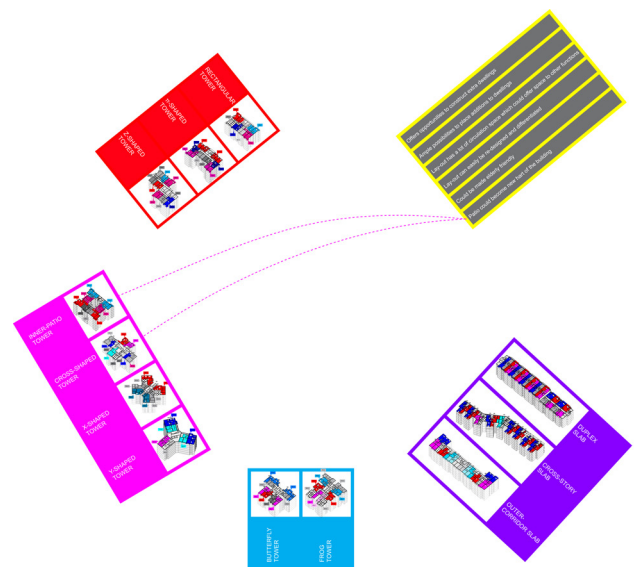
**x.3 Lay-out has a lot of circulation space which could offer space to other functions.**



**x.4 Lay-out can easily be re-designed and differentiated.**



**x.5 Could be made elderly friendly.**



**x.6 Patio could become new heart of the building.**

### **3.7.4 Opportunities when rehabilitating the early high-rise typologies**

Although all high-rises deal with similar problems, each typology has distinct design characteristics. They therefore have distinct strengths and flaws and offer different opportunities when rehabilitation is concerned. This paragraph summarizes the typological SWOT analysis and the opportunities for rehabilitation per typology (see figures 3.50-3.51).

The following six opportunities were defined (which high-rise typology offers which opportunity has been made visible in figure x):

- 1. Offers opportunities to construct extra dwellings.*
- 2. Ample possibilities to place additions to dwellings.*
- 3. Lay-out has a lot of circulation space which could offer space to other functions.*
- 4. Lay-out can easily be re-designed and differentiated.*
- 5. Could be made elderly friendly.*
- 6. Patio could become new heart of the building.*

### **3.8 Building technology of the high-rises**

The building techniques used for the high-rises vary slightly. Although all are made of concrete, the building method and construction type can be different. Most of the high-rises are made with carrying wall constructions. The carrying walls, a concrete circulation core and concrete floors ensure that the structure is stable. In certain cases a column construction was used. Although not much is known on the current condition of the construction, the high-rises were all constructed after the great earthquake of 1976. After this earthquake regulations to construction became much stricter, guaranteeing safety during seismic events.

As to the construction method three main options were used (see figure 3.52) (Hui, 2012, 253-255). In situ pouring of the construction was an option but as most of the high-rise designs were standard designs more industrialised building methods were stimulated. As an alternative to the time-consuming (and usually lesser quality) in situ pouring the construction would be assembled from pre-fabricated parts. Another alternative would be to have the construction poured in situ but with the use of standardised moulds.

One of the most applied construction method was a mixed method. The interior structure would be poured in situ (either with or without the use of standard moulds) and the façade would be made from pre-fabricated elements.

### **3.9 From beacon of modernity to crumbling compound**

Even though the first generation initially was a beacon of modernity, their current state is less glamorous. In the following paragraphs the reasons why the high-rises have decayed will be discussed.

#### **3.9.1 On the physical deterioration of the early high-rises caused by leftist housing policies (1949-1978)**

The high-rises have been directly influenced by the aftermath of problems caused by years of leftist-housing policy (see figure 3.53). The early high-rises were constructed when housing need was dire and needed to be completed fast and with a limited budget. Functional housing standards (in particular square meters of living area) were continuously controlled (Lü et al., 2001, p.210-211). As a result over-emphasis was made on developing too small, efficient housing according to unified design regulations (Hui, 2012, p.154-155).

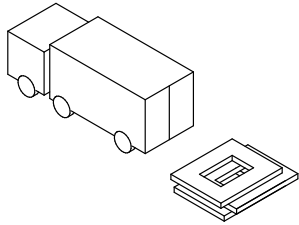
Additionally the high-rises could only be completed with a relatively low technical quality due to lack of refined construction methods, installations, and lack of skilled workers. The early high-rises were made with industrialised building methods, methods that were underdeveloped in socialist China and would only be refined by the market in the 1990's. (Lü et al., 2001)

Furthermore socialist housing policies did not pressure housing maintenance, which resulted in the physical deterioration of the high-rises. In 1948 the Management Committee of public housing in cities was placed in charge of the management and distribution of all publicly owned housing (Lü et al., 2001, p.117). However the rents for

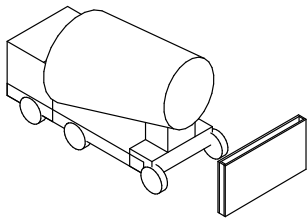
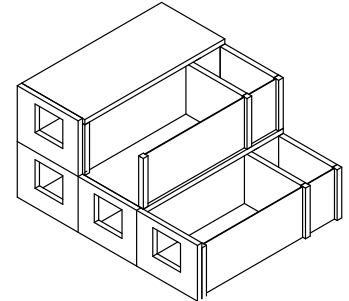
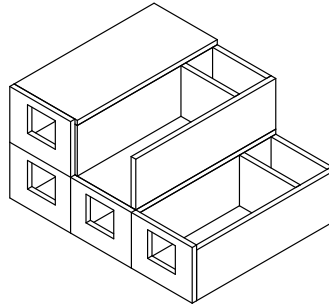
**CONSTRUCTION TYPES +  
CONSTRUCTION METHOD**

**LOAD BEARING WALLS**

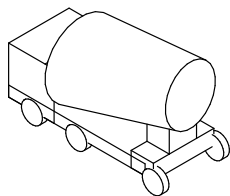
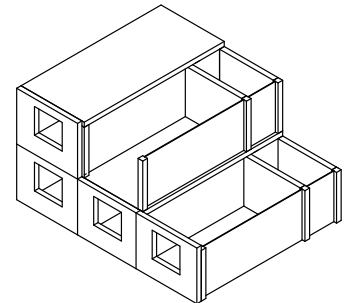
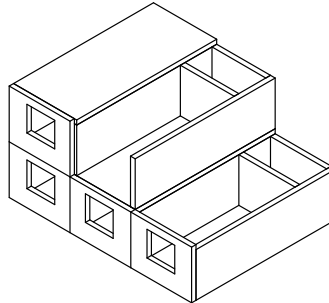
**COLUMNS**



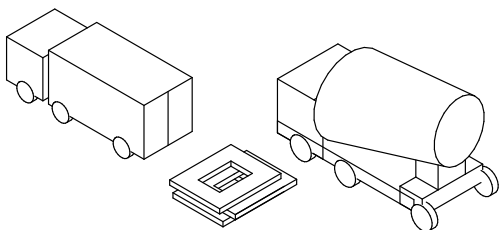
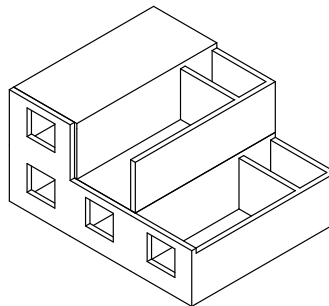
**PREFAB BUILDING COMPONENTS**



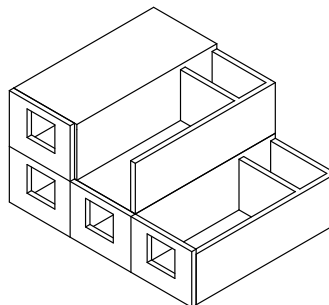
**IN SITU + STANDARDISED MOULDS**



**IN SITU**



**PREFAB BUILDING COMPONENTS + IN SITU**



*Figures 3.52: Construction method and types of the early high-rises in schemes*



public housing were set extremely low, making it impossible to maintain all public housing (Lü et al., 2001, p.110-111). As a result the Chinese housing stock has seldom seen maintenance to technical installations, plumbing or maintenance of the public corridors and grounds (Hui, 2012, Lü et al., 2001, Wang, 2007).

Moreover, from all typologies in the (former) public housing stock the high-rise housing is most difficult to maintain. The high-rises have more expensive technical systems making maintenance costly. Furthermore the early high-rises were not developed under administrative fiat by a Danwei but were commissioned by the OUHD and afterwards would be provided to multiple Danwei's to allocate their employees to. One high-rise building could have multiple Danwei's responsible for (arranging) maintenance, making unified maintenance planning more challenging.

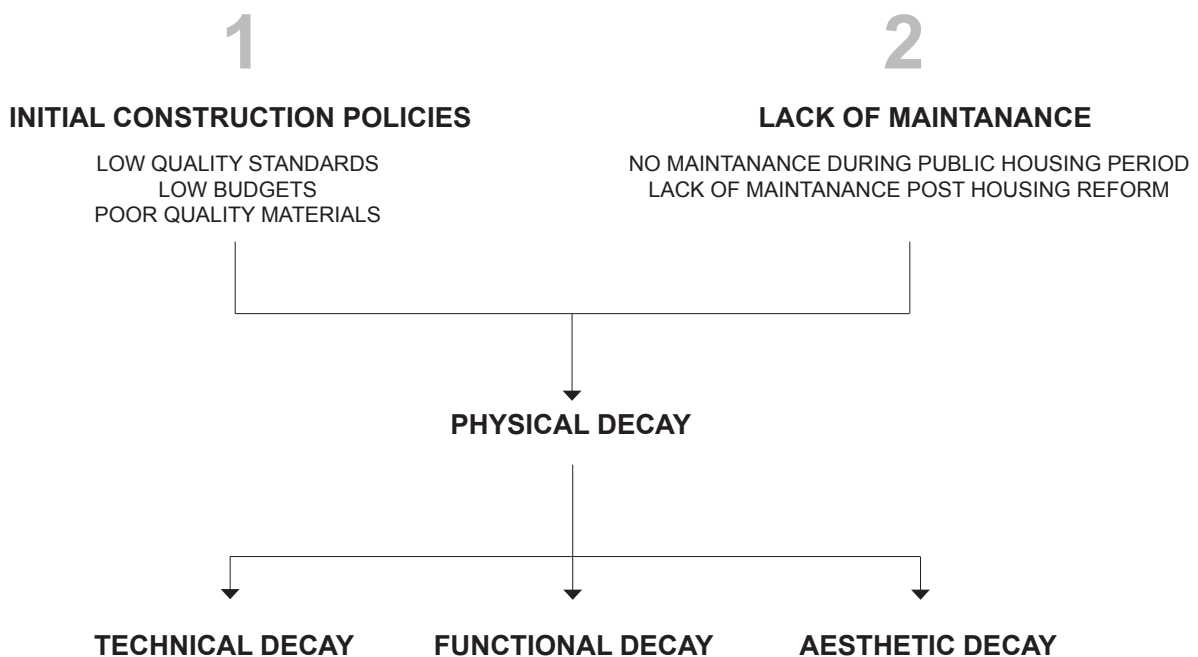
### 3.9.2 The early demise of the high-rises – during transition (1978-1998) and post housing-reform (1998-now)

In 1978 economic reforms were introduced and China was “opened up”, a gradual period of economic transition commenced.

Concerning urban housing the government encouraged a dual strategy. Firstly the government (experimentally) tried to sell part of the public housing stock with subsidized prices (Chen et al., 2008). Secondly commodity housing was constructed by real-estate developers and sold at the market (Deng et al., 2014).

In the mid and late 1980's the demand and supply system of the transitional Chinese economy was still a simplification. It inevitably led to economic fluctuations in various markets, including the housing market (Lü et al., 2001, p.223). Housing speculation during the unstable, transitional 1980's would greatly influence the quality of housing construction. Although the lack of personal responsibility during socialist times set the foundation, it was during this decade that Chinese housing became a true consumption good. The speculation led to cheap, fast construction of high-rises to accommodate demand and generate profit for developers. During the transitional period (1978-1998) the housing need could not be alleviated sufficiently. The World Bank (1992) concluded that the average living space per person in cities was still only 6.84 square meters in the early 1990s. About 28 per cent of households had no sanitary facilities, only 45 per cent possessed water taps available for their exclusive use, and large parts of the stock experienced significant physical deterioration. It became apparent that a housing reform was a necessity. The transitional period of Chinese housing policy ended with the housing reform of 1998, after which a rather liberal market housing policy would take hold on China lasting until the late 2000's (Deng et al., 2014).

To reduce the financial burden from the construction and maintenance costs of public housing, until then unsuccessful (Lü et al., 2001, p.225), experiments of public housing sales of the 1980's and 1990's were mainstreamed and within

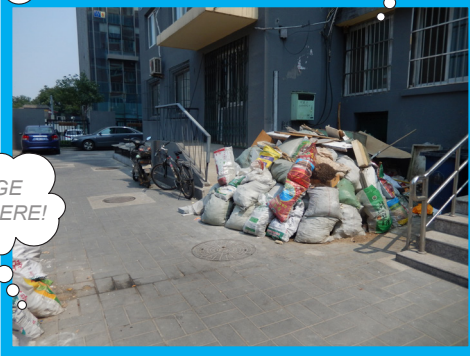


Figures 3.53: Infographic on the causes and types of physical decay in the early high-rises

ILLEGAL SUB-STANDARD STRUCTURES



NO GREEN OR COMMUNITY SPACE!



OVERCROWDED AND ILLEGAL PARKING



GARBAGE EVERYWHERE!

POORLY MAINTAINED INFRASTRUCTURE



ONLY SUPERFICIAL MAINTENANCE



BASEMENT SLUMS



COMMUNAL CORRIDORS POORLY MAINTAINED AND CLUTTERED

POOR CONSTRUCTION QUALITY



SMALL SERVICES



BIG BEDROOMS NO LIVINGROOM



several years most of the public housing stock was privatised.

The housing reform also caused the public departments, who are responsible for the public housing maintenance, to be disbanded. New maintenance schemes, appropriate for multifamily dwellings, had not replaced the old provisions and common facilities are generally poorly maintained (Hui, 2012).

### 3.9.3 Physical status quo described

The physical decay is of a functional, aesthetic and technical nature. It has become apparent in the dwelling, building and communal ground.

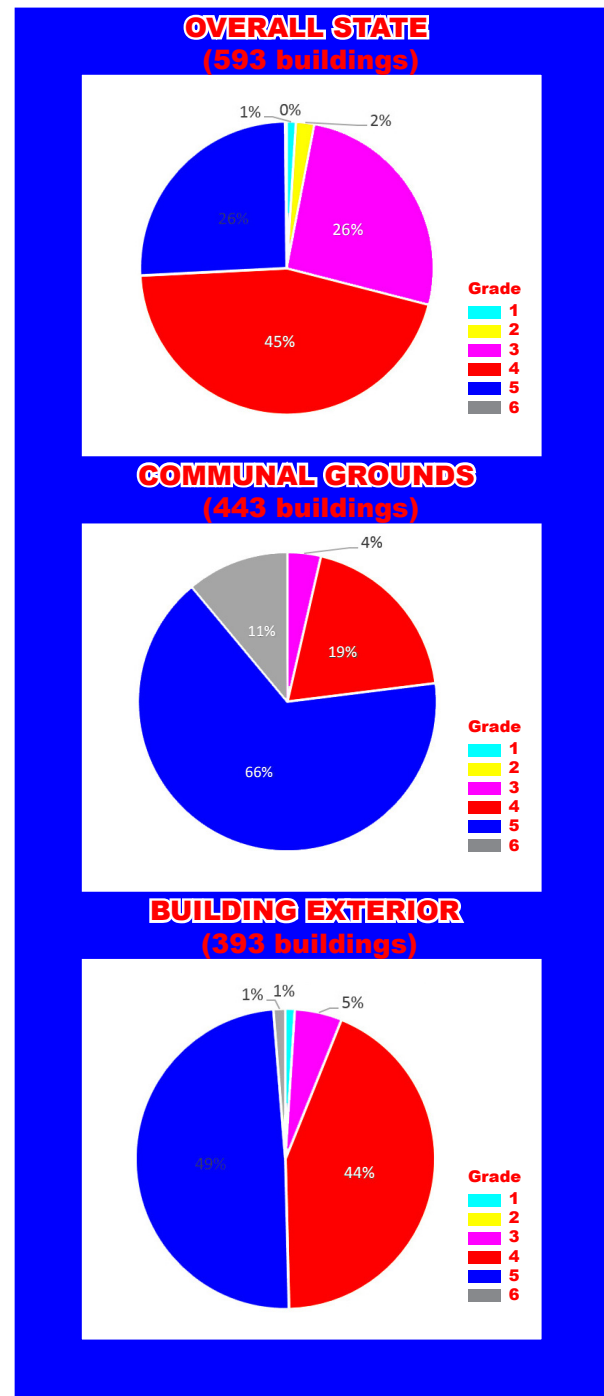
Problems on the scale of the communal grounds can be summarized as followed (see figure 3.54): the presence of illegal additions and sub-standard constructions, illegal and overcrowded parking, lack of green and maintained community space, dirty communal grounds with overflowing litter. The problems in the building are the dirty, deteriorated communal corridors, broken elevators, leaking roofs, old and broken piping, heating and ventilation systems, deteriorating uninsulated facades, old and poorly placed window frames. On the scale of the dwelling problems are the following: small dwellings with small bathrooms and kitchens. Often there is a lack of storage space. Many of the dwellings are not according to current demands.

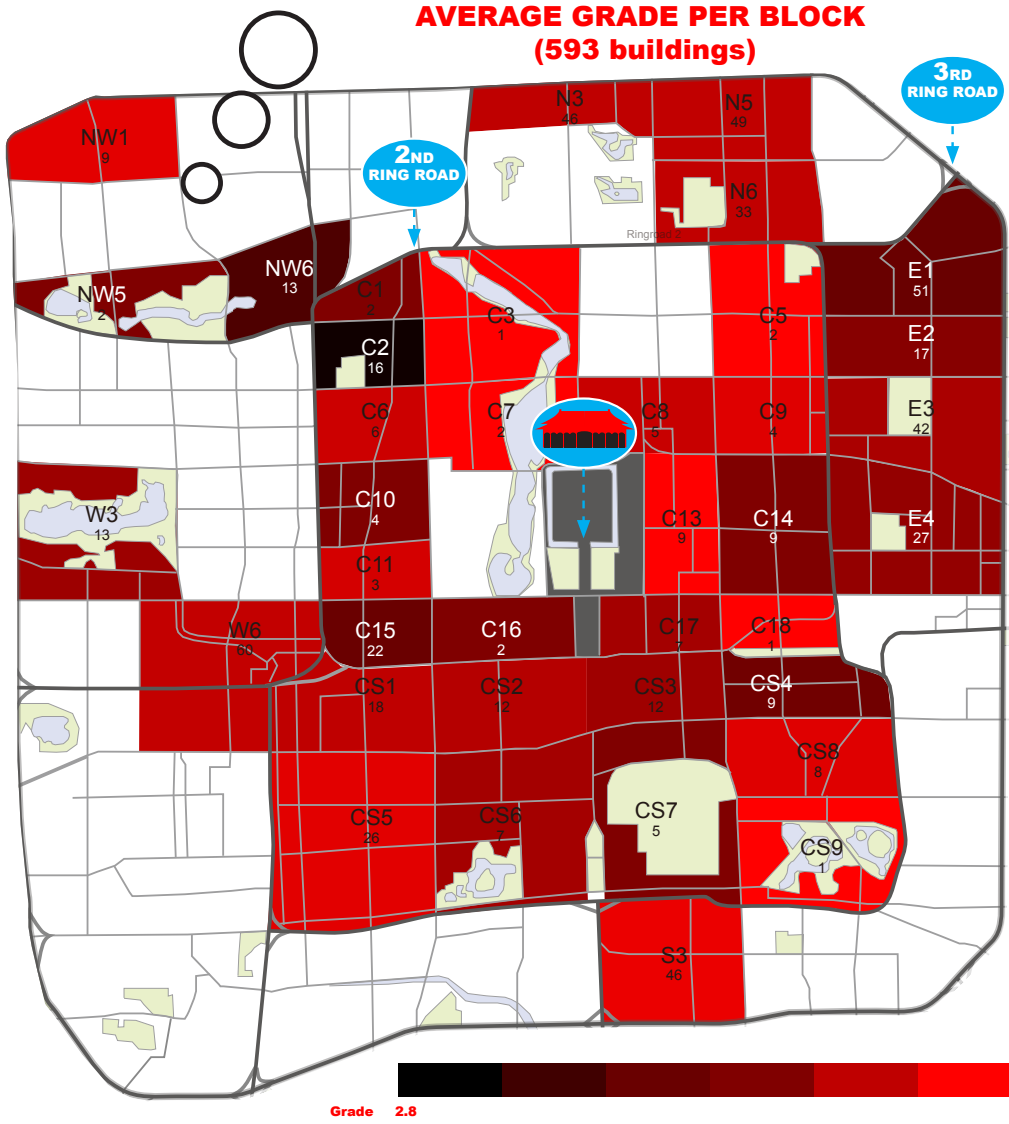
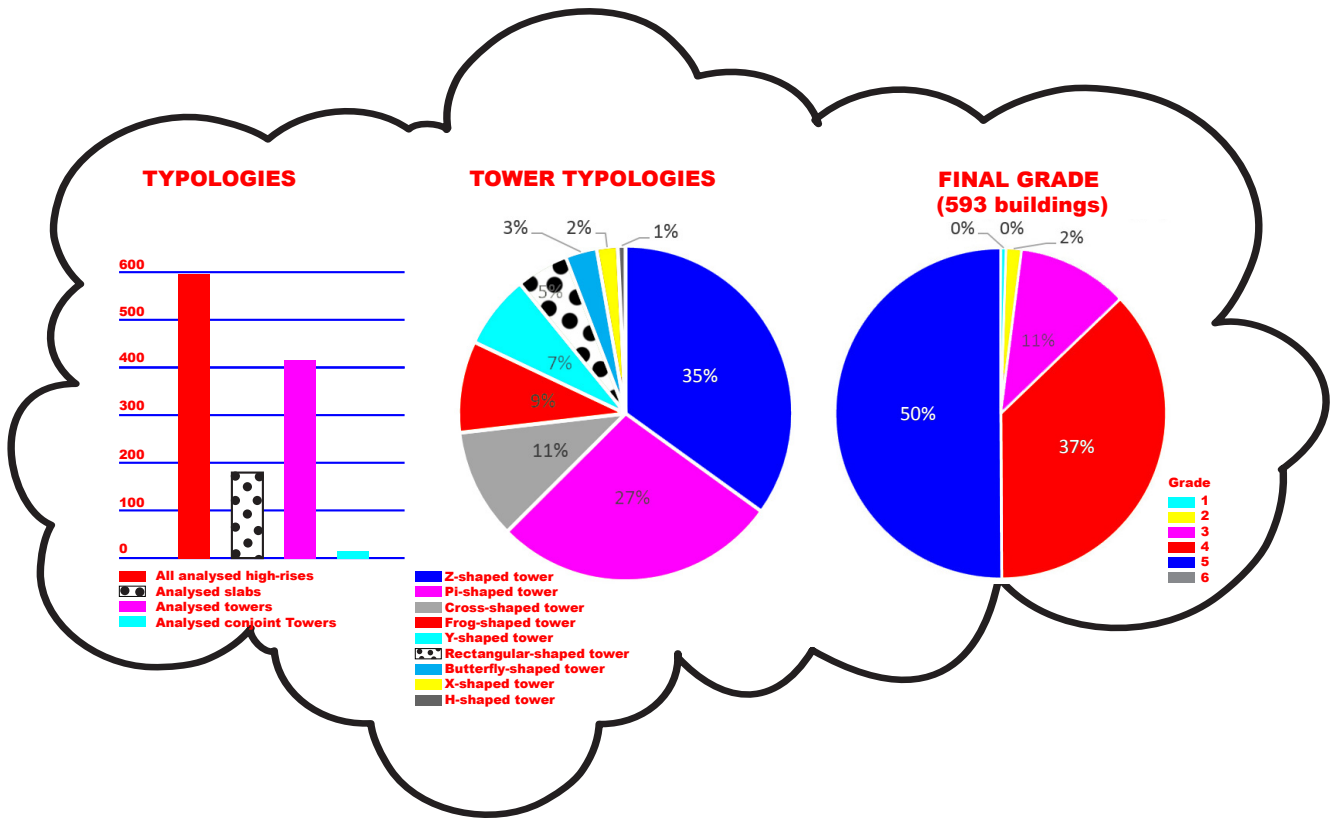
### 3.9.4 Physical status quo in numbers

From a study to the status quo of the early high-rises by means of site visits, a condition assessment and analysis of over 600 buildings (van Stijn, 2016), it has become possible to determine more precisely the amount of physical decay (both aesthetic, functional and superficial technical) on the exterior of the building and communal grounds, and so the gravity of the situation (see figure 3.55).

A vast majority of the buildings (87%) scores a 4 or 5, meaning that there is severe decay or even irreversible decay. If solely looked at the state of the communal ground, numbers are even more distressing: 87% scores a 4 or 5 and a staggering 11% of the communal grounds scores a 6 (in need of immediate major renewal).

Furthermore it becomes visible that the state of buildings on average is slightly better in the north, east and west, whether conditions in the south and central areas are poorer.





Figures 3.54 (left): Images of the physical status quo  
 Figures 3.55 (right): quantitative data on the current status quo (van Stijn, 2016)



### 3.9.5 The exodus: social impoverishment in the early high-rise housing facilitated by the transition to the market economy

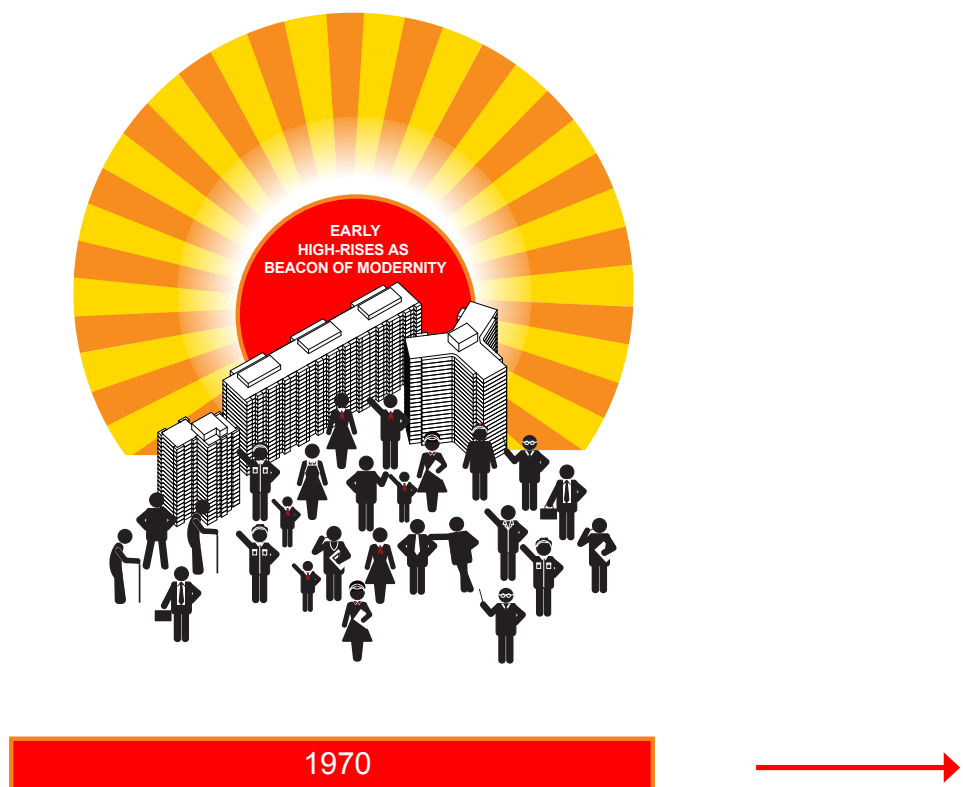
Next to the direct influence on the physical quality of both the early (the first and transitional) and later (post housing reform) generations of high-rise housing, the housing reform also influenced the social make-up of the early high-rises. The early high-rise housing is suffering from the negative effects of social-spatial segregation (Hui, 2012, p.279).

Recent studies opt that housing in post-reform China needs to be understood in relation to the rise of a socially exclusive, pro-growth mode of urban governance (Wang, 2011, Wang, 2010, Zhang, 2002, Zhang and Fang, 2004, Zhu, 1999). Currently the society is becoming more and more polarized and segregated (Li, 2002). Division of social groups occurs along urban and rural boundaries, between different provinces and cities, and even within the internal structure of a city (Hulshof and Roggeveen, 2011, Sun, 2004).

The system of welfare housing allocation before the reform allowed the accommodation of different income groups and social strata in the

same residential district. After the housing reform urban residents had to choose their residence according to personal preference and most importantly financial capacity. Beijing's spatial structure would get more and more heterogenous, with the housing reform as a contributing factor, according to the economic income of households (Feng, 2004, p.159-162). Furthermore groups with similar levels of income or with the same way of life, tended to choose to live in the same district, aggravating the social-spatial segregation (Ye et al., 2010, p.282).

Social-spatial segregation has developed as followed. In the later generation dwellings made in the city centre, usually as part of market urban renewal, a gentrification process took place pushed by high land value. This caused these new dwellings (characterised by good spatial locations with well-developed urban facilities and access to most job opportunities) to become available only to highest income groups (Hui, 2012, p.280). The majority of later generation's (high-rise) housing estates, stimulated by the land lease system (Anglin et al., 2014), were made outside of the fourth and fifth ring road of Beijing. These new estates cater in di-



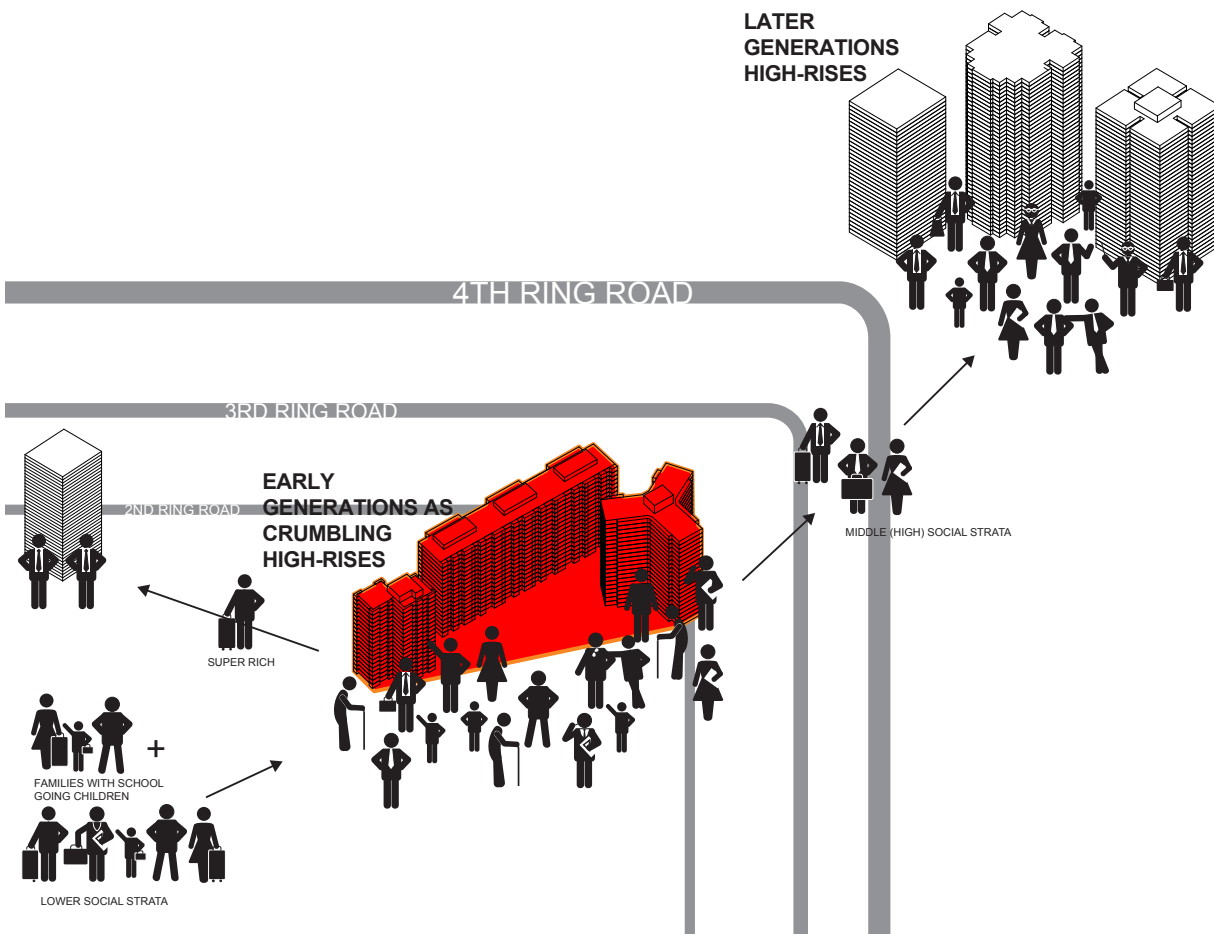
verified, higher quality housing, targeted to specific social strata. Due to the cheaper location of the new dwellings in the outer ring-roads, they were often targeted to middle and middle-higher income groups. Middle-low and lower income groups had to make due with decayed housing areas, or move to the outer rings (as relocates of urban renewal projects) (Hui, 2012, p.280).

The ongoing process of social-spatial segregation also has its effect on the early high-rises. Although the (still) tolerable physical state of (some of) the early high-rises and extremely good locations have for now maintained part of the middle income groups (especially households with school going children) in the early high-rises, the construction of newer generations of high-rises has a negative influence on the earlier generations. The multiplied capital from the home owners has set an exodus in motion. The middle and higher income groups are moving out of the earlier high-rises into the newer estates (Hui, 2012).

Furthermore real-estate speculation and lack of enforcement of affordable housing policy (Ye et al., 2010, p.279) in the post housing reform period have created a lack of affordable housing.

The early high-rise housing and other types of former public housing make up a great part of Beijing's rental stock. The apartments or subdivided rooms in the early high-rises will be rented out to lower strata, generating profit for the owners and partially filling the need for more affordable housing in the city.

Even though the social-spatial segregation seemed stimulated by developments in policy and seems demanded by the consumer, it has negative consequences. The high percentage of renters from lower social strata living in the early high-rises has a negative effect on the physical conditions. Renters will invest less in their apartment as it is only a temporary home to them (Hui, 2012, p.321). Considering that the social deprivation originated due to the (comparative) physical deterioration, both processes together have initiated a negative spiral in the early high-rise housing.



Figures 3.56: Infographic on the exodus

### 3.9.6 Financial impasse

Over the years it has become clear that nobody has made major reinvestments in the high-rises (see figure 3.57).

This is a problem common in high-rises. Multiple occupancy residential types, such as high-rise units are more prone to conflicts in remodelling and upgrade processes than any other residential type. This is mostly due to the entanglement of common elements and individual elements, making (unguided) decision processes complex (Kendall, 2004).

However there are several processes which aggravate the financial impasse. One of the problems is the short-term oriented investment climate, a by-product of the housing reform. After the reform, between 2000 and 2004, the real estate market boomed. Mass housing, most commonly in the form of high-rise housing construction, had directly and indirectly become the GDP motor of the China. On 10 October 2008, Prime Minister Wen Jiabao pointed out how important the boom in housing had been: 'Real estate is a significant mainstay industry of our national economy, it is important in driving the industries of steel, building materials and home appliances, and it especially plays a key role in the development of financial industries'.

During the period of the housing boom, increasing wages, lack of other investment possibilities and increasing housing prices made housing from a consumption product into investment objects. After the millennium the consumer was equally occupied with the short term profit of real-estate as developers. As more and more owners do not live in the dwellings their interest in living quality will be reduced and interest in the dwelling as "milking cow" or fast profit machine increases. This has diminishes the need for long-term oriented investment.

The renters who replaced the owners also have little interest to invest besides in what can cheaply improve their living condition or what they can take with them when they move.

And if any stakeholders wished to make an investment, it has been made difficult due to land ambiguity. Privatised public housing has been sold without leasehold. This makes the government owner of the ground and communal spaces. During socialist times the government rarely performed maintenance, and after the privatisation no maintenance system replaced the public maintenance. The government has not made major investments

in the early high-rises. Only superficial fixes were provided when an important event would pass some of the crumbling buildings (Hui, 2012, p.625). Those owner occupiers who do invest in their home stop the renewal at the threshold. So in reality nobody has the responsibility and interest to ensure investment in the communal parts of the building.

Some of the early and the majority of the late transitional high-rises however have been sold with a land lease, but due to the lack of a sufficient maintenance scheme these high-rises have also decayed. Also the decay of these generations high-rises is aggravated by the land lease system as discussed in chapter 1.2.

All processes combined it has resulted in a financial impasse in which nobody is willing to invest in the crumbling high-rises. This has become a dangerous situation which needs to be addressed. Without investment there can be no physical improvements. Without those it is a matter of waiting until the decay causes a serious event to shake people into action.

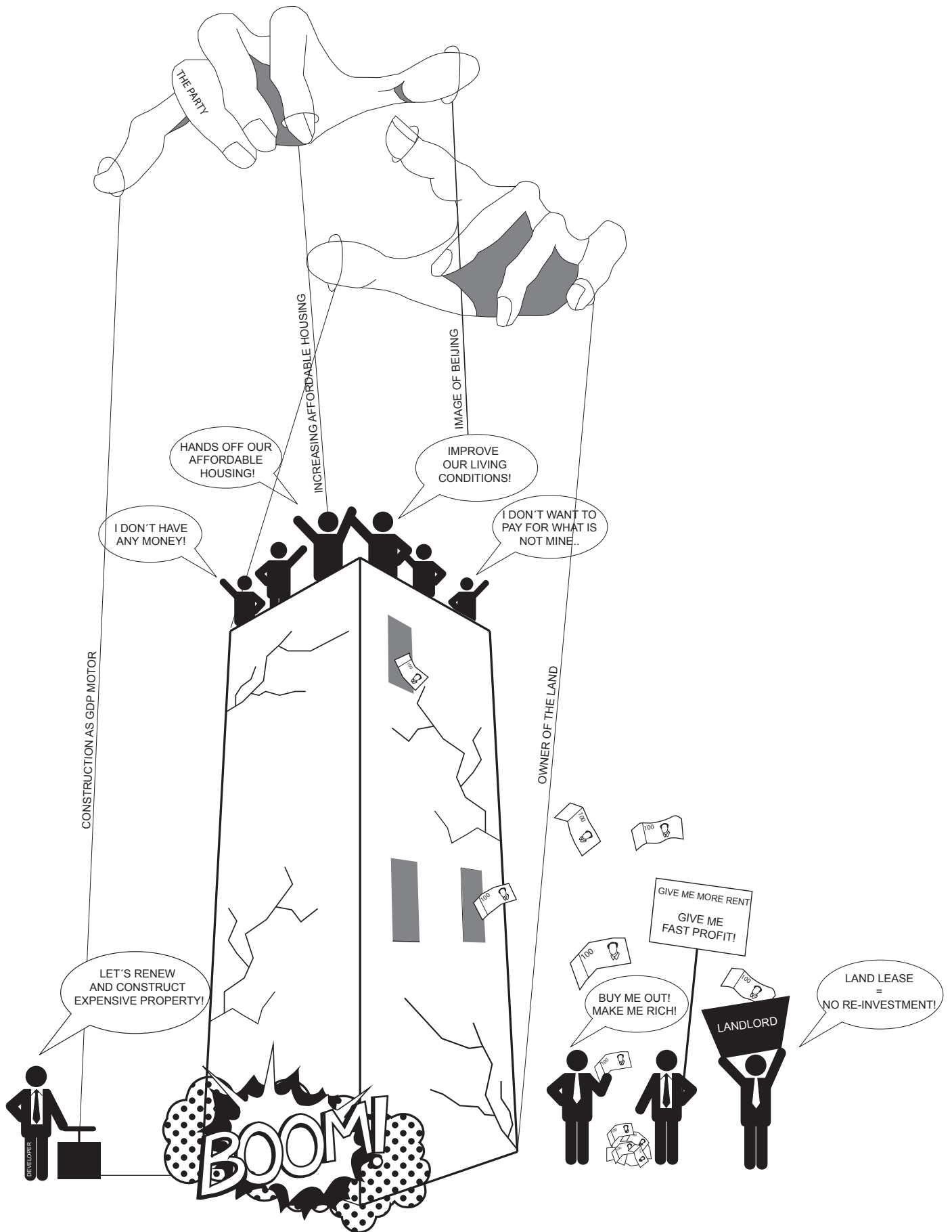
### 3.9.7 Conclusions on the status quo

Several conclusions can be drawn on the status quo with regard to the development of the rehabilitation strategy. Problems stem from various policies and are physical social (organisational) and financial in nature. Therefore an integral rehabilitation strategy which is able to simultaneously tackle these issues is necessary.

Physical approach should focus on improving the aesthetic, functional and technical quality of the high-rises on the scale of the communal grounds, building and dwelling in order to solve the physical challenges as mentioned in chapter 3.9.3.

To solve the social-spatial segregation interventions beyond the scope of the high-rises are necessary. As problems stem on a higher scale: societal scale, it will be more effective to propose change there. To help alleviate the segregation problems the rehabilitation of the early high-rises should strive for a differentiation of the housing. By providing ample of affordable housing for lower incomes and ensuring the physical improvements and creation of luxurious housing conform market demands for higher strata it becomes possible to house different groups in the early high-rises.

To break the financial impasse it is important to make stakeholders more aware of the problems but mostly more enthusiastic to invest.



Figures 3.57: Infographic on the financial impasse



### 3.10 Changing demands in Housing: understanding the later generation high-rises

Physically the early high-rises have decayed, people are moving out. But where is it that they want to move to? By understanding what the desired housing is, it becomes possible to improve the early high-rises according to meet current (and future) demand. This can help solve and prevent further social-spatial segregation.

#### 3.10.1 Case: Huilongguan case 东亚上北中心 (Dōngyà shàng běi zhōngxīn)

Huilongguan was originally built at the end of the 1990's as a satellite town to relieve the pressure of the city centre. It also served as a replacement location for those who lost their house during the construction of the Beijing Olympics site. Still considered underdeveloped one decade ago (as facilities and sufficient infrastructure were severely lacking), the construction of the 5th and 6th ring road, the metro line and shopping malls have incorporated Huilongguan as a fully equipped residential area in the city fabric.

Even though housing prices have risen and rental prices are on the rise as well, it is still the more affordable option to the dwellings in the city centre. Where in the early high-rises in the city centre a single room with shared facilities on the third floor can already cost around 2200 RMB per month, in Huilongguan a 2 bedroom apartment can be rented for a price between 2500 and 3000 RMB per month. However the apartments in Huilongguan offer more modern design and facilities

compared to the dwellings in the early high-rises.

Although dwellings built in Huilongguan are actually mostly mid-rises some examples of modern (relatively) affordable high-rises can be found as well. One case study Dōngyà shàng běi zhōngxīn (see figures 3.58-3.76) was researched to show what a comparable budget can offer in high-rises outside of central Beijing. In this gated high-rise compound an apartment with one bedroom, spacious living room and own facilities can be rented from 2500 RMB per month.

The most significant difference to the early high-rises is probably the spacious, and luxurious layout of the communal grounds. Gated by fences and a plinth of amenities, the communal space is guarded it offers a green oasis. In the green park sport and community facilities can be found. Compared to the early high-rises the communal spaces are only occasionally disturbed by parked cars and laundry.

The (birdcage) façade, and lay-outs are designed according to modern standards, but both in the communal grounds, the building, and dwelling signs of superficial physical decay and illegal additions can be found. The interior of the communal spaces shows similar signs of beginning wear and neglect.

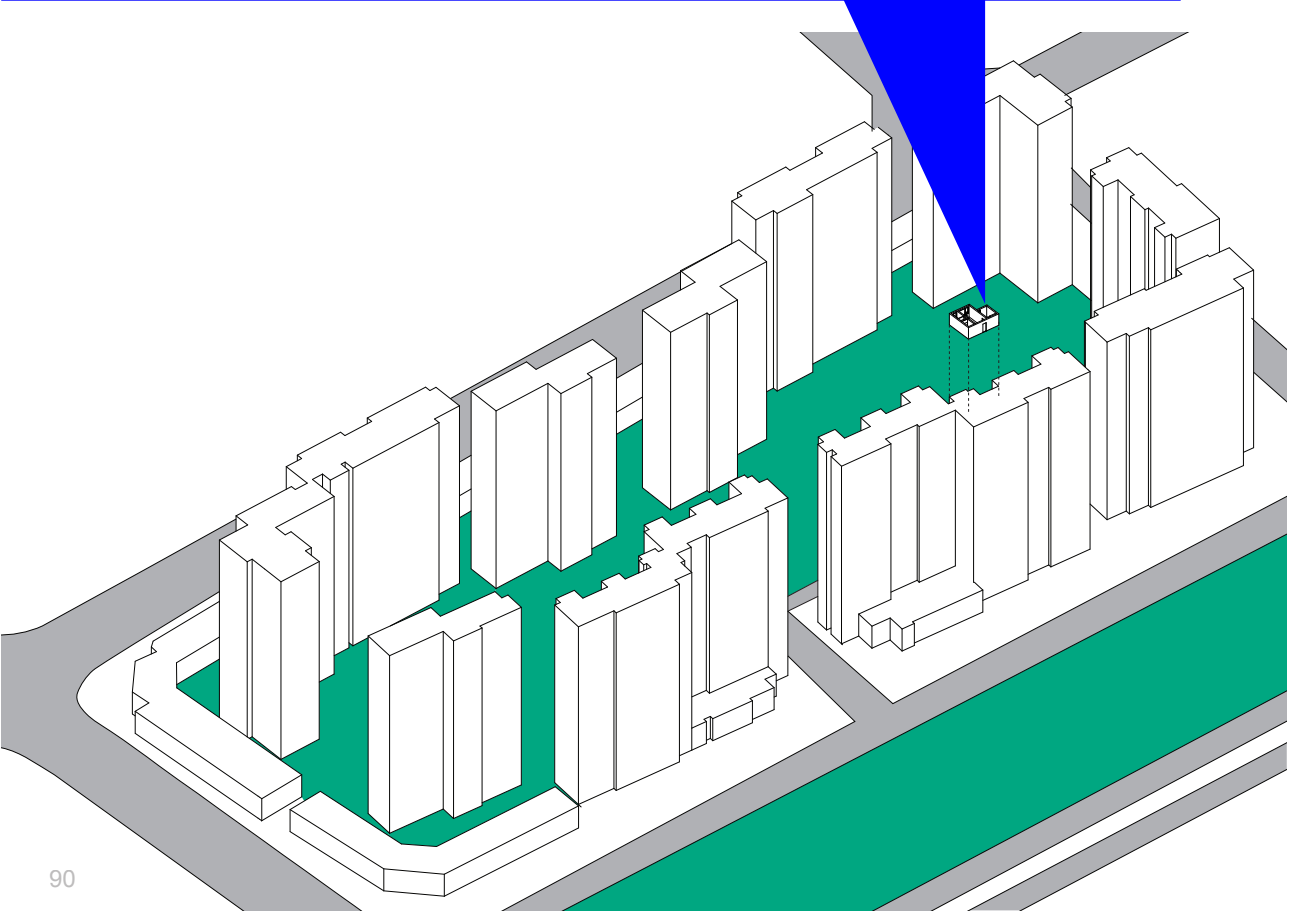
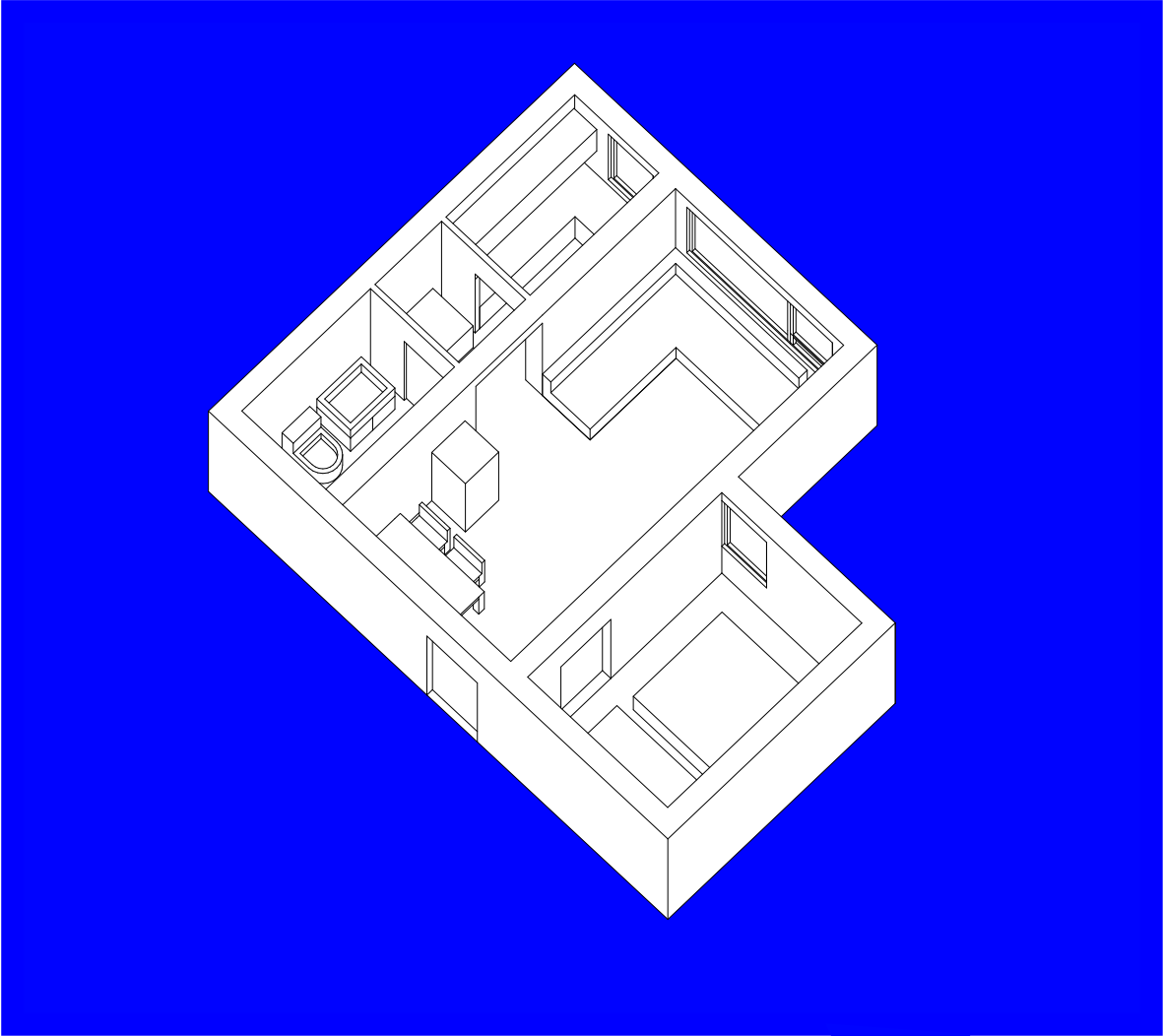
Figure 3.58: Satellite image case site 东亚上北中心

Figure 3.59: Satellite image Huilongguan satellitetown

Figure 3.60 (page 90): 3D model case site 东亚上北中心







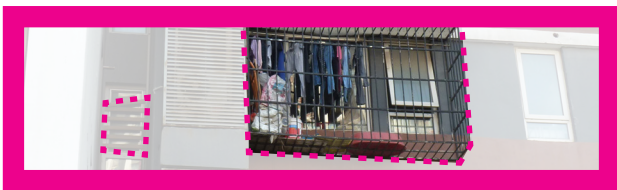


Figure 3.61: High-rises as seen from the street  
 Figure 3.62: Birdcage Facade High-rises as seen from the street  
 Figure 3.63: Eyesight perspective from the communal grounds  
 Figure 3.64: Eyesight perspective from the communal grounds  
 Figure 3.65: Entrance to tower 7  
 Figure 3.66: Detail of an (illegal) cage addition on the facade  
 Figure 3.67: Detail of superficial technical and esthetic decay of the facade  
 Figure 3.68: Detail of superficial technical and esthetic decay of the facade  
 Figure 3.69 (page 92): Communal grounds  
 Figures 3.70-3.76 (page 92-93): Living room









### 3.10.2 Case: 紫芳园三区 (Zǐ fāng yuán third district)

The next case is the Zifangyuan third district (see figures 3.77-3.94). Completed in 2007 this is an example of a later generation high-rises complex. The high-rises are located in a large communal ground, which is guarded. The compound has an underground parking, which allows the communal ground to be a car-free park. In the park there is space for a community square and ample of community facilities. Furthermore, just like the communal spaces in the building, the communal ground is clean and excellently maintained.

The high-rises themselves have a modern design. The facade is clean, has large windows, and air-conditioning units are hidden in designated areas. Inside the building different dwelling sizes can be found (with a varying amount of bedrooms). All of the dwellings have a south orientation, with a large modern lay-out, including a spacious central living room, separate large kitchen, large bathroom(s) and separate storage room.

The location of this complex is comparable to the early high-rises. As the location is similar but the quality of the housing is superior, the price is three or fourfold. A dwelling in this complex will cost around 6 to 8 million RMB. For most residents of an early high-rise complex it would be unaffordable to live here.

*Figure 3.77: Communal grounds*

*Figure 3.78: Satellite image*

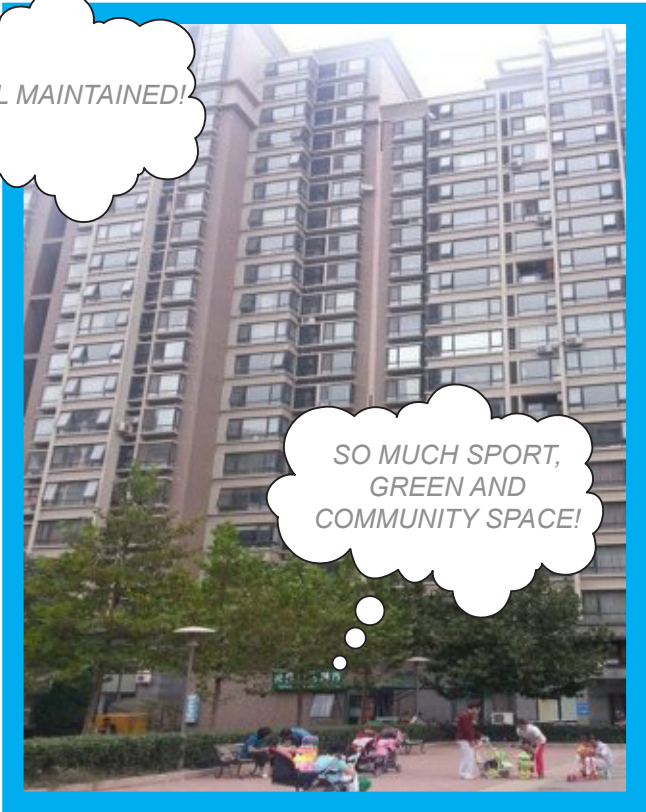
*Figure 3.79 (page 96) 3D model case site*

*Figures 3.80-3.94 (page 97-99): images of two dwellings*





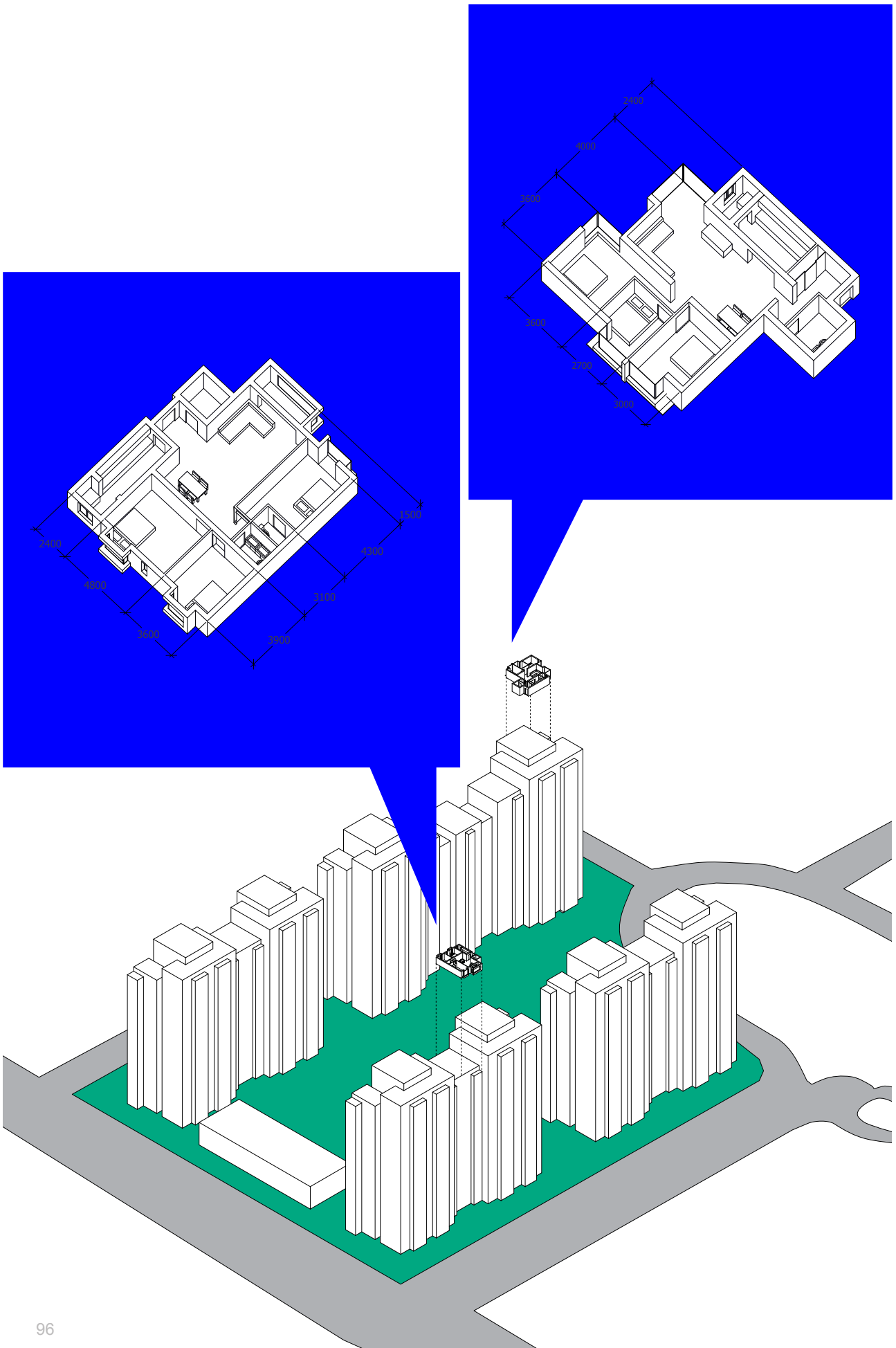
SO WELL MAINTAINED!



SO MUCH SPORT,  
GREEN AND  
COMMUNITY SPACE!

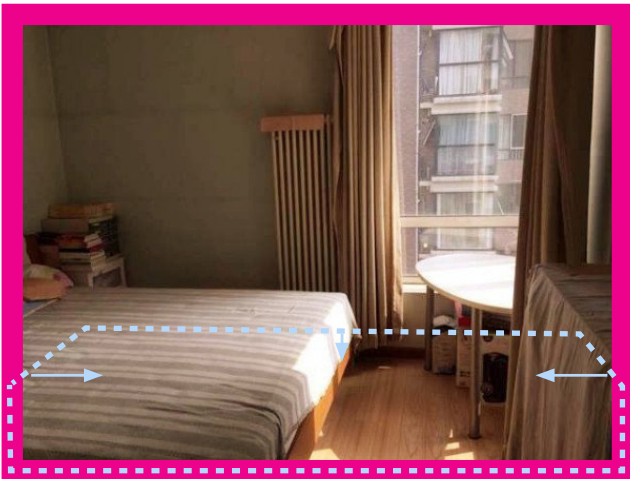








BIG LIVING SPACE

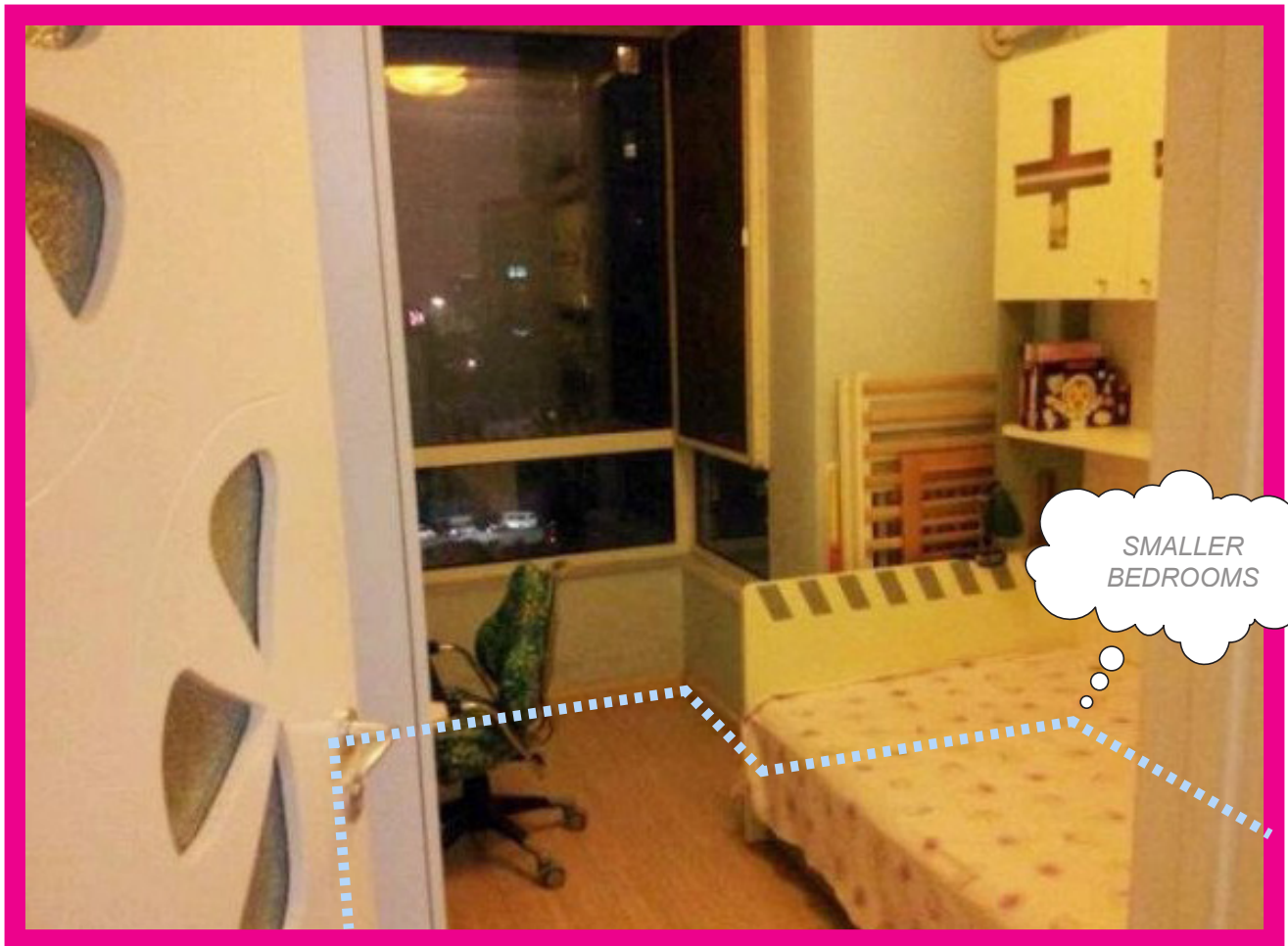


ROOM FOR KITCHEN APPLIANCES

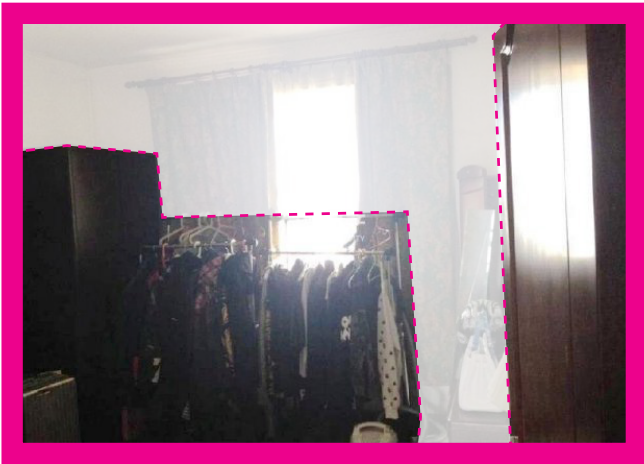


BIG BATHROOM









SMALLER  
BEDROOMS



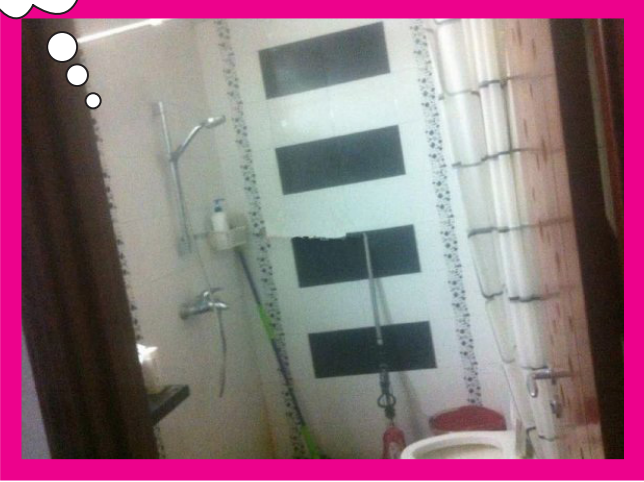
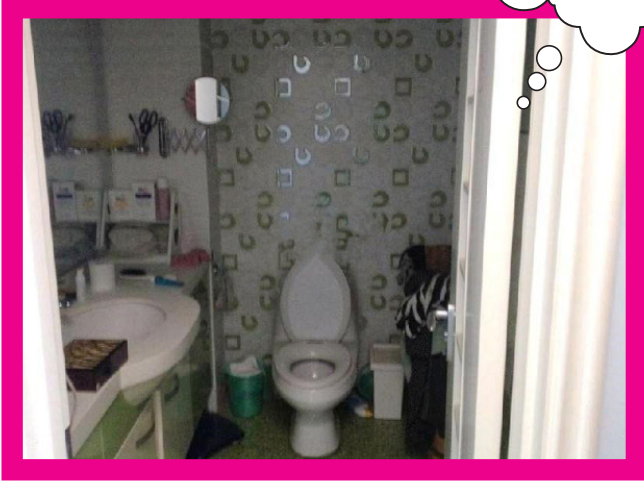
BIG LIVINGROOM



BIG KITCHEN



TWO BIG BATHROOMS





**Shandong 山东** Friendly  
**天然氧吧 一线海景房**  
 TIAN RAN YANG BA YI XIAN HAI JING FANG  
**同呼吸 共命运 感受品质生活**  
 没有雾霾/PM2.5  
 只有清新的**海风**

**2389元/m<sup>2</sup>起**  
**隆重推出特价房 16.8万/套**

**郑重声明：我们为开发商直属  
 驻北京服务中心 无中间环节 成本价销  
 一线海景 现房销售  
 购房无风险 服务有保障**

**“海居”不再是梦，梦想就在眼前 每周看房班车 火热报名中...**  
 热线电话：**010-59424188 010-59417499** 幸运编号：  
**C-699**  
 地址：北京市丰台区马家堡东路71号立业大厦1209室  
 铁：10号线角门东A口北行600米

MOVE OUT OF THE  
 POLLUTED CITY INTO  
 THE GREEN

**“穹顶之下”  
 没有海景房 你 out 了!**

**环境对比**

我国某城市 我国某城市

青龙高速 德龙烟城际铁路 蓬莱龙口旗顺海底隧道

**摒弃旧思想!  
 你的健康由你负责!  
 一起来感受大海边的房子吧!**

**选择龙回海景房您有八大理由**

- 理由一：空气清新、环境好，小区周围大量黑松林和当地海洋性气候非常适合人类居住；
- 理由二：楼盘距海只有20米，名副其实的一线海景房；
- 理由三：唯一可落户的小区，购房就可落户享受当地上学、就业、医疗等等市民待遇；
- 理由四：紧邻国家投资的人工岛，升值潜力无限；
- 理由五：房产资质齐全，七十年大产权；
- 理由六：周边配套齐全，毗邻市中心；
- 理由七：中国五百强企业倾力开发，购房有保障；
- 理由八：海在北面，独特地理位置临海不潮湿。

**实景图**

西海岸精品户型图  
 G户型 122.71㎡ F户型 122.71㎡

金城蓝湾A区精品户型图  
 C1户型 122.71㎡ E1户型 122.71㎡

建筑面积约：54.18㎡ 建筑面积约：80.95㎡ 建筑面积约：48.00㎡ 建筑面积约：81.11㎡

▲以上所有数据仅供参考，不作为合同附件，部分数据以当地测绘部门相关消息为准。开发商保留对此资料数据修改而无事先通知的权利。

Figures 3.95-3.96: real-estate flyers selling apartments

Figure 3.97 (page 101-102): Current demands to the high-rise living environment, and prerequisites to the strategy

**3.10.3 Case: 你out了! (Nǐ out le! = You are out-dated)**

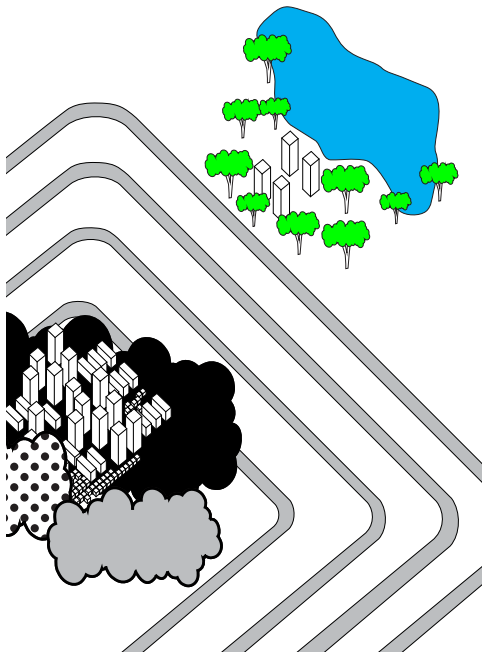
Folders of real estate companies (see figures 3.95-3.96) often make commercials with the same type of housing complexes: housing located in the periphery or outside of the “dirty and polluted” city (Hulshof and Roggeveen, 2011, p.114). They try to sell a dream similar with Corbusier’s. Housing with light, air, space, in the green, connected to the city with flying motorways and high-speed trains.

Furthermore advertising is often made to specific target groups. Complexes especially designed for young professionals, families, or the nouveau riche are the order of the day (Hulshof and

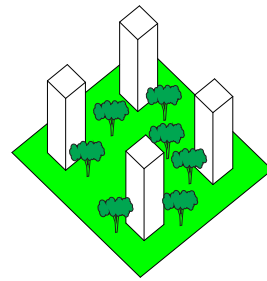
Roggeveen, 2011, p.125). Often targeted to (upper) middle class or higher classes they help pull them away from earlier generations high-rises.

**3.10.4 Changing demands in conclusion**

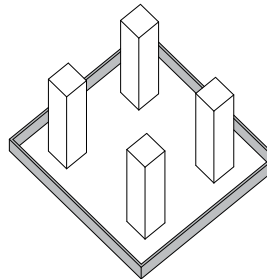
According to the analysed case studies the following characteristics (see figure 3.97) distinguish the later generations from the early generations high-rises. These characteristics should be matched or surpassed during rehabilitation to ensure that buyers and in particular higher social strata (who are moving away) remain interested in the early high-rises on the housing market.



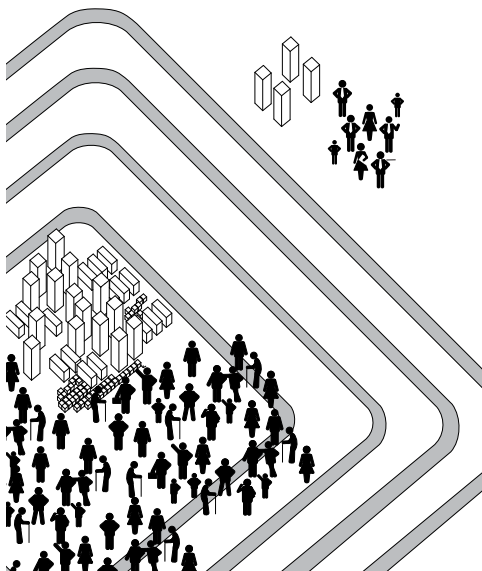
*Modern dream of moving out of the polluted city to towers in the green*



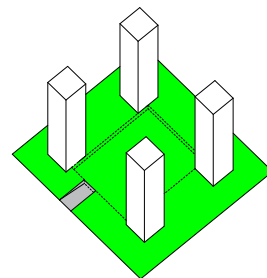
*Ample and maintained green space*



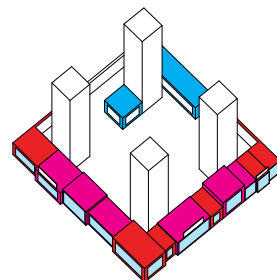
*Gated*



*Living with people like you*



*Underground parking (little cars in communal spaces)*

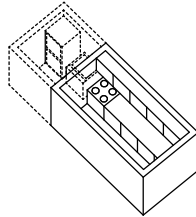


*Many amenities and community facilities*

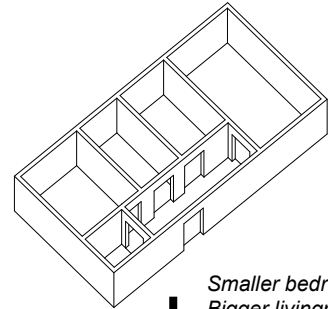




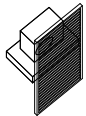
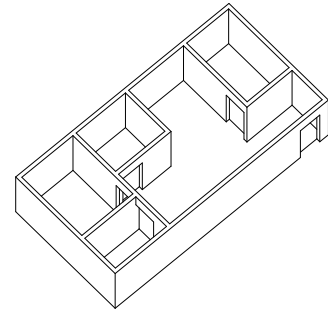
*Decent facade and new building design*



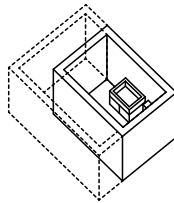
*Larger kitchen*



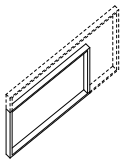
*Smaller bedroom +  
Bigger livingrooms +  
No hallways*



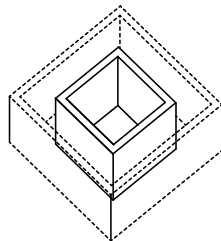
*Hidden airconditioning units*



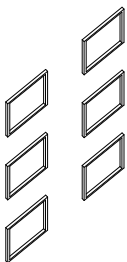
*Larger bathroom*



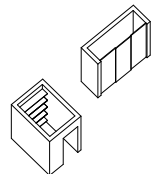
*Big windows*



*Big dwellings*



*Uniform windows and facade*



*Storage space*

**Notes:**

1. In the 1950's, following the guidelines of the former Soviet Union's housing program, the housing standard of 9 meter square living space per person (common in the former Soviet Union) was used. Double the realistic PCR housing standard, they would be allocated to multiple families. A policy also named the reasonable design, unreasonable use. (Lü et al., 2001, Hui, 2012)

2. In the "Opinions on the architectural standard of apartments and dormitories" released in 1966 by the minister of Building Industry it was stated that living space should not be more than 4 square meters per person and the living space per family not more than 18 square meters (Lü et al., 2001, p.176)





4.0





**THE STAKEHOLDERS OF  
THE EARLY HIGH-RISES REHABILITATION**

## 4.0 STAKEHOLDERS OF THE EARLY HIGH-RISES

In this chapter research findings on the stakeholder analysis will be discussed. To answer the question: Who are the involved stakeholders and is it possible to identify their interests, needs and possibilities in the rehabilitation process of the early high-rises? Several sub-sub questions will be answered throughout the chapter:

### 4.1 Who are the stakeholders in the rehabilitation process of the early high-rise housing of Beijing?

Who to include as a stakeholder depends on the applied definition of what a stakeholder is. The definitions differ in how inclusive they are. Eden and Ackermann (1998, p.117) define a stakeholder as: "People or small groups with the power to respond or negotiate with and change the strategic future of the organisation". To them a stakeholder can only be people or groups that have the power to directly affect the organizations future. On the contrary, Nutt and Backhoff (1992, p.439), Johnson and Scholes (2002, p.206) and Bryson (2004, p.22) urge the use of a more inclusive definition of stakeholders, considering a broader array of people, groups and organisations with or without power.

An inclusive definition seems more befitting to the challenges of China's crumbling high-rises. Especially considering that the many powerless "stakeholders" involved, yet ignored, in previous renewal plans, were able to prolong or prevent renewal processes. Therefore the definition of Nutt and Bakcoff will be used: 'All parties who will be affected by or will affect the rehabilitation strategy. In accordance with this definition and the identified stakeholders in Chinese renewal processes of previous research on urban renewal in former public

housing stock and urban villages in Chinese context (Wu, 2013, p.57, Hui, 2012, p.375), the stakeholders in figure 4.1 will be taken into account.

### 4.2 Is it possible to understand stakeholder's needs and interests in the rehabilitation process?

When reviewing literature, generic interest of different stakeholders can be identified on renewal or rehabilitation processes of the early generation high-rises in Chinese context (see figure 4.2).

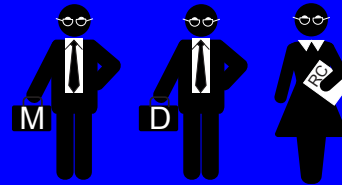
#### 4.2.1 Governments

Parallel to the Danwei systems (and subordinate to it) an official, hierarchical governance system in urban areas was developed. This urban administrative structure of governments consisted legally of three levels. The municipal government on city level, district and sub-district (jiedao). The latter one meaning street or road in Chinese, is the basic level of government in Chinese cities. The Jiedao Banshichu (sub-district office) is responsible for the governance of each sub-district. The population of each jiedao area in Beijing is usually between 30.000-60.000 people (Hui, 2012, p.177). Under supervision of the Jiedao Banshichu the self-governance organisation of the neighbourhood: the residents committee facilitated the administration on the lowest level of urban governance. They were the link, between policy and people. With the transition of the planned economy to the socialistic market economy the danwei-state system was abandoned. A new system transformed (several of) the residents committees to a shequ (community) committee (Hui, 2012, p.192-194). The shequ as an organisation representing resident's auton-

# STAKEHOLDERS OF THE REHABILITATION PROCESS OF THE EARLY HIGH-RISES

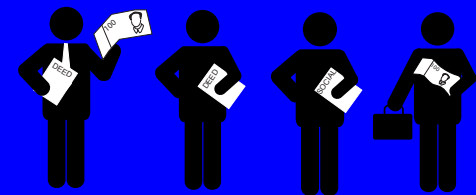
## 1. GOVERNMENT

Beijing municipal government,  
District government, sub-district offices,  
Residents or Shequ committee



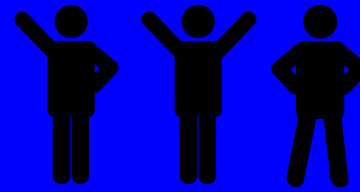
## 2. PROTECTED LOCAL RESIDENTS

Landlords  
Owner occupiers  
Tenants of public housing  
Owners of local enterprises



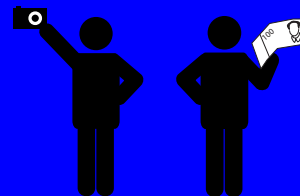
## 3. UNPROTECTED LOCAL RESIDENTS

Tenants of privately owned housing  
Sub-tenants public housing  
Rat population



## 4. VISITORS AND CUSTOMERS

Visitors  
Customer



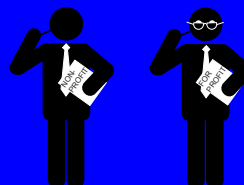
## 5. PROFESSIONALS

Consultants, designers



## 6. URBAN RENEWAL AGENCIES

Non-profit agencies  
Publicly owned-for-profit renewal agencies





omy in the more individual oriented socialist market economy. The administrators of the shequ are elected by local residents (under supervision of the government).

#### *1+2+3. Beijing municipal government, district governments and sub-district offices*

The government's stakes in the high-rises are contradictory. Firstly they have a high general interest in providing a good living environment for its citizen but simultaneously have several specific interests in the early high-rises.

The high-rises are very visible architectural elements in the centre of the urban fabric and the ongoing dilapidation has a negative effect on the image of a modern Beijing. The preparations for the Olympics in 2008 in Beijing, and other important political gatherings have pushed the government to commence beautification projects (Hui, 2012, p.625). High-rises along main infrastructure, likely to be on the route of the guests visiting Beijing for these events would receive a partial cosmetic makeover (Hui, 2012, p.357). Usually it involved superficial renovation such as repainting and removing of scattered air-conditioning units and illegal façade additions.

Furthermore the income of the municipal governments for a high percentage (even as high as 60%) depends on the income of land-leasing (McKinsey Global institute, 2009, p.89). As the first and early transitional high-rises were constructed prior to the land-leasing, most of the land of these earlier generations of high-rise is still property of the government. As the decay continues and the properties are approaching the end of their intended lifespan the land of these well-located dwellings will become a potentially very lucrative redevelopment site for the government. The land could be leased out to develop up-scale, high-end developments. (The land of the high-rises built in the nineties will more likely be leased to the owners of the dwelling and as only 25 years of their lease-time has passed re-leasing is not yet of interest.) A conventional renewal of the early high-rises, could make room for more expensive developments. These developments are in the interest of the government as the nation's GDP is being pushed forward by re-construction (Ye et al., 2010, p.275).

Their main interest of the 3 layers of governance are highly contradictory in regard to a possible rehabilitation process of the high-rises and can be concluded as followed:

1. Improving the quality of the social and physical (aesthetic, functional and technical) living environment, but without having to make high investments.
2. Improving the modern image of the city by beautification of the high-rises.
3. Receiving fast municipal income from land-(re) leasing.
4. Driving real-estate construction, usually by full scale renewal to push the GDP growth.

#### *4. Shequ committee (formerly known as residents committee)*

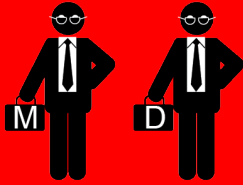
The shequ committee, as link between policy and people has high interests in the high-rise communities. They are responsible for a vast amount of tasks, heavy administration duties, and daily organisation of life in the communities (Hui, 2012, p.192-194). Although affected by a possible rehabilitation they will not have extremely high interests as their task currently does not include maintenance or improvement of the high-rises living environment. However when the rehabilitation will commence the shequ committee could become included, again as link between policy and people (in regulating capacity or to manage resident representation), raising their interests.

#### **4.2.2 Protected local residents**

Protected local residents are those stakeholders who are protected by law to maintain their dwelling. They have a deed or governmental social rent contract.

##### *1. Landlords*

The landlords are those who purchased (several of the) public housing dwellings during reform or bought (several) properties on the secondary housing market. The rising housing prices and rental prices made the purchase of these dwellings highly lucrative. The landlords themselves often live in high-end housing estates (Hui, 2012, p. 280, 315). Their interests are purely financial, a matter of extracting as much profit as fast as possible. The state of their rental properties is usually poorer, as



## 1. GOVERNMENT

1. Improving the quality of the social and physical (aesthetic, functional and technical) living environment to increase rental prices, but without having to make high investments.
2. Improving the modern image of the city by beautification of the high-rises
3. Receiving fast municipal income from land-(re)leasing.
4. Driving real-estate construction, usually by full scale renewal to push the GDP growth.



## 2. PROTECTED LOCAL RESIDENTS

### Landlords

1. Possibility to receive a high buy-out or compensation for their dwelling.
2. Improving the quality of the social and physical (aesthetic, functional and technical) living environment to increase rental prices, but without having to make high investments.
3. Short rehabilitation process to minimize loss of income from rent, or a rehabilitation process in which renters remain living there.



### Owner-occupiers

1. Possibility to receive a high buy-out or compensation for their dwelling (or the possibility to retain the dwelling during the rehabilitation (no re-placement))
2. Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make high investments.
3. Increasing the value of the property as fast as possible.



### Tenants of public housing

1. Possibility to retain the dwelling during the rehabilitation (no re-placement)
2. Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make high investments.
3. Maintaining the low rental prices.



### Owners of local enterprises

1. Possibility to receive a high buy-out or compensation for the property or possibility to keep the business open during the rehabilitation (no re-placement or long closure period)
2. Maintaining their market proportion (keeping a check on competition).



## 3. UNPROTECTED LOCAL RESIDENTS

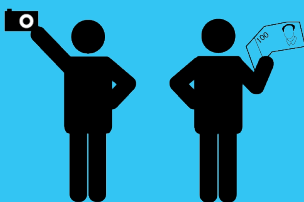
### Tenants of privately owned housing and sub-rented public housing

1. Possibility to retain the dwelling during the rehabilitation (no re-placement)
2. Decreasing or maintaining the rental cost
3. Offer affordable properties to buy.
4. Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make (any) investments.



### Rat population

1. Possibility to retain the dwelling during the rehabilitation (no re-placement) or better quality and cheap alternative dwelling in city centre
2. Decreasing or maintaining the rental cost
3. Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make (any) investments.



## 4. VISITORS AND CUSTOMERS

1. Retaining or increasing the possibility to enjoy the vitality and ample amenities of the early high-rises.
2. If applicable diminish the physical borders that the high-rises and their communal grounds are to visitors and customers.

# INTERESTS OF THE STAKEHOLDERS IN THE REHABILITATION PROCESS ON A LIST

both landlord and renter refuse to invest, compared to owner occupied housing (Hui, 2012, p.321).

When the high-rises must be rehabilitated the interest of the landlords could be concluded as followed:

- 1.Improving the quality of the social and physical (aesthetic, functional and technical) living environment to increase rental prices, but without having to make high investments.
- 2.Possibility to receive a high buy-out or compensation for their dwelling.
- 3.Short rehabilitation process to minimize loss of income from rent, or a rehabilitation process in which renters remain living there.

#### *2. Owner occupiers*

From all the stakeholders the owner occupiers will have the highest stakes as they do not only share interests in the condition of the living environment but also carry the weight of the financial investment they have made in the dwelling. Their interest in a rehabilitation process can be summarised as followed:

- 1.Possibility to receive a high buy-out or compensation for their dwelling (or the possibility to retain the dwelling during the rehabilitation (no re-placement))
- 2.Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make high investments.
- 3.Increasing the value of the property as fast as possible.

#### *3. Tenants of public housing*

The residents of the public housing who did not want, or were not able to purchase their dwelling

could retain their public housing. The rent is still under market price. Often the tenants of public housing consider the rental property as theirs (Hui, 2012, p.314). Their interest (in case they are occupying their dwelling) in a rehabilitation process can be summarised as followed:

- 1.Possibility to retain the dwelling during the rehabilitation (no re-placement)
- 2.Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make high investments.
- 3.Maintaining the low rental prices.

#### *4. Owners of local enterprises*

Owners of local enterprises are a great contributor to the vitality of the neighbourhoods of the high-rises. Their main interests are of an economic nature:

- 1.*Possibility to keep the business open during the rehabilitation (no re-placement or long closure period)*
- 2.*Maintaining their market proportion (keeping a check on competition).*

#### **4.2.3 Unprotected local residents**

With the steep increase of property prices post-reform, vast profits were made with the purchase of former public dwellings. Many of those who initially purchased one of these public dwellings or purchased one on the secondary housing market do not actually live there anymore. The rising housing prices have made sub-letting of the (sub-divided) apartments extremely profitable (Hui, 2012, p.315).

Although the percentage is lower, in a similar manner many of the houses which were retained as public housing during the reform are being sub-

let for market rates by the tenants. Although this is prohibited, many of the residents who retained their assigned public housing see it as their property (Hui, 2012, p.314). Usually these dwellings will be rented for a bargain market price. This is a benefit for the sub-letters and prevents them from complaining to authorities. Even though the illegal subletting has a benefit to the legal private rental market, the social injustice in this situation is still very clear as the tenants themselves pay little rent and receive high rents for the subletting of a dwelling that is a public asset.

The rat population is a nickname for a group of people living illegally in the basements of buildings (Kim, 2014). In many of the basements of the high-rises small, sub-standard, sub-divided dwellings can be found. Offering poor living quality yet located in the city centre these are the homes of the rat population. Often poor migrants coming from the country side without a houkou, (or the less affluent legal residents) will find a place in these illegal slum-like dwellings.

From all the stakeholders these groups should be considered as the most vulnerable groups. Their stakes are high, yet their interests are unprotected and have been discarded in the conventional renewal processes of the last decade of the previous century and the beginning of the new millennium. Often in renewal processes their housing would become too expensive to retain it after renewal or renovation (Hui, 2012, p.377).

#### *1. Tenants of privately owned housing and sub-tenants of public housing*

The tenants of privately owned housing and sub-tenants of public housing have high interests in

the high-rises. This is their daily living environment which is in a process of physical and social decay. They have an interest in the affordability of the dwellings. As currently it is one of the only options to live (reasonably) affordable in the city centre in a dwelling with modern facilities. Often the (sub-) tenants have to share these facilities with other tenants as many of the rental properties have been subdivided to maximise profits.

During a rehabilitation process their concern will be first and foremost the option to retain their dwelling, and fear that rents will rise forcing them to seek other housing. In conclusion the generic interests of the tenants of privately owned housing and sub-tenants of public housing can be concluded as followed:

- 1.Possibility to retain the dwelling during the rehabilitation (no re-placement)
- 2.Decreasing or maintaining the rental cost
- 3.Offer affordable properties to buy.
- 4.Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make (any) investments.

#### *2. Rat population*

The interest of the rat population in the rehabilitation of the early high-rise can be summarized as followed:

- 1.Possibility to retain the dwelling during the rehabilitation (no re-placement) or a cheap and better alternative dwelling in the city centre.
- 2.Decreasing or maintaining the rental cost
- 3.Improving the quality of the social and physical (aesthetic, functional and technical) living environment without having to make (any) investments.



### **3.2.4 Visitors and customers**

The visitors and customers of the early high-rises have a limited interest at the moment. They are passers-by enjoying the vitality and ample amenities due to good locations of the early high-rises.

Many of the high-rises have a communal ground which usually only grants limited access to passers-by. Except for the amenities which are often located on the edge of the terrain the high-rises and grounds behind form unattractive borders for slow traffic (Hui, 2012, p.61).

The current interests of the visitors and customers in the rehabilitation of the early generation high-rises could be described as followed.

1. Retaining or increasing the possibility to enjoy the vitality and ample amenities of the early high-rises.
2. If applicable diminish the physical borders that the high-rises and their communal grounds are to visitors and customers.

### **4.2.4 Professionals**

Currently consultants and designers have very limited interests in the high-rises. The main interest for now is academic. But from this academic interest, and need to improve, the rehabilitation of the high-rises can become a project, instead of a cold case. Then it will be in the interests of the professionals to provide as smart as possible solutions for these projects to become part of the tender to improve the living environment.

### **4.2.5 Urban renewal agencies**

#### *1. Non-profit agencies*

The non-profit agencies have in the current situation a limited interest. As the challenge of the

crumbling high-rises will become more urgent and renewal processes commence, the publicly controlled non-profit agencies will become full stakeholders as they might become the executor of part of the rehabilitation (Hui, 2012, p.738).

#### *2. Publicly owned-for-profit renewal agencies and private developers*

As the Non-profit agencies the current interest of publicly owned-for-profit renewal agencies and private developers in the high-rises is minimal. Their main current interest is the enormous value of the land to which they have no access at the moment. Only when these parts of the land are made available through tender or a business case which could make the rehabilitation of the high-rises profitable, could the interest of these formerly mentioned parties become significant and make them part of the rehabilitation.

### **3.2.6 Interconnection of interests on an urban or societal scale**

To be able to fulfil the interests of stakeholders it is first necessary to fully understand the origin of the stakeholder's interests. Many of the interest seem to have a (inverse) linear relationship. They are not only interconnected but often derive as a reaction to processes on an urban or even societal scale (processes which have been discussed in the previous chapter). Clear examples are the demand for more affordability, sustainability versus the demand for short-term profit, GDP growth and housing market reheating. Although problems could be alleviated, some problems might not be completely solvable on the high-rises scale. So understanding exactly how interests are linked to problems on higher

scale, is a necessity to find the most efficient scale to solve the issues. The interconnection of interests and links to processes on urban and societal scale are shown in the info graphic in figure 4.3.

### **4.3 What could be the stakeholder's possible role in the rehabilitation process?**

To explore the stakeholders possible role in the rehabilitation process, a clear insight in the degree they are able to enforce their interest in the rehabilitation is necessary. To gain this insight the stakeholder analysis method: the power versus interest grid (see figure 4.4-4.5) will be applied. When we measure the interest in the rehabilitation of the crumbling high-rises of the different stakeholders in accordance to the power they hold in the process several interesting conclusions can be deducted.

Firstly it was impossible to show the interest versus power relations in only one grid. Clearly the power relations are different on the scale of the building or da yuan versus the dwelling. Traditionally the government is one of the most powerful stakeholders in Chinese urban development. Although in different periods of time and policy the involvement of market parties has differed, the government of the people's republic of China always has great control over the process. Although they have retained this power on the building and urban scale post housing reform, the scale of the dwelling has become a different matter entirely. The housing reform stimulated the privatisation of housing and even though the land and the high-rise the dwellings are located in are still owned by the state, the scale of the dwelling is controlled by the owner of the dwelling. This juxtaposition between power relations on the different scales suggest that

# STAKEHOLDERS INTERESTS: THE INTERCONNECTION ON THE URBAN + SOCIETAL SCALE

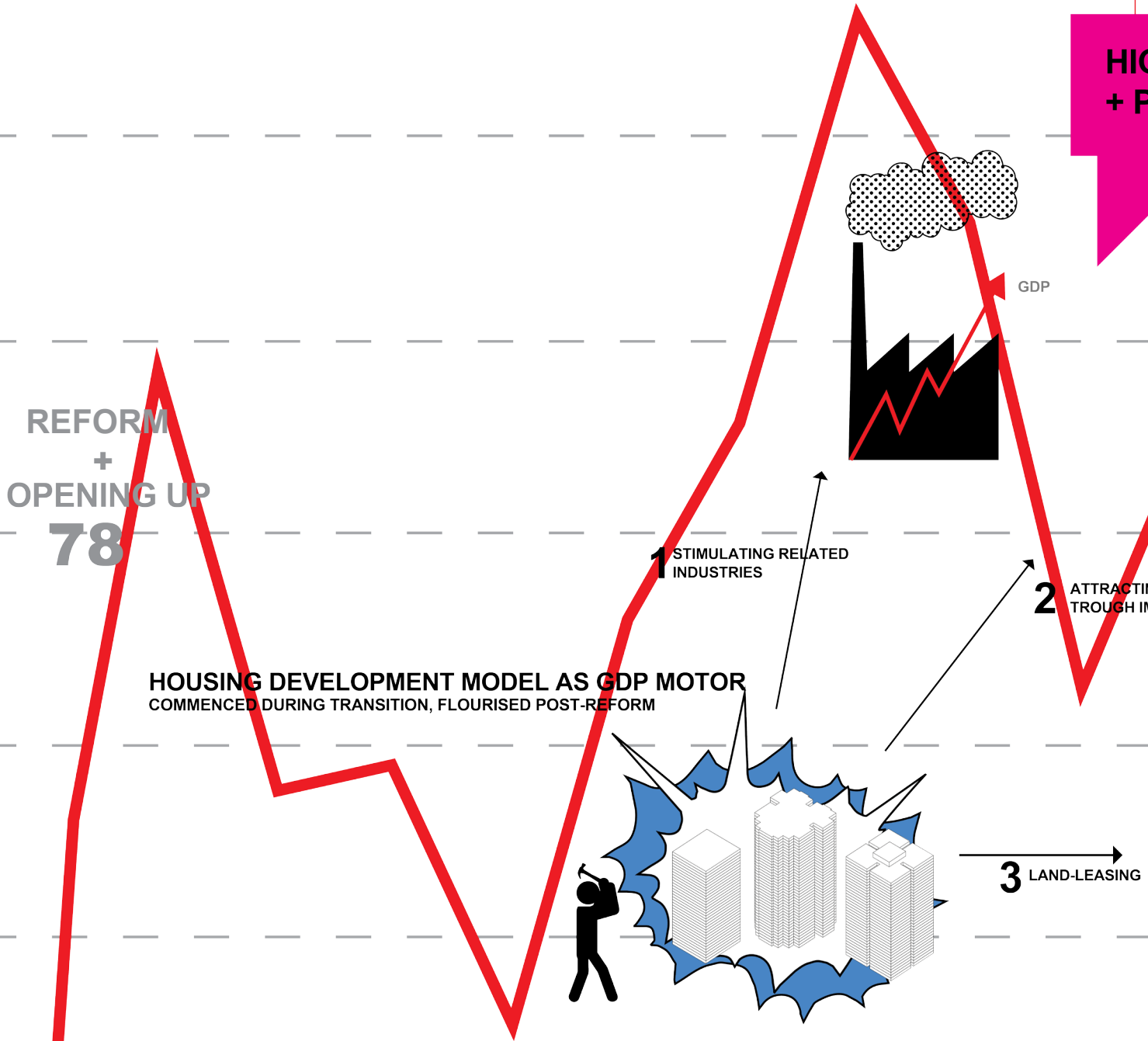


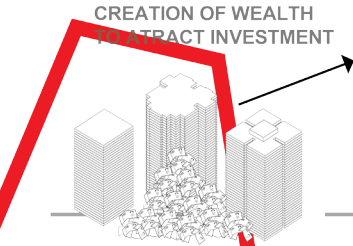
Figure 4.3 (page 114-117): Infographic on the interconnection of stakeholder's interests on the urban societal scale

ENVIRONMENT IS BEING POISONED AND EXHAUSTED!

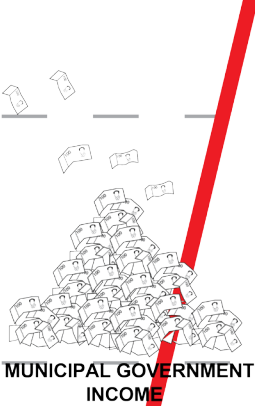
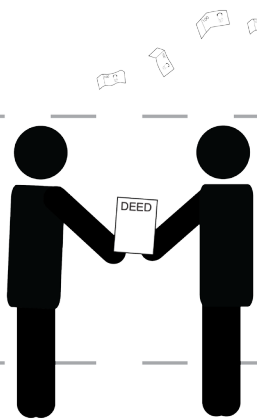


HIGH CONSUMPTION  
POLLUTION

SHORT TERM ORIENTED  
DEVELOPMENT MODEL

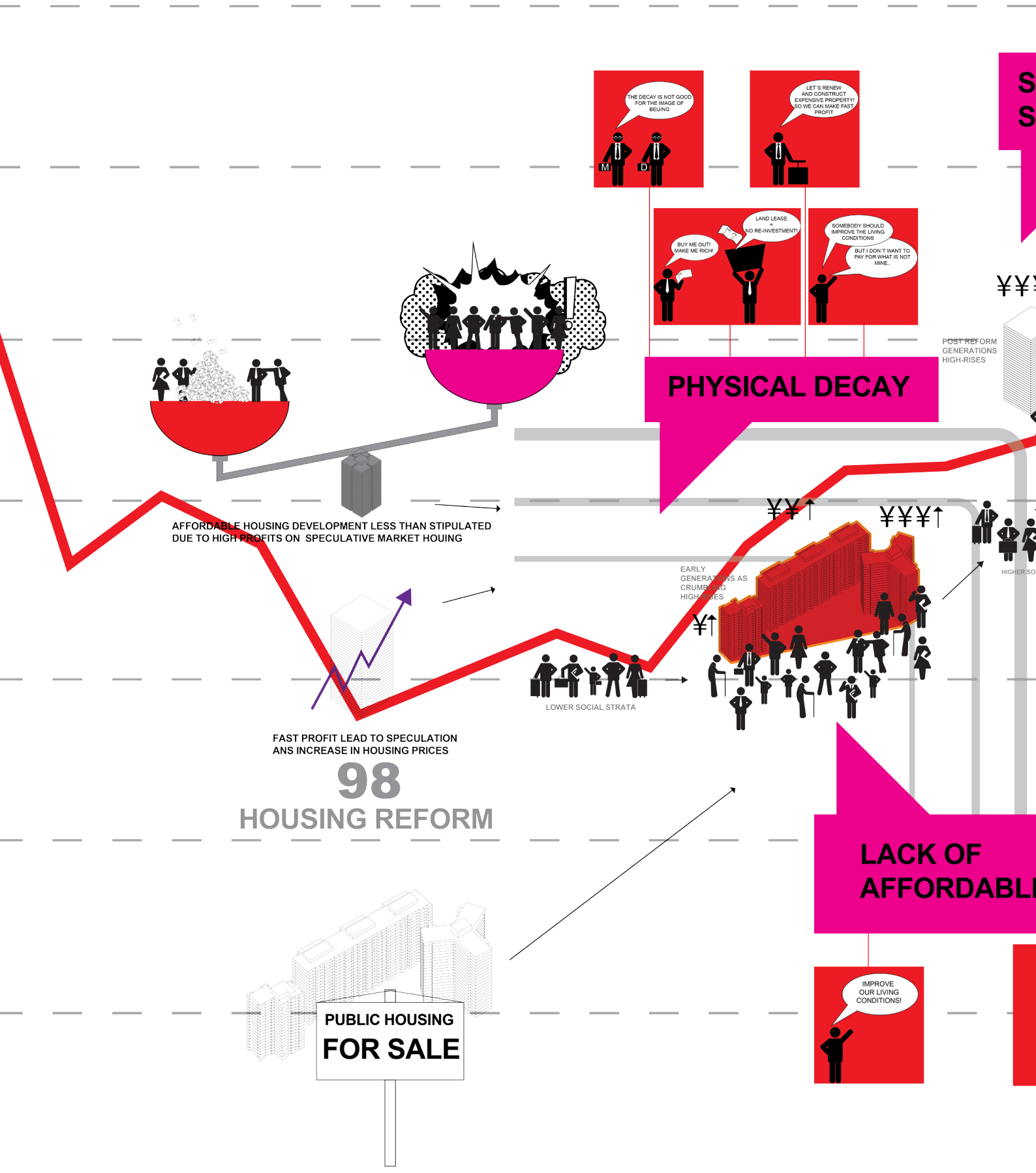


SHORT TERM ORIENTED DEVELOPMENT



UNSUSTAINABLE  
MUNICIPAL FINANCING

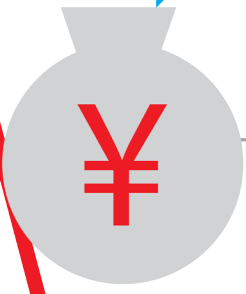




**SOCIAL SPATIAL SEGREGATION**



**REAL ESTATE CRISIS + HIGH INTERIOR DEPT**



**08**  
PERIOD OF ADJUSTMENT

**HOUSING**



12%

14%

12%

10%

8%

**15**  
TODAY 6%

4%

a rehabilitation strategy must be a dual strategy in order to rise above the current impasse between stakeholders. Namely the privatisation will make it almost impossible to implement a strategy top-down to improve decay in the dwellings. However the opposite is equally true, residents will most likely fail to implement a bottom-up strategy to successfully rehabilitate the building and communal space. Therefore a dual strategy where bottom-up interventions will be used on dwelling scale and top-down interventions on building and communal grounds scale should be developed.

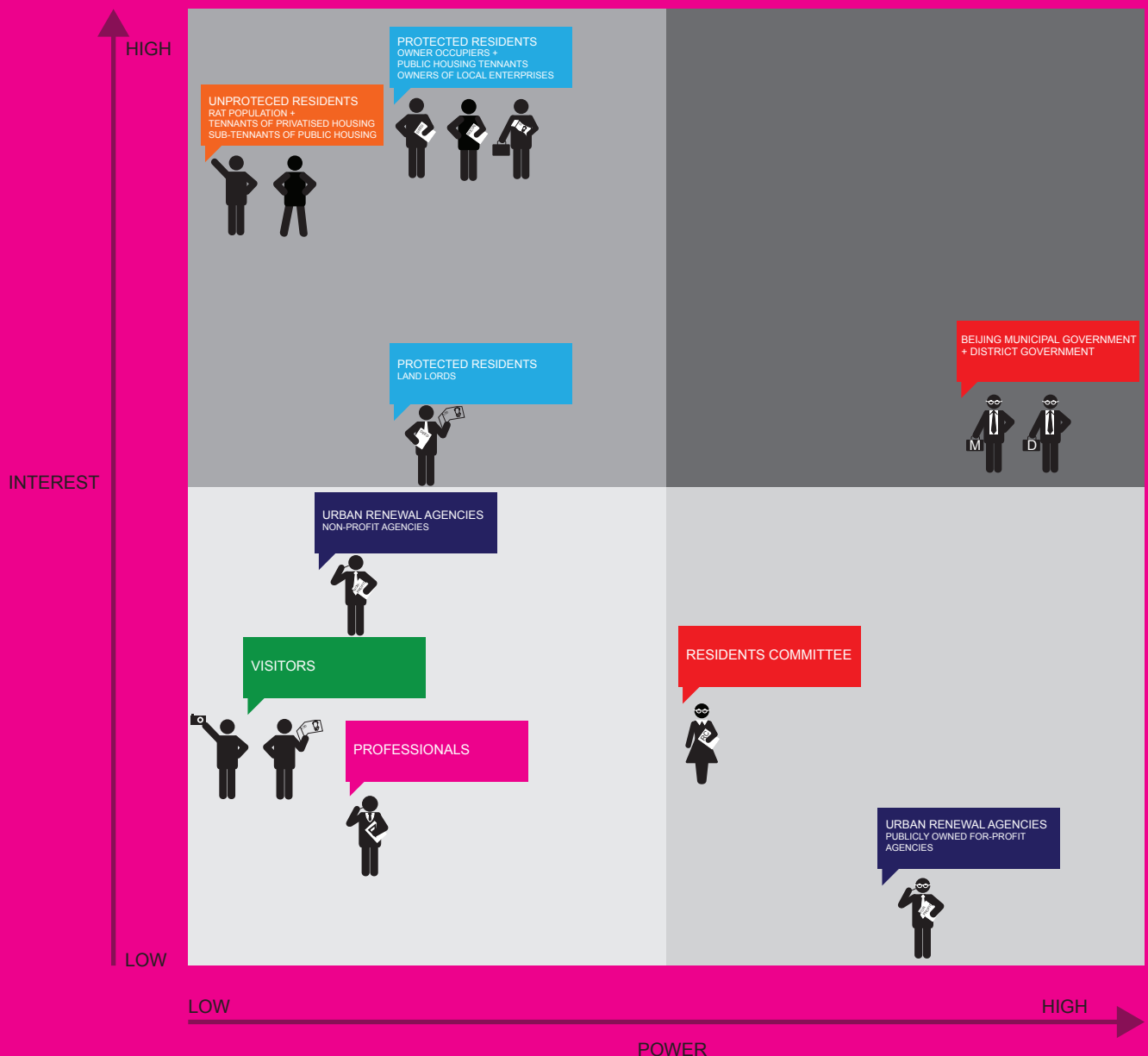
#### 4.4 Stakeholders in conclusion

From the stakeholder analysis it is possible to make

several conclusions which need to be incorporated when defining the strategy:

1. Some of the interests (need for more affordable housing, fast profit orientation), stem from problems on higher scales, which can probably not be solved on the scale of the high-rises only. To find a sufficient solution, the strategy will have to determine a course of action on more than the architectural scale level.
2. Many of the interests are contradictory to each other. To successfully break the current impasse, the rehabilitation strategy needs to balance or address some of these contradictory interests.
3. A dual strategy will be used to rehabilitate. Top-down to rehabilitate the building and communal grounds and bottom-up on the scale of the dwelling.

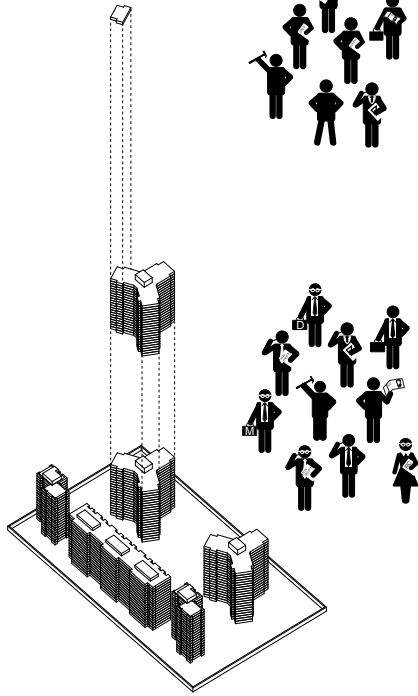
Figure x: Power versus interest grid of the early high-rises: communal grounds + building scale



DWELLING:  
BOTTOM-UP  
REHABILITATION

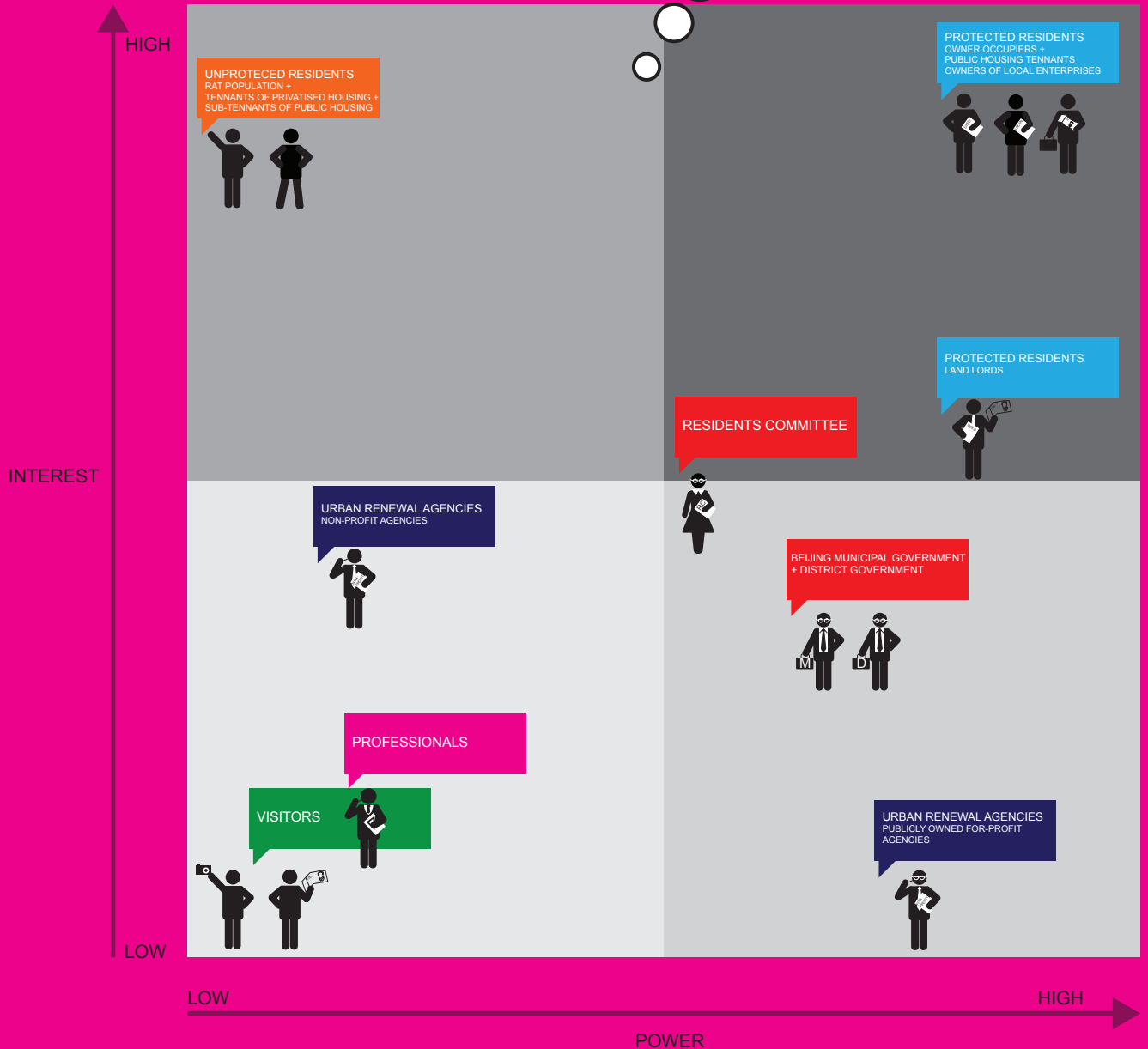


BUILDING & DA-YUAN  
TOP-DOWN  
REHABILITATION



*The power relations on dwelling and building scale are so different a dual strategy will be a pre-requisite. Top down to rehabilitate the building and communal grounds and bottom-up on the scale of the dwelling.*

Figure x: Power versus interest grid of the early high-rises: dwelling scale









# STRATEGIC PRECEDENTS

# III PART A

The chapters of part two were concluded with constraints, conclusions and prerequisites to which the rehabilitation strategy needed to respond.

In the chapters of part 3, we move from the existing to the possible. To fulfill the prerequisites and form an intermediate to an integral strategy, precedents for each of the domains (social organisational, physical and financial) will be researched.





5.0





**SOCIAL ORGANISATIONAL TOOLS FOR  
THE EARLY HIGH-RISES**



## 5.0 SOCIAL ORGANISATIONAL TOOLS FOR THE EARLY HIGH-RISES

### 5.1 Rehabilitation strategy – precedent research

When researching tools to form a hands-on integral rehabilitation strategy, the research of Hui (2012) forms an important precedent. The research aimed to solve the urban housing question and achieve social-spatial integration by developing an integral rehabilitation strategy for the former public housing of Beijing. The work of Hui is based on a broad research of the complex problems and a variety of rehabilitation precedent cases. His work can be considered inspirational, and formed a broad scientific base on which this work could be developed.

However, a significant amount of parts of the strategy Hui suggests are not applicable to the early high-rises. It does not offer a convincing “hands-on method” and integral strategy to deal with the challenge of the early high-rises of Beijing. Which parts of the financial, physical and/or organisational strategy components are and are not adoptable or adaptable, can help determine which components need to be further investigated.

Firstly, Hui (2012) looked from the view of the urban planner to solve the urban housing problems (housing affordability, problem of conventional renewal and social-spatial segregation). As these problems were the main concern of the research and the decaying former public housing a consequence, his strategy aimed to solve the problems on the urban-societal scale. Changes on this scale, although the right scale to make efficient changes, take long and are very difficult to implement. This research approaches the problems from the other way, looking first to the problems of the building and the stakeholders and how to start solving these before the negative spiral causes their status quo to deteriorate any further. Although the negative spiral

on site was traced back to the social process on a higher scale, and change on this level will still be necessary, this rehabilitation strategy needs to help alleviate the problems on short-term as well as solve them on long-term. The changes proposed by Hui to solve the urban social problems are very realistic and based on current developments. Although they alone will not be sufficient to ensure that the rehabilitation strategy can be used from tomorrow, they form a realistic strategic base and could be adopted in the strategy.

Furthermore elaboration on the physical tools of the strategy, were limited. This is due to two reasons. Firstly Hui’s work did not focus on the specific case of the early high-rise. Although they were included in his theoretical framework the cases focussed only on the mid-rise former public housing from the fifties- sixties and seventies-eighties. Secondly the architectural level was not the main focus of the research. The only physical interventions on the architectural level were illustrated in two (mid-rise housing) case studies. Even though some of the physical interventions suggested, could be applied on the high-rises as well a clear and workable approach on how to physically rehabilitate the high-rises is still missing.

Similarly the financial strategy as proposed by Hui does not offer feasible solutions, especially on the short-term. Although some of the tools suggested are valuable, the base of the financial model was a compensational strategy on and off plot size which is not suitable for the already dense high-rise areas.

In chapters 6.0 references which can provide strategic tools for the physical rehabilitation will be researched. In chapter 7.0, Hui’s financial model

and some additional cases will be researched to provide the tools to develop a financial model for the rehabilitation of the high-rises. In the remainder of this chapter the social organisational strategy as suggested by Hui will be discussed.

## **5.2 Re-socialisation model for the provision of affordable housing**

In order to adequately deal with the rehabilitation and fulfil the interest of the stakeholders towards the provision of affordable housing, changes in the organisation of affordable housing provision are necessary.

Although physical interventions and strong financial models could alleviate the affordability issues on the plot it will not be sufficient to solve the problems as the affordable issues stem from problems on a higher scale. To intervene on a higher scale and provide an adequate solution Hui's (2012) model on the rehabilitation of the former public housing proposes a process of housing re-socialisation. This model is realistic and based on the current policy change from the government towards inclusiveness, and the focus on affordable housing provision. It proposes to change the current affordable housing provision policy with a two-fold affordable housing policy.

### *1. Public rental housing*

The affordable housing provision should refocus on the public rental housing provision. This type should be between 30-40% of the entire housing stock, and should cover the need of the lower in-

come groups. This includes residents who do not have a houkou but have paid tax in Beijing for more than 5 years.

The public rental housing stock includes the current public rental housing and the retained social housing. However many will have to be created by new construction and transformation from existing housing stock. In the public rental housing sub-letting will be strictly prohibited.

### *2. New affordable housing.*

New affordable housing should become 20-30% of the total housing stock and is targeted to middle income groups. The new affordable housing should provide social, owner-occupied housing. The houses will be constructed with tax and land-lease exemptions or reductions, and sold to cost price. Re-sale will be limited and sub-letting is again forbidden. Also owners of affordable housing and public rental housing are not allowed to purchase any commodity housing or properties.

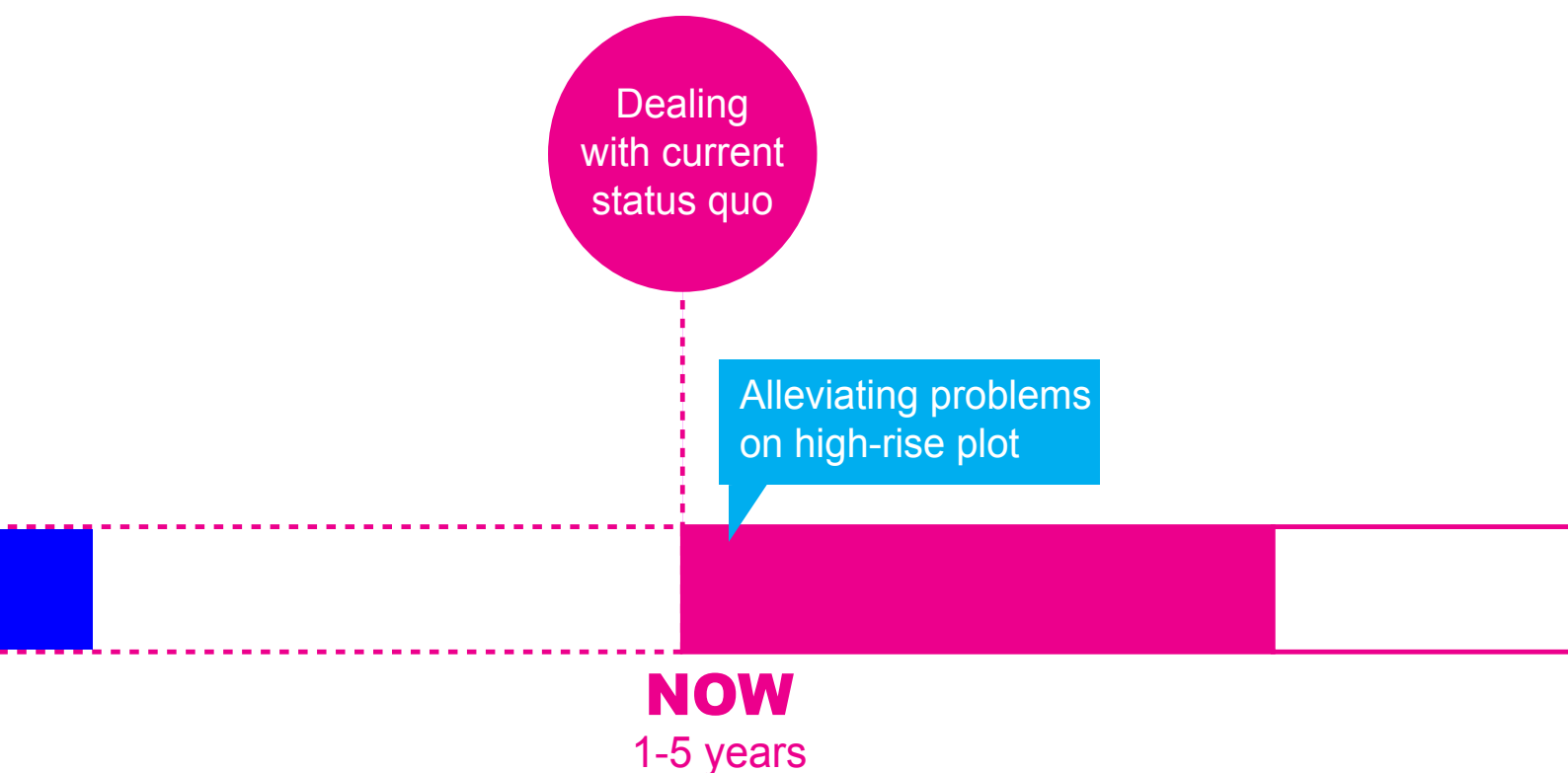
The development of affordable housing needs to be done by a non-profit housing development corporation. This corporation could be created by existing state owned, or private developers. They need to operate under a new legal framework and should be financially guaranteed by the government.

To prevent social-spatial segregation Hui emphasizes that the provision of social housing should be equally divided over the city and not concentrated in the periphery. As land in the city is scarce and expensive for construction of new affordable housing, the early high-rises could play an important locus for retaining and creating affordable housing.

The latter re-housing model for rehabilitation process, the housing re-socialisation as proposed by Hui, can offer a suitable solution to the affordability issues. This policy will help solve the lack of affordable housing. The model points to the former public housing as an important locus for housing (re)socialisation, so this should have an effect on the proposed long term rehabilitation plans for early high-rises. It also means that the problems can also be solved outside the high-rise plots. However it is important to note that the changes proposed in this model take place on a policy level, it is unlikely that

the changes will be made on a short term. Therefore the model will be adopted in the strategy on a long term (see figure 5.1).

On short term the story is entirely different. Where on long term solutions can be found outside the plot size, to deal with the issues on a short term, the limitations of the current social-organisational status quo needs to be respected. Alleviation for problems on the urban societal scale, such as the provision of affordable housing need to be developed on the plot scale (see figure 5.1).





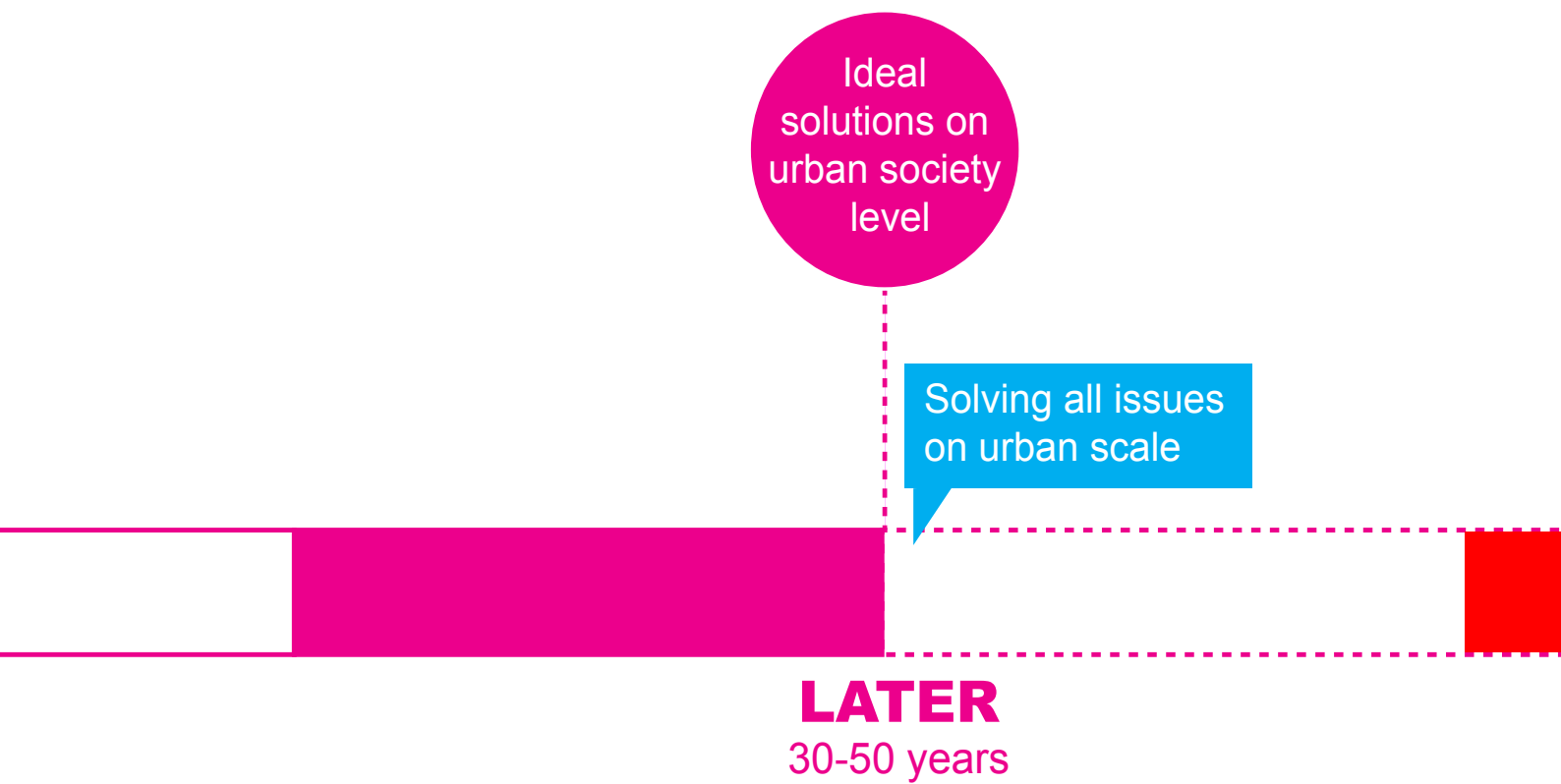
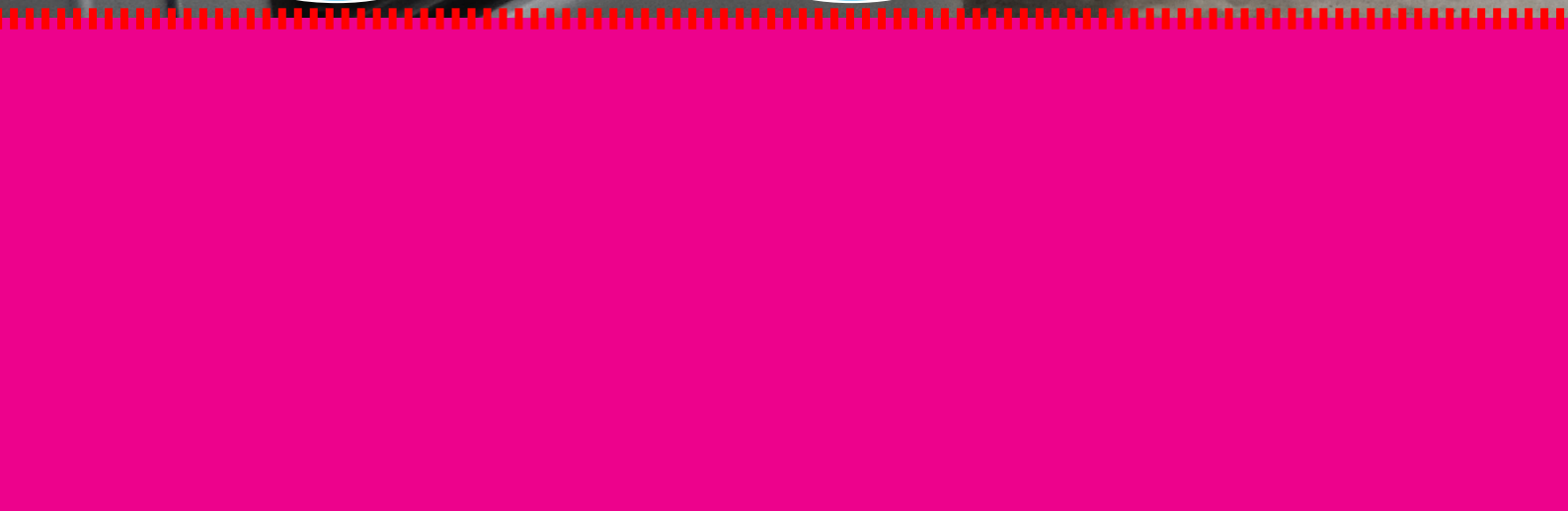


Figure 5.1: Working within an imperfect reality versus ideal future



6.0







**PHYSICAL INTERVENTIONS FOR  
THE EARLY HIGH-RISES**



## 6.0 PHYSICAL INTERVENTIONS FOR THE CRUMBLING HIGH-RISES

### 6.1 RE-Opening Building Systems

The open building methods, developed in the second half of the previous century, aimed to provide a solution for juxtaposition of constantly changing demands of the stakeholders of buildings versus the inertia of the buildings (Cuperus, 2001). Within this method the separation of responsibilities for different building parts was proposed to guarantee adaptability and so sustainability of the living environment.

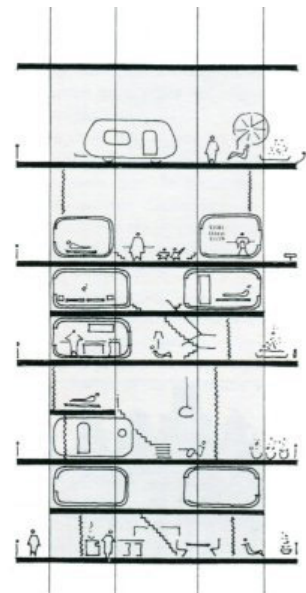
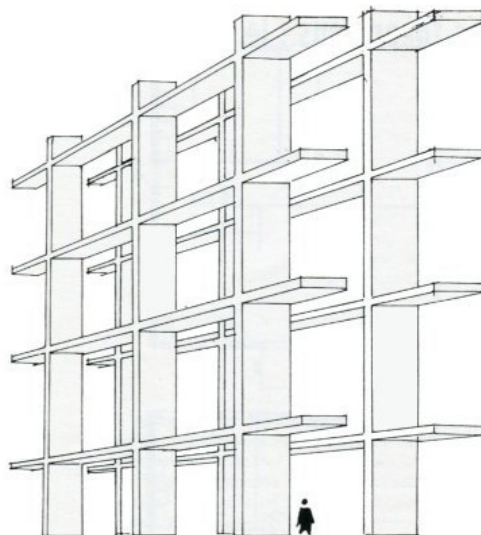
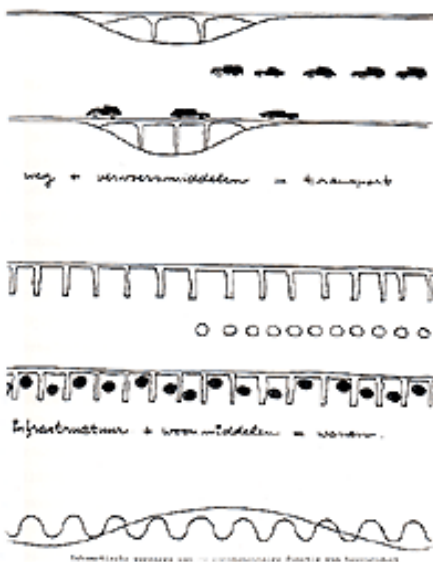
These themes are similar to the “constraints” as developed in part 2 for the rehabilitation strategy of the early high-rise housing. The need to adapt to current housing demands and separate responsibilities (and rights) for communal grounds, building and dwelling could mean that the Japanese and Dutch precedents and experiments in open building offer a theoretical precedent on how to physically intervene in the high-rises.

#### 6.1.1 SAR method – the proposal for a new housing process

Post war the housing industry in the Netherlands was experiencing major changes. To alleviate the housing shortage, caused by the Second World

War, repetitive, massive and homogeneous housing was constructed for the masses. As a critique the Dutch architect N. John Habraken published the book: “Supports: an alternative to mass housing” (original title: De dragers en de mensen) in 1961. The main question of the book remains relevant today, and if turned around it becomes relevant as well for the early high rises in Beijing. According to Habraken (1961) the main problem of the Dutch residential architecture from this period was that the dwelling would be built for people, who would never get the chance to make any decision on their living environment. Furthermore the dwelling as a finished product, and especially in multifamily dwellings, will lack adaptability to future demands. Habraken argued “We should not forecast what will happen, but try to make provisions for the unforeseen” (Habraken, 1961).

Fighting against the idea of the house as a consumer product, as a repetitive and finished product, he proposed the concept of the house as a process, as an alternative to conventional mass housing production methods. Habraken introduced different levels of decision making in the building process: The act of the building and the act of



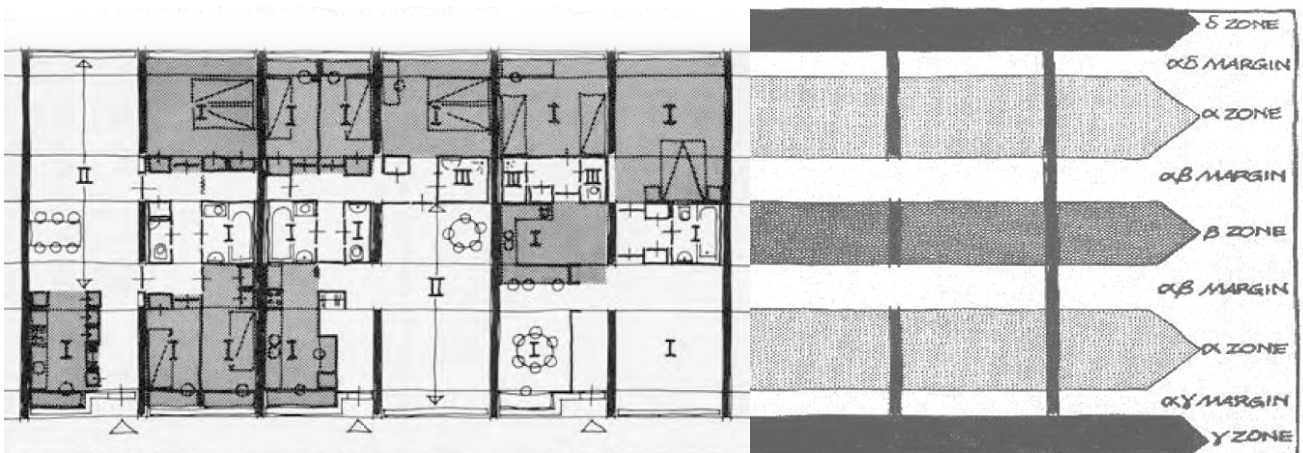
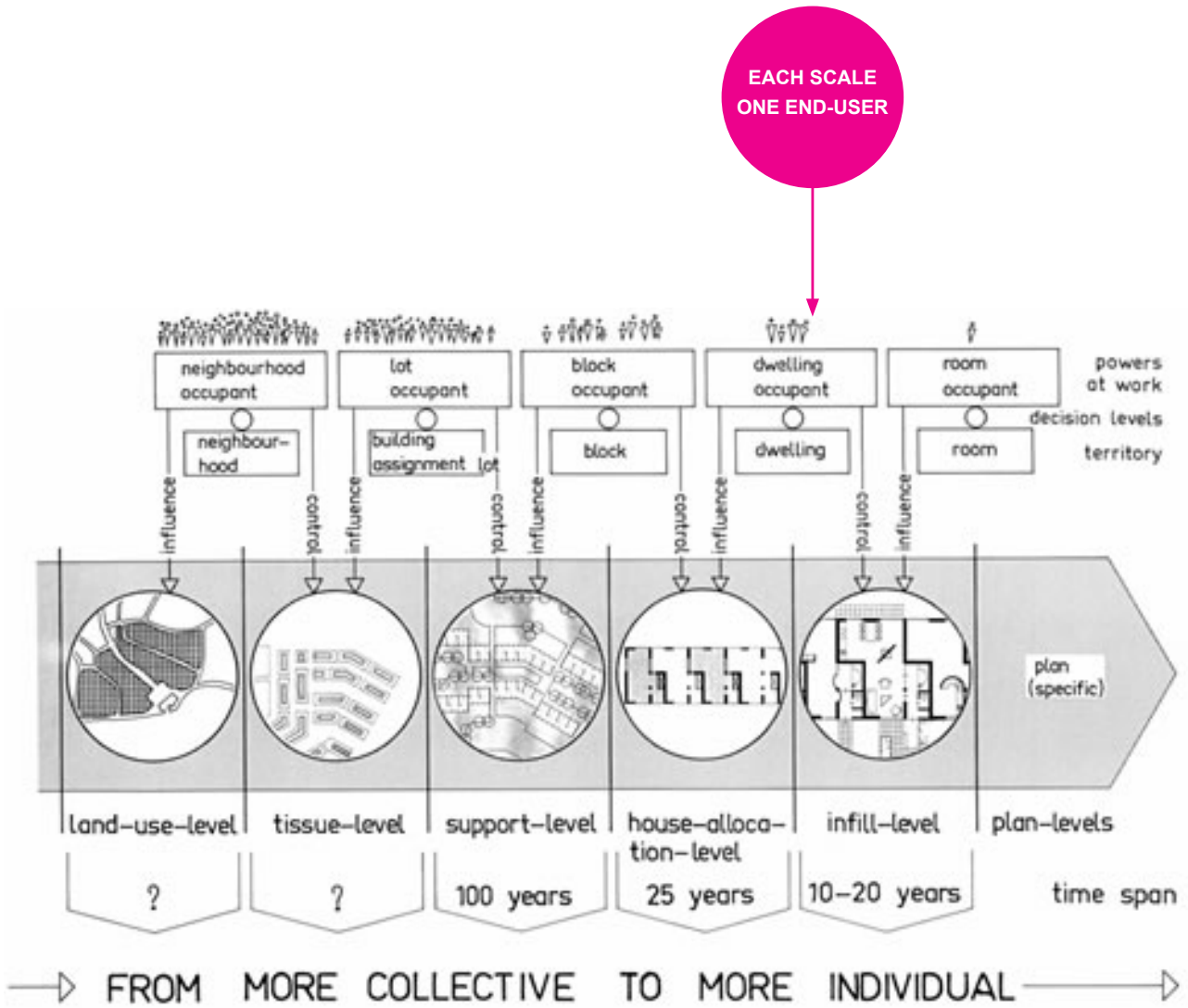


Figure 6.1-6.3: Concepts on separation between carrier and infill (images by Habraken)

Figure 6.4: Ideas on responsibility according to a scale of influence (image by Habraken)

Figure 6.5: An open building created on zones (image by Habraken)

the dwelling separating the “base building”: those parts dependant on regulations, structure and installations which are controlled by the community from the “separable units or infill”: that which can be adapted to the wishes of the user, like interior divisions, closets, kitchens bathrooms, etc. With this division he intended to untangle the “spaghetti model” to achieve the wished adaptability in buildings. Furthermore a zoning system was developed to deal with the adaptability and differentiation in dwellings.

Habraken’s ideas of support and infill for architectural “design” explained in the SAR65, was further developed in the SAR 73. The ideas developed on architectural scale were projected into the urban development scale. A division was made into five primary, physical systems which together form the built environment (Cuperus, 2001, Nagore Setién, 2014): the urban structure, the urban tissue (blocks), the building, the infill components and the furniture. Per “system” a main stakeholder can be defined who has the “final say”. Where on the furniture scale it is the room occupant, on the infill level this is the resident(s), on the building scale this is the developer or housing corporation, the municipal council on the tissue level and the larger municipality on urban structure (Van der Werf, 1993, Cuperus, 2001).

Furthermore a lifespan was defined for each of these system. The SAR (see figure 6.4) determined the lifespan of support as 100 years, dwelling infill as 25 years and furniture infill as 10-20 years. Confirmed was also the need to deal with layers in an independent manner to allow layers with a short lifespan to be renewed without affecting more durable layers. Different parts and com-

ponents of the building were to be the responsibility and under the control of different stakeholders. The different levels of decision-making should be disconnected from each other, yet coordinated (Cuperus, 2001, p.3-4).

### **6.1.2 Designing the support**

The SAR has not defined what exactly is understood with support or infill for each project. The ambiguity with the base resulted from the discussion on what was desirable to be left out of the support to achieve more adaptability and to what was feasible, which can be different per projects. What could be defined as support could be divided into three types (see figure 6.6) of support systems (Nagore Setién, 2014, p.97):

#### *1 Support as construction*

The support is formed by solely load bearing elements and circulation (galleries and infrastructural cores). By only including the “skeleton” of the building and deeming the other elements as infill, the adaptability of the building will be maximised.

#### *2 Support as envelope*

In this scenario the envelope (façade) becomes part of the support next to the construction.

#### *3 Serviced supports*

Here the services such as kitchens and bathrooms become part of the supports next to the load bearing structure, circulation and envelope.

### **6.1.3 Infill**

As Habraken believed that a home was created by its occupants, so was the infill to be assembled by



the occupant. Within the developed support the occupants could choose their desired infill from a set of standardised, industrial produced infill options. When their needs changed, so they could decide to change the infill (Leupen, frame and generic, p.163).

#### 6.1.4 Modulair coordination, zones and margins

The dimensions and placement of the structure (and infill system) would be determined according to their developed modular system. This system a clever alternating grid of 10 and 20 centimetres, resulting in 30 centimetre bands. The system also incorporated the idea of zoning. Four zones

were defined: Alpha, beta, gamma and delta. The alpha zones is given to serve spaces such as living rooms and bedrooms. Beta spaces are servant spaces such as wet cells, kitchens etc. The gamma zones are reserved for access spaces such as galleries, stairs, circulation and infrastructural cores. Finally the delta zone has been allocated to the outside private spaces (Leupen, 2006, p.163-165). Between zones margins of zones were defined to ensure dwelling differentiation and adaptability.

According to Leupen (Leupen, 2006, p.165) the system was overemphasized by the SAR and undermined their real intentions of achieving flexibility. However the system was developed to attune

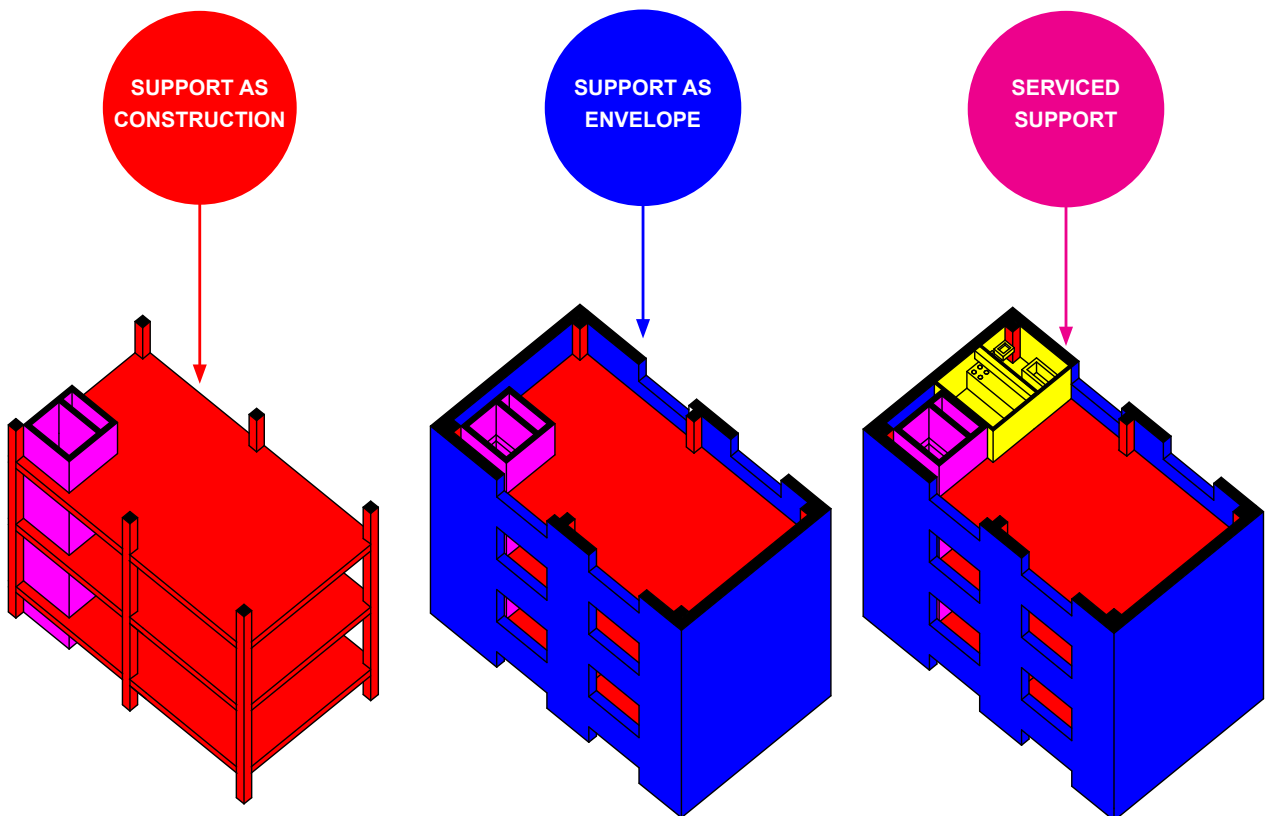


Figure 6.6: Support as Three definitions of a carrier

to the producers of building elements so that standardised elements could be prefabricated by the industry. The prefab elements could then be universally applied in any SAR project.

### **6.1.5 From the Dutch to Japanese open building**

In the post-war period rapid urbanisation and population displacement caused for need of urban housing. In the 30 years after the Second World War research, and experiments caused major developments in construction techniques, dwelling typologies, and industrial production of building elements.

In 1972 over 2 million houses were developed often in multi-family dwelling types of a poor standard, with very small and generic floor plans. Although for many families the multi family dwelling was only seen as transitional, a dream was to own a detached family house as soon as possible. However many families experienced that the limited housing stock and staggering prices would make these aspirations high impossible to fulfill. When in 1980 the bad housing conditions of immediate post war housing became a hurdle, focus was put on fulfilling housing needs of families in these multi-family dwellings and to the construction of detached housing. (Kendall and Teicher, 2010)

Certain similarities in building typology and organisation and the idea of separating infill and base led Japanese interest towards the SAR method. In the following years some influential experimental projects for school buildings (e.g. GSK) and other building typologies (GOD Project) were developed as illustrations of open building and to stimulate the development of building systems for the Japanese housing market. In 1980 the first open building project was completed. In the follow-

ing years more than a dozens of Open Building projects have been realized.

#### *1. Kodan Experimental Project (KEP) + The KSI case*

The Japan Housing and Urban Development Corporation (HUDc) implemented a three-phased, six year project in Open Building named the Kodan Experimental housing project. The goal of the project was to develop a systems approach to housing.

The KEP team divided the building into 5 systems (see figure 6.7): structure, skin, interior finishes, service or sanitary systems and airconditioning equipment. For each system specifications were developed, manufacturers enthused to develop system components. The KEP developed a 300 mm grid and rule system to ensure that components could be used universally.

Many experimental structures were developed under the KEP project, focussing on lowering costs, rationalising construction and increasing consumer choice in housing (Kendall and Teicher, 2010). The KSI 98 demonstration project in Hachioji, Japan is one of KEP milestone projects.

In the KSI experiment 5 units and 2 pent-houses were commissioned by the HUDc. The dwellings were designed by the HUDc design office and Kan Sogo design office in 1998. The support structure consisted of a concrete Z-beam skeleton using post-stressed, pre-cast concrete hollow flat slab floors, beams and columns. Furthermore it includes common drainage lines set outside each of the dwellings. The infill was provided by the HUDc and several private sector infill products.

The KSI project is in response to the aging housing stock and the (financial and organisa-

tional) inability of residents to renovate multi-family dwellings. The KSI proposed a model where the public sector owns the support and the individual residents rent space and own the infill.

### 2. Two-step-housing supply system

Kazuo Tatsumi and Mitsuo Takada from the Kyoto University studied the existing Japanese housing. Their research concluded that the boundaries between public and private, owned and rented were insufficient and not correctly used in urban housing construction in Japan. As a new distinction (see figure 6.8) the researchers developed the two-step-housing supply system, which uses the Japanese vernacular tradition of shell and infill construction. Firstly, with the use of social overhead capital a public support base is constructed, which has to be durable, of good quality and is common property. What is incorporated in the base varies in each two/step housing project. In the Senboky New town, Osaka, the positions of bathrooms and kitchens

were also fixed in the support, Whilst in the 1989 Sneri Inokodani Housing Estate a utility trench was placed in the support allowing for variation in the placement of the service spaces. In the second step the infill is placed by users, supplied ideally by small regional construction companies.

### 3. Century housing system (CHS)

The Century Housing System was introduced in 1980 by the ministry of Construction in order to extend the (physical and functional) lifespan of the new housing stock. The leader of the team, professor Utida, proposed a building component system based on a modular rule system and guided by the idea of the direct relation between lifespan and component groups. The latter would influence the sequence of construction. A component with a longer lifespan would be installed before a component with less lifespan. As an example piping, which has a shorter lifespan than the construction should not be cast into structural components.

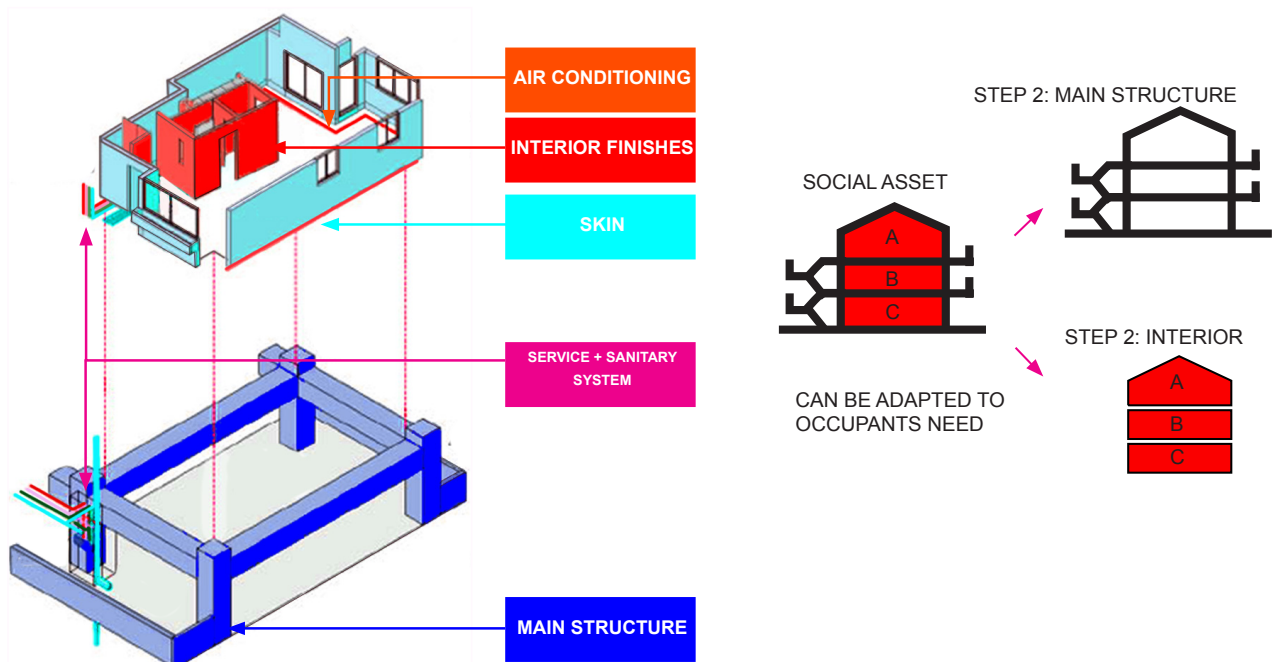


Figure 6.7: KEP layers of Open Building  
Figure 6.8: Two-step-housing supply system



### 6.1.6 China and open building

Although the approach to open building in Japan and China are different, there is an increasing interest in the open building movement in China. Experimentation with innovative housing approaches has been stimulated to find solutions for building better quality mass housing (Kendall and Teicher, 2010, p.259).

Examples in Open Building already exist in China. Bao Jia-Sheng has constructed several exemplary support-infill projects and continues to research the method in Chinese context.

Furthermore it is possible to argue that in the newer generation high-rises the open building tradition is introduced in an undeveloped form. In these dwellings it is common to buy housing in a casco state, where only the base is bought (incorporating structure, envelope, services, piping, common areas) and the infill needs to be made by the occupant. However universal industrialised infill systems are not yet commonly available and need to be developed before one could speak of a fully developed open building method (as proposed in the Netherlands and Japan).

The People's Republic of China has a strong history in making standardised design plans. However the emphasis was always put on the programmatic layout in relation to floor areas, and much less on developing an adaptable industrialised building method. But now the lack of quality housing with resulting short life-span, together with the recent stimulants (since 2008) to build more affordable public housing again, has pushed the Beijing standard design institute to stimulate the development of industrial, standard design components, and plans to guarantee a better construction

quality.

A type of Open building (CHS) is stimulated to guarantee a 70-100 year housing lifespan. Proposed is to separate the structure, the dwelling boundaries as more permanent components and the interior infill which is of a less durable nature.

### 6.1.7 Families of the open building movement

Several urban-architectural movements have close ties to the suggestions made by the open building movement. A British and Japanese experiment will be discussed below.

#### 1. Archigram plug in city – lavishing in the consumer society

The group Archigram was a British group consisting of six young architects: Warren Chalk, Peter Cook, Dennis Crompton, David Greene, Ron Heron and Michael Webb. The group became known between 1961 and 1974 for their neo-futuristic vision on urban development methods. Peter Cook's quote: "The pre-packaged frozen lunch is more important than Palladio" shows the glorification of the consumer society, and is a critique on their predecessors (Crompton, 1994). They were especially critical on the modernist architecture that was built in the sixties in Britain but lost all the qualities that the modernist stood for. Peter Cook described it as: "the crap that is going up in London, against the attitude of the continuing European tradition of well-mannered but gutless architecture that that absorbed the label modern but had betrayed most of the philosophies of the earliest modern" (Crompton, 1994). Instead they strove to take full advantage of the hedonistic possibilities that the modern consumer society could offer. Themes such as

## BUILDING COMPONENT ACCORDING TO THE 5 LAYERS OF CHS

COMPONENT	LIFESPAN	AVERAGE LIFESPAN
LIGHT, BULBS, PACKING	3-6 years	4 years
HOT WATER HEATER, HOME APPLIANCES, PIPING, WIRING	6-12 years	8 years
MOVABLE PARTICIANS, BUILT IN FURNITURE	12-25 years	15 years
EXTERIOR DOORS AND WINDOWS, ROOF	25-50 years	30 years
FOUNDATION, MAIN COLUMNS AND BEAMS	50-100 years	60 years

clip-on technology, disposable living environment, (space) capsule dwellings and mass consumption are part of their legacy, which has remained almost completely theoretical.

One of their projects in particular is of interest to the rehabilitation strategy. In a more avant-garde way than the SAR's proposals the Archigram group developed a conceptual urban development model which also proposed the separation of building components. The project "Plug-in-city", although never build, offered a new approach to urbanism reversing traditional ideas on infrastructural role in the city. Contrary to its name, plug-in-city is in fact not a city in its traditional meaning but it suggested a constantly evolving parasitic mega structure hovering above all the major urbanised areas of Britain (see figure 6.9). This mega structure would however give a place to all the functions off a city: Circulation, dwelling and other service functions would be plugged in to the mega structure by gigantic cranes that have a place on top of the mega structure. The placement could al-

ways change, because everything was considered to be of a temporal nature (see figure 6.10). For example: shop units had have a life expectancy of 3 years, and the basic mega structure would expire within 40 years. After their expiring date the architectural elements would be replaced by units that would comply with the new technology available.

## 2. Japanese experiments in open building: Metabolists

In the 1950's the city of Tokyo experienced an extended period of economic growth. After the conservative party developed a policy to stabilise the social welfare system, the population concentrated itself in the city. Considering that the surrounding rural land had already been urbanised, the metropolis became overcrowded. These heavy changes of the metropolis were a starting point for the ideology of the Metabolists. Kenzo Tange, and after him the Metabolists, argued that the existing ways of organising cities was not able to cope with the immense growth and change of the contemporary

PARASITE  
OVER THE  
EXISTING URBAN  
FABRIC

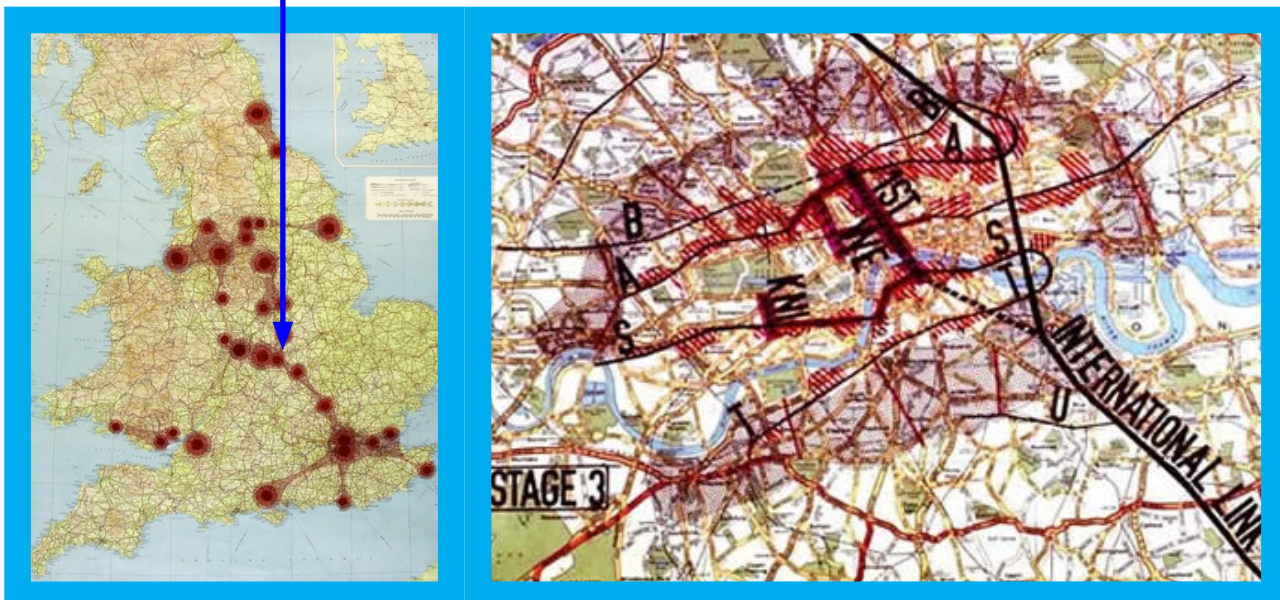
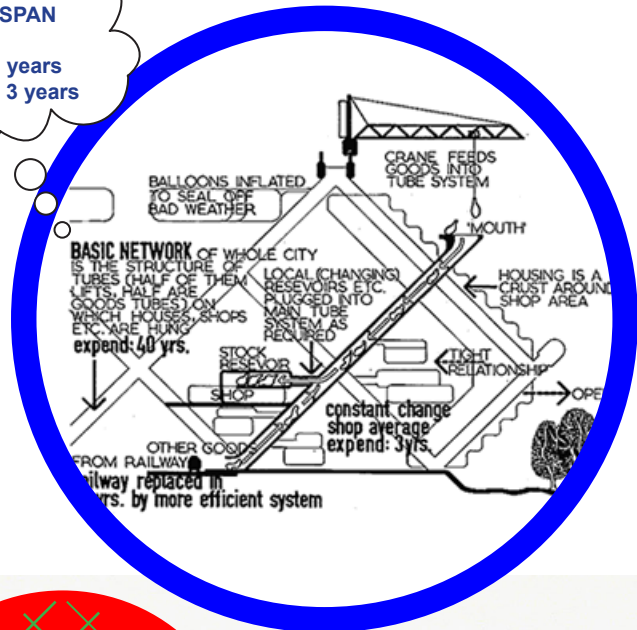


Figure 6.9: Parasitic mega structure in "Plug in city"



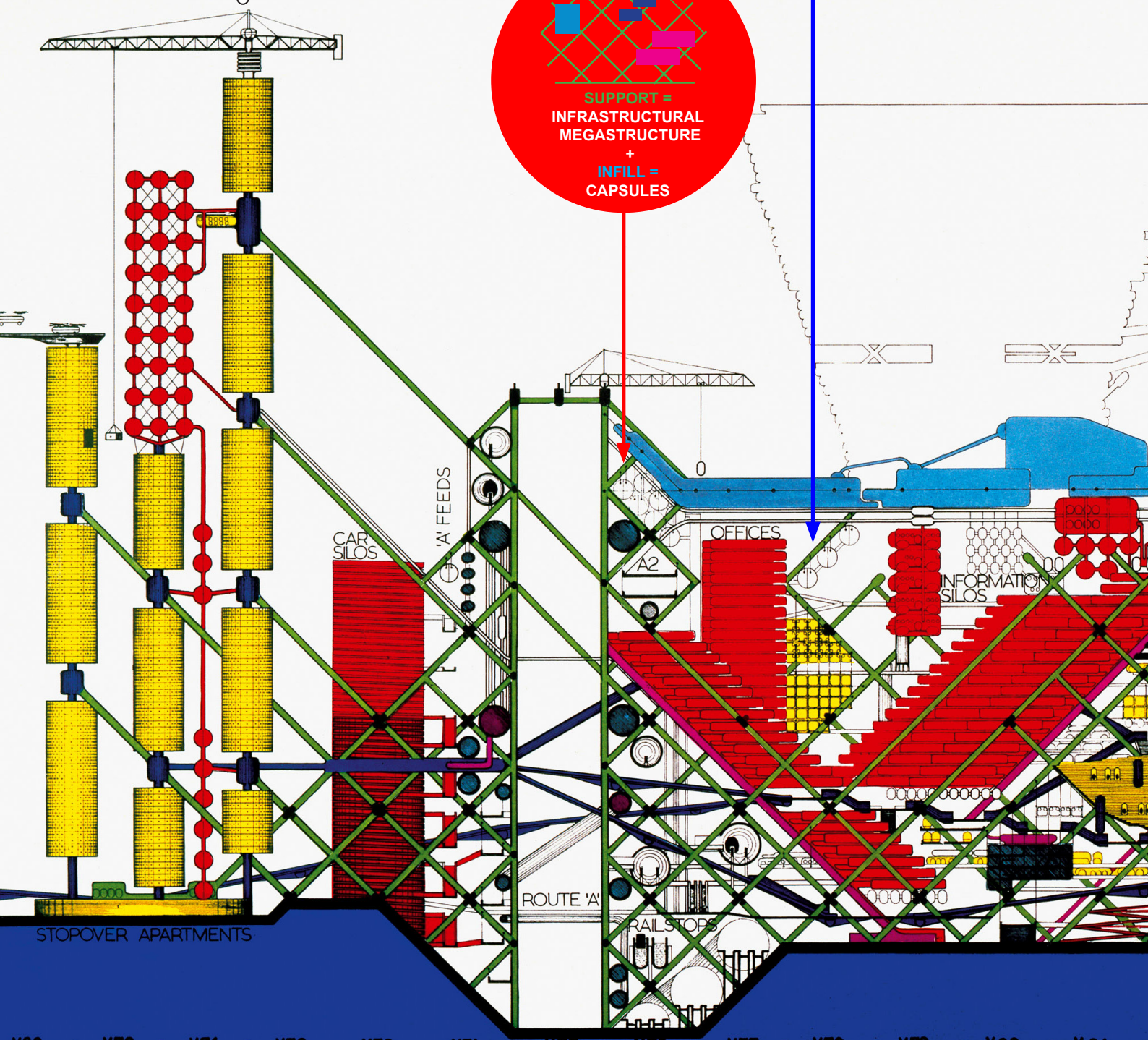
EACH COMPONENT HAS ITS OWN LIFESPAN

SUPPORT = 40 years  
SHOP CAPSULE 3 years



EACH COMPONENT CAN BE EASILY CHANGED AS THEY BECOME OUT-DATED

SUPPORT =  
INFRASTRUCTURAL  
MEGASTRUCTURE  
+  
INFILL =  
CAPSULES





cities (Lin, 2010, p.3).

Therefore in the design of the extension of Tokyo into the Bay Tange argued that the traditional urban pattern of a radial centripetal transportation system was in fact a relic of the past and is not a valid principle anymore in the contemporary mega cities, which he defined as cities with a population greater than 10 million (Kultermann, 1970).

So instead of building around a civic centre, Tange proposed to develop the city in a linear way, along a civic axis (Kultermann, 1970). Kenzo Tange, although he was never a true member of the Metabolist, could be described as greatly influential to the ideas of the Metabolists (Lin, 2010, p.2). In

1960 he made his first proposal for an urban extension in the bay of Tokyo (see figures 6.11).

Central in his plan is a dominant civic axis from which the city would expand in a linear way. This axis would hold, next to a diversity of civic functions, a cyclical circulation system divided according to speed of movements. The axis also gave means to structure the city and to divide it into organic units. In order to find a new urban spatial order that would facilitate an open organisation of contemporary society (Tange, 1961).

The cyclical trait of the organisation of the axis made it possible to gradually develop the axis and the remaining functions of a city attached to it,

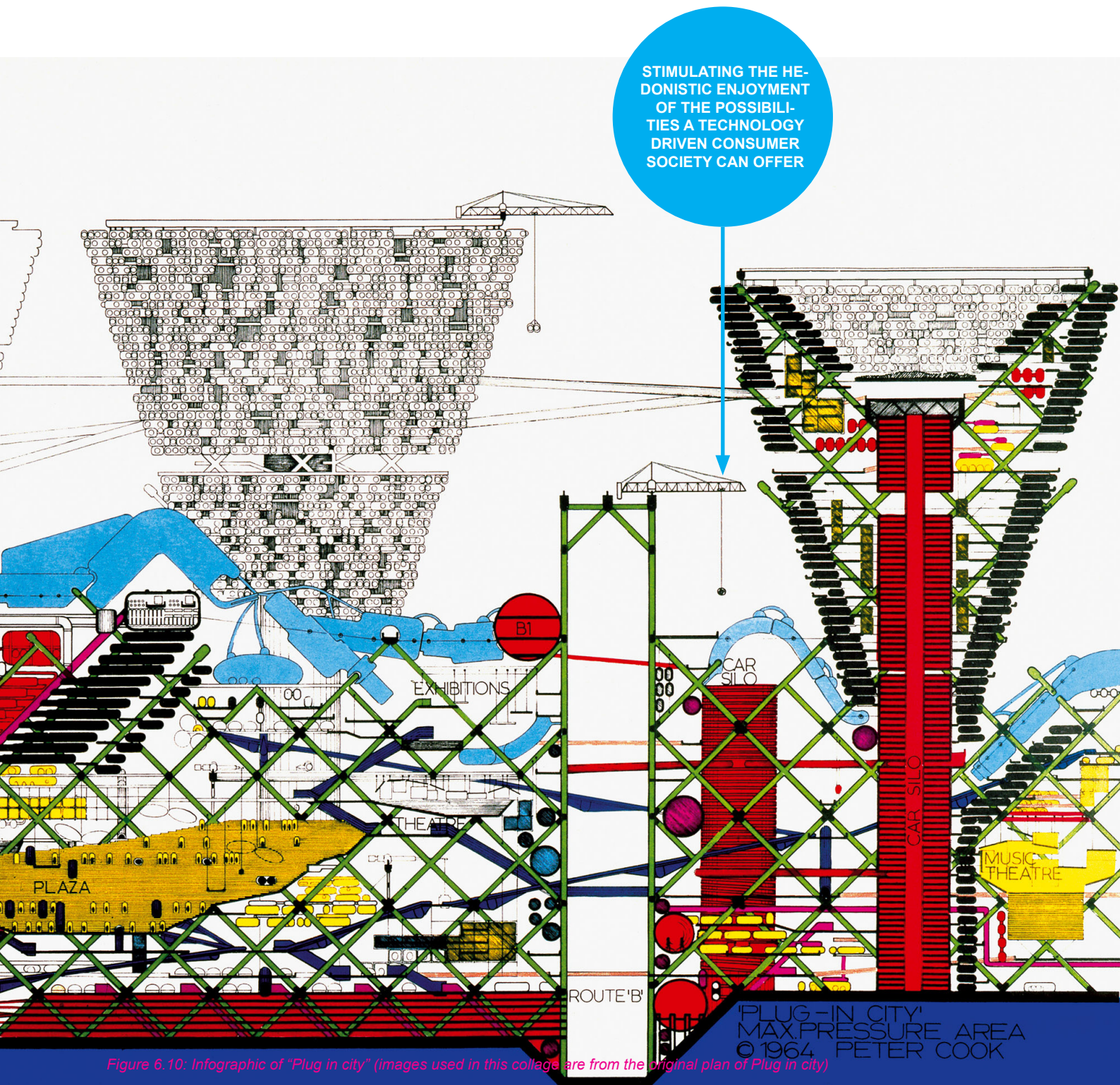


Figure 6.10: Infographic of "Plug in city" (images used in this collage are from the original plan of Plug in city)



because at each stage the system would be complete, while it was continually possible to add another unit (Lin, 2007). This Civic axis was a more or less fixed frame of the plan while the “new city developments” attached to the plan could be seen as transient. These extremes were perfectly balanced, the long-term and large-scale structures which offered next to no freedom and the short-term elements which were open to free individual choices and could be renewed according to the contemporary individual’s wishes. The design managed to connect the longer lifecycle of the civic axis with the shorter lifecycles of the individual structures. In this way creating a spatial organisation that is alive, renewing itself according to Metabolist lifecycles and moving itself forward into the future (Lin, 2007).

After Tange we see these formal elements and the ideology reappearing numerous times in the followers of the Metabolist manifesto. Probably one of the most famous examples on architectural scale is the Nakagin capsule tower designed by Kisho Kurokawa (see figures in 6.12) and completed in 1972. The building consists of two interconnected concrete (circulation) core construction. 140 prefabricated units were plugged in to the construction core. Each capsule measures 2.3 m by 3.8 m and functions as a small living space (compliant with an “existenz minimum” research) or small office. Capsules could be connected to create bigger spaces. Although the capsules were designed to be replaced when they passed their lifespan, no capsule has ever been replaced and many have fallen in disrepair.

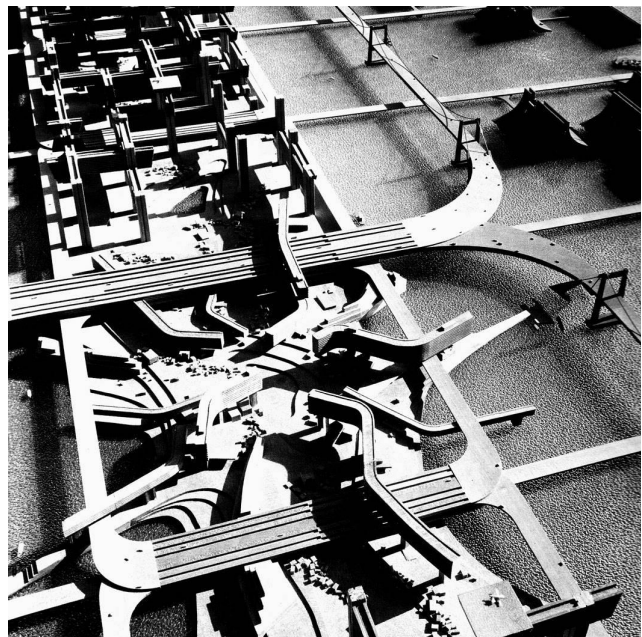
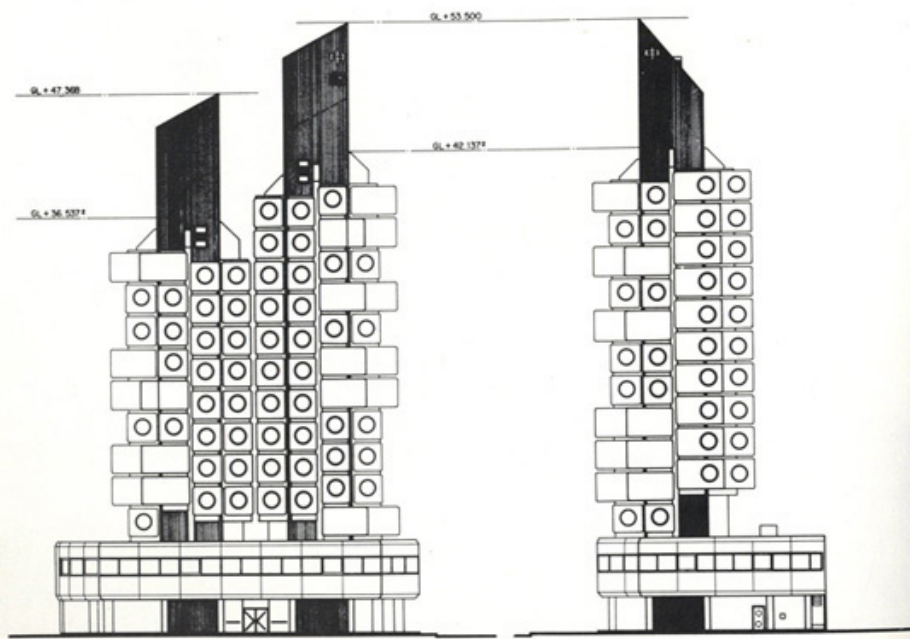
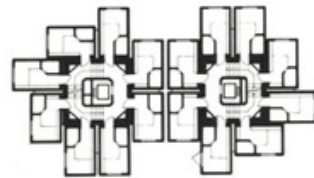
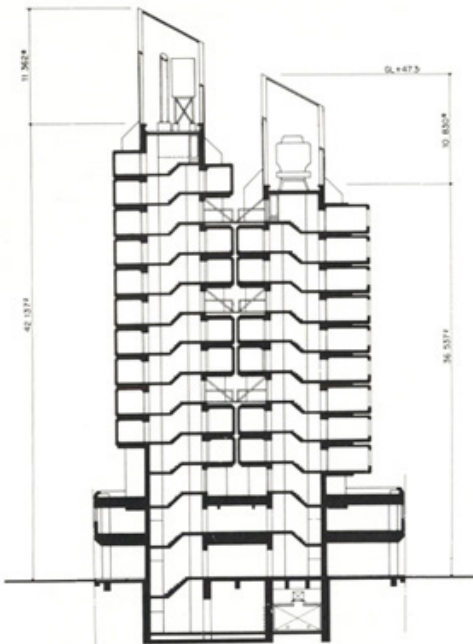
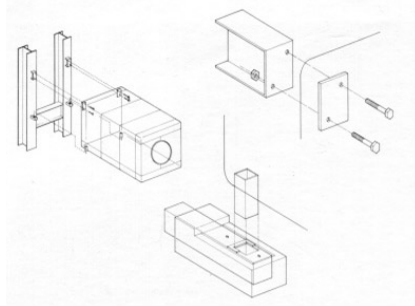
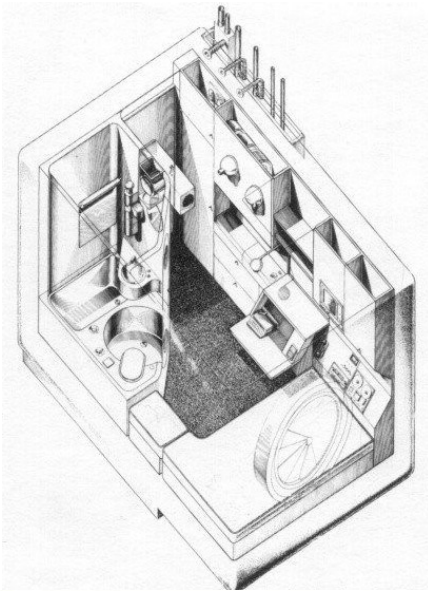


Figure 6.11: Tange's plan for Tokyo bay (images by Kenzo Tange)

Figure 6.12: Design of the Nakagin capsule tower (drawings by Kisho Kurokawa)





## **6.2 Conclusions: towards a sustainable, consumer driven and re:opened building**

The open building methods offers a suitable physical approach on how to deal with the demands for the rehabilitation strategy towards separation of responsibilities in a building process. It also offers a way to deal with constantly changing housing demands.

However none of the main OB methods (as researched) directly offer a convincing approach for the crumbling high-rises in China. Although the open building methods have been applied to housing renovation projects the main methods first and foremost deal with the building of new buildings according to an open building system. The early high-rises are already what the OB movement would call “spaghetti” buildings. So instead of creating open buildings, the physical method should deal with the re-opening of high-rises.

To develop such a RE-opening method inspiration can be found in literature where the application of the OB method on existing housing stock has been researched (such as the application of open building on the post war housing stock in the Netherlands in Kapteijns (1989) and Cuperus and Kapteijns (1991)). Furthermore by combining and adapting several techniques from the SAR, KEP, KSI, CHS, Two step supply method and families of the open building movement, a suitable solution for the rehabilitation of the early generation high-rises can be found.

### **6.2.1 Separation of responsibility through definition of tissue, carrier and infill**

From the SAR the idea to separate the tissue, building support (or carrier) and infill according to the lines of building component responsibility should be adopted to offer a solution for the separation of public and private responsibilities in the high-rises. Divisions developed for the SAR, and other open building theories and families were a conscious design choice. The division as proposed for the application of open building in the existing living environment in Kapteijns (1989) followed the division of building component responsibility (and might have proposed small changes) as was already present in the built environment. By adapting their proposed division to the situation in Chinese

high-rises, a division can be made to define the building components and responsible stakeholders belonging to the systems: tissue, support and infill in the high-rises. Higher scaled systems as mentioned by the SAR, are outside of the scope of the rehabilitation. Important to notice is that although a distinction can be made between the (components and lifecycles of the) tissue and the carrier the responsible parties will be the same on both these scales (see figure 6.13). This is of course due to the fact that the responsible stakeholders for the site of the high-rises are the same as for the building(s) on the site. The separation of the building components per system (tissue, carrier, and infill) has been made visual in the axonometric of the case of Dongsishitiao (see figures 6.14-6.16). Interesting to see is that the proposed separation between carrier and infill in the high-rises reminds either of the most minimalist definition of a carrier made by the SAR and of the separation made between carrier and infill by metabolist’s Nakagin capsule tower project and Archigram’s plug-in city. In the division the support is defined as an infrastructural (mega) structure: including the load-bearing structure, foundation, communal circulation (elevators, staircases, and corridors), building components belonging to the communal space (windows and doors) and technical infrastructure. The infill is defined as “drawers and capsules” inserted or plugged in the carrier. This means dwelling infrastructure, patrician walls, furniture, services, extensions, doors of the dwelling.

Several components will be partially part of the carrier and partially of the infill. This is due to the fact that the high-rises’ building components belonging to the different systems are currently intertwined (“spaghetti” construction). One of those shared elements are the load bearing walls within the dwelling. Their structural integrity (even after infill changes are applied) needs to be guaranteed within the carrier. The superficial (aesthetical) finishes are part of the infill. Furthermore some of the infill packages might suggest to break open part of the load-bearing wall but it is part of the responsibility of those in charge of the carrier to approve structural safety of such an intervention before it can be executed as part of an infill change. Another shared component is the thermal barrier. In

current situation the façade is intertwined with the load-bearing structure. An update to improve and untwine the façade should be part of the carrier. However it could be possible to follow current practice (although more regulation might be desirable) that allows changes to the façade as part of the infill. Especially if extensions (etc.) require change to the updated façade.

### 6.2.2 Affordability and availability through the grid

Both the SAR and the KEP developed their own grid to help the standardisation and thus industrialisation of the building components. This could guarantee that the product would be available en masse and affordable. Although the developed grids of the SAR and the KEP are too complex to ensure practical use in the Chinese high-rises the use of a grid

system should be a good idea to propose improvements for the high-rises. As the early high-rises are built according to standard designs, or even using prefab building elements, and were all based on a 0.3 meter grid it should be possible and highly advantageous (financially) to use a standard grid system. This ensures that systems can be produced industrially and can be made affordable and with a high(er) quality.

### 6.2.3 Increasing sustainability through correlation lifespan and construction sequence

The SAR identified that tissue, carrier, and infill had their own lifecycle. By separating the components according to their “system” material could be saved as the components with a longer lifespan would not have to be renewed before their time. This practice of the open building movement stimulates continu-

## RESPONSIBLE STAKEHOLDERS PER SYSTEM

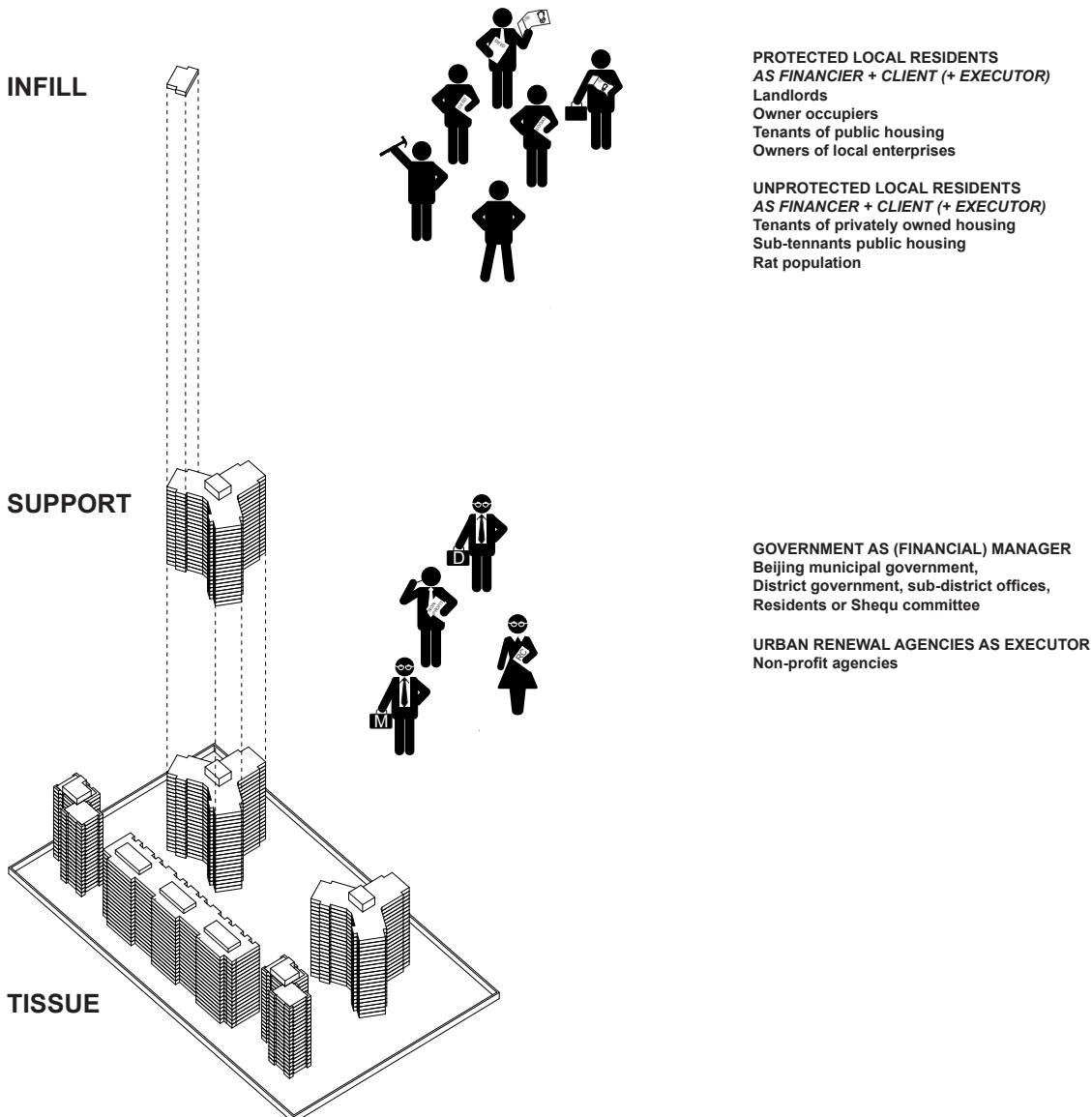


Figure 6.13: responsible actors per system

ous renewal (Kendall, 2004), prolonging the overall lifespan of a building. In this sense it could provide a solution to guarantee more sustainability and durable housing which is high on the public agenda. The physical method to achieve this goal can be found in the method of the CHS proposing the direct relation between the lifespan and the construction sequence. This idea should be incorporated in the high-rise rehabilitation to ensure that components can be easily repaired and changed so that the dwelling can keep adapting to changing demands. The proposed layer division should be observed both on the level of tissue, support and again on the layer of infill.

#### 6.2.4 Sustainable consumerism

By combining the ideologies of the SAR and Archigram's Plug-in-city a form of sustainable consumerism can be developed. From the previous

paragraph it became clear that the SAR (and the other open building systems) clearly had the goal to produce more sustainable (in terms of material waste and energy) buildings. Yet, looking from the viewpoint of the plug-in city the open building system could stimulate a healthy housing-consumerism for both the public and private stakeholders. By providing standardised and industrial solutions, to be continuously interchanged with outdated components, to keep meeting new demands, could be an important strategy to re-stimulate the sluggish housing construction sector. Simultaneously the living conditions of many residents can be improved by applying these systems. Especially this idea of providing easy, affordable and customised standardised housing infill solutions, following the housing needs and trends, fits very well into the current societal process of "regulated" individualisation.

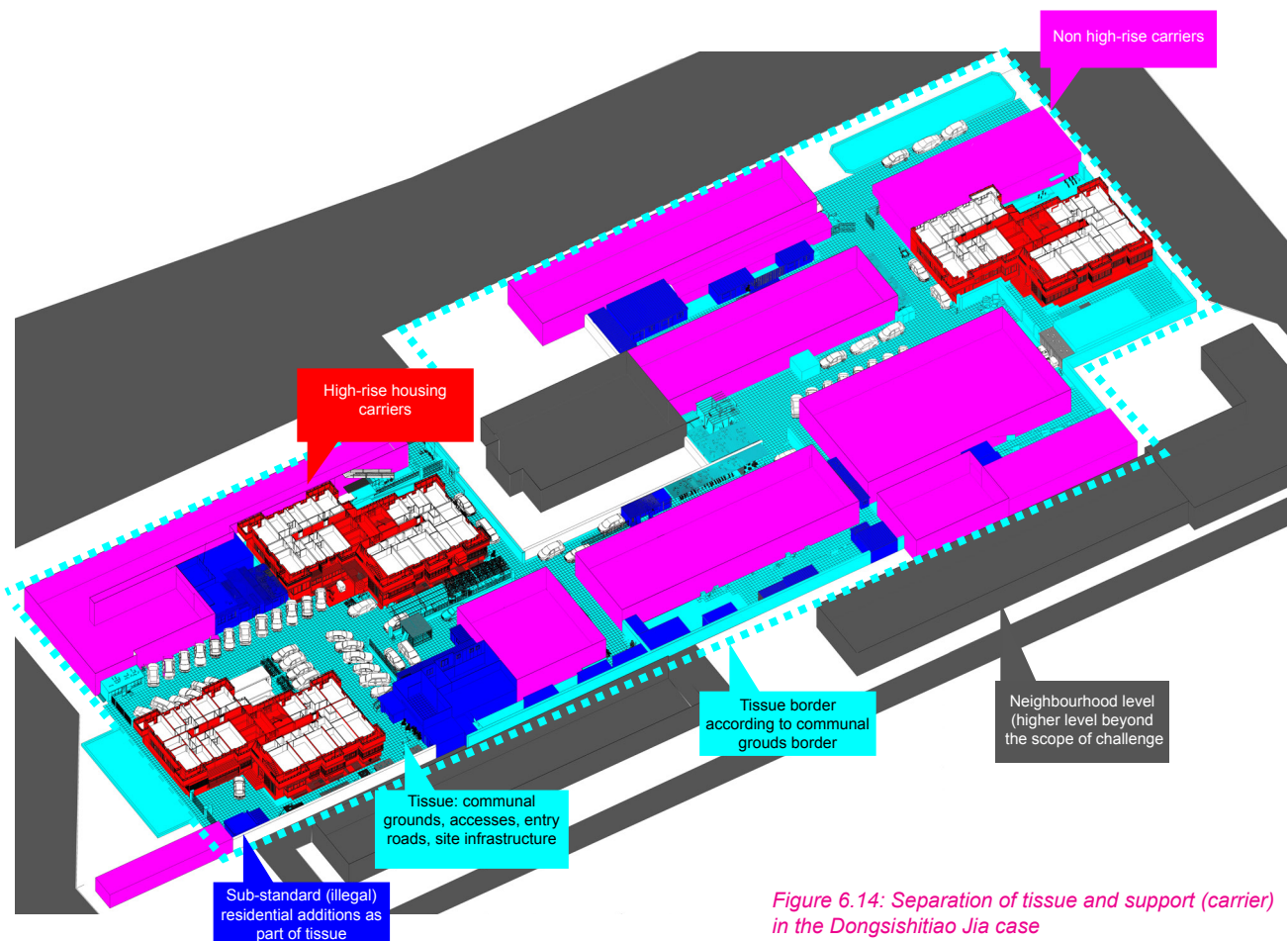


Figure 6.14: Separation of tissue and support (carrier) in the Dongsishitiao Jia case



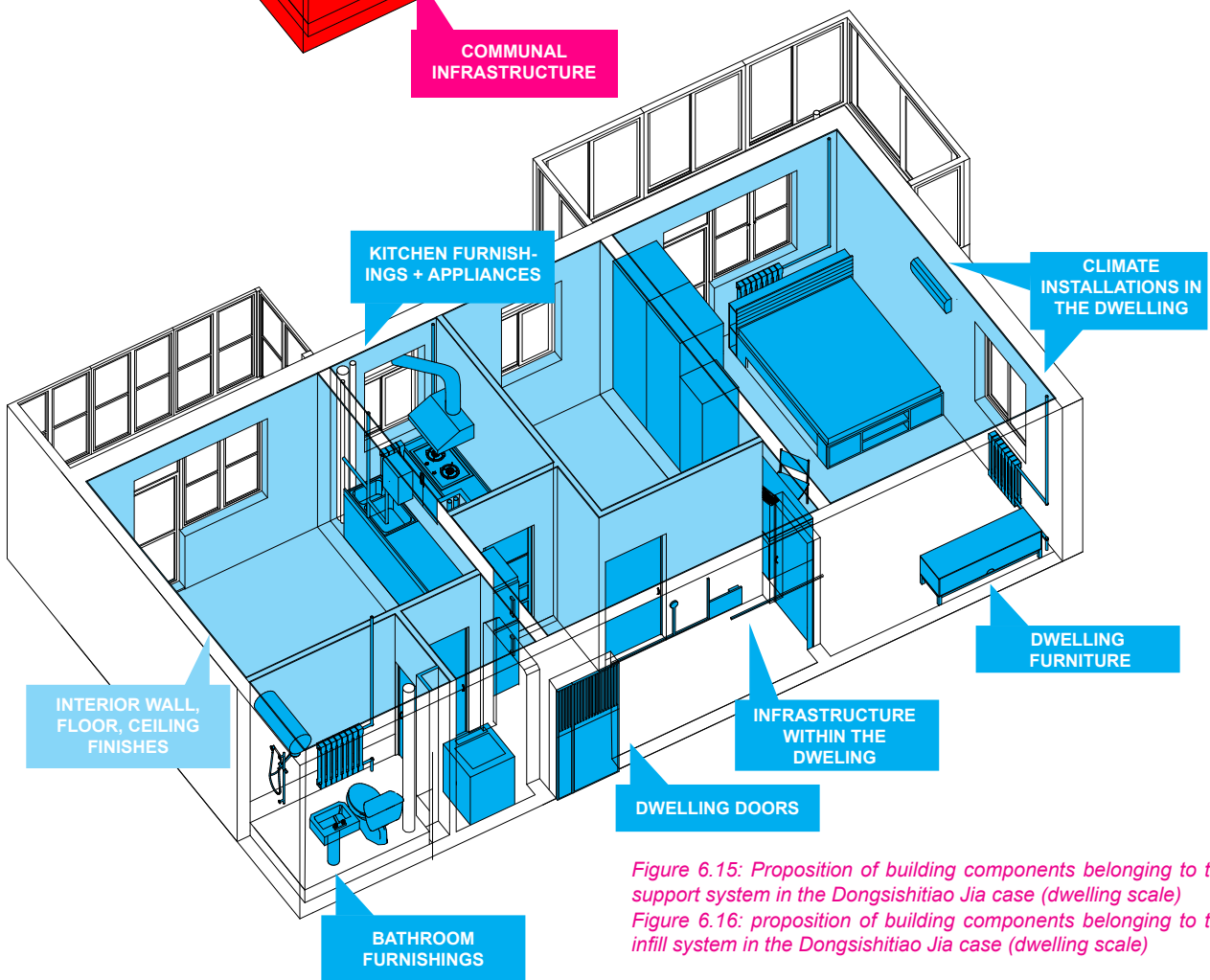
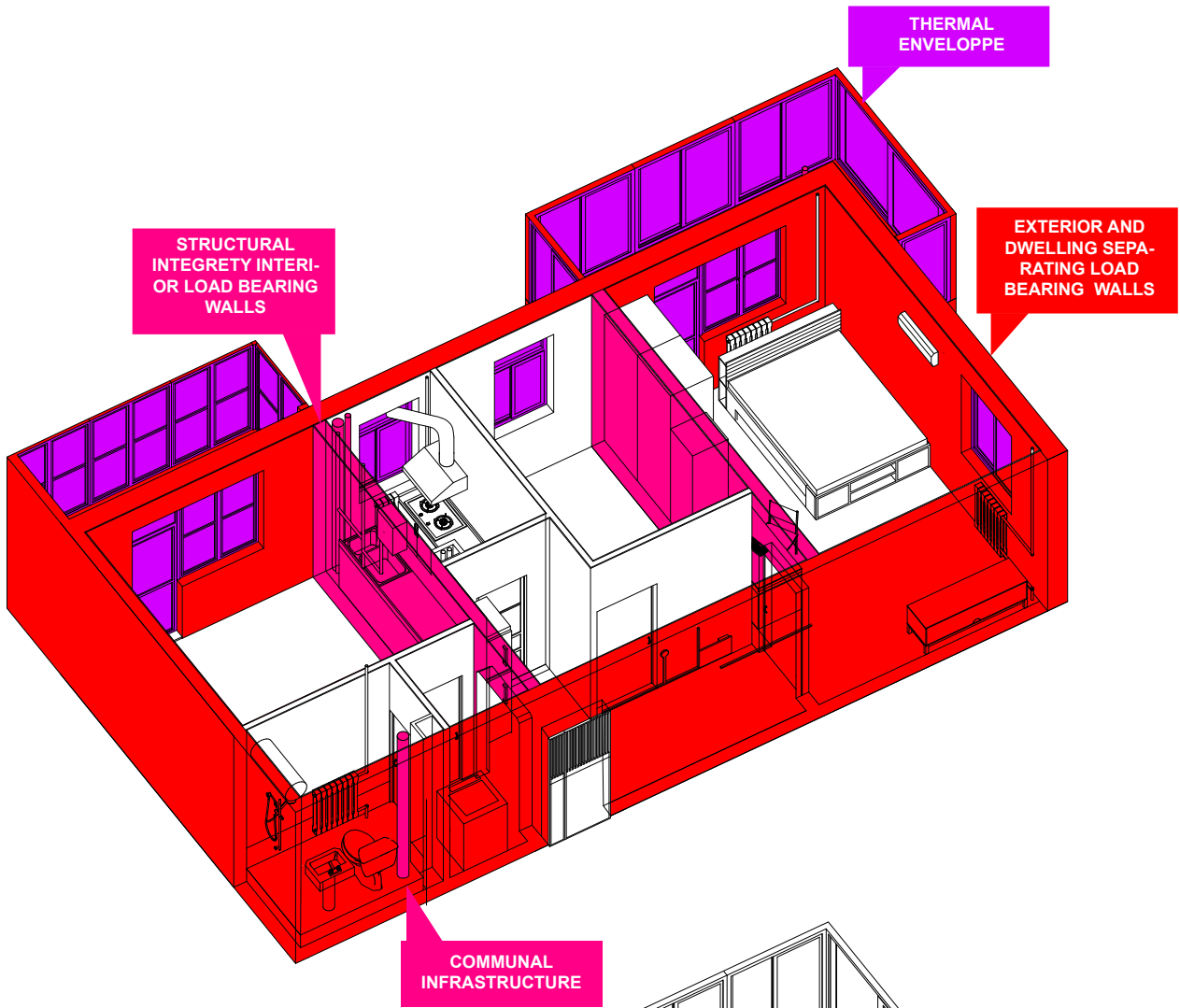


Figure 6.15: Proposition of building components belonging to the support system in the Dongsishitiao Jia case (dwelling scale)  
 Figure 6.16: proposition of building components belonging to the infill system in the Dongsishitiao Jia case (dwelling scale)



7.0







**FINANCIAL TOOLS FOR  
THE EARLY HIGH-RISES**



## 7.0 FINANCIAL MODEL FOR THE CRUMBLING HIGH-RISES

As a reference for a suitable financial model fit for the rehabilitation of the existing housing stock in China, we look again to the research performed by Hui (2012). He extensively researched different precedent rehabilitation projects to distil possible tools that could be used to finance the rehabilitation.

His main financial strategy (see figure 7.1) was to make a self-sustained investment. Although self-sustaining in the long term, initial governmental financing would be necessary. Tax exemption, reduced land-lease fees and a long term loan would finance the rehabilitation. Sources for the loan could be the housing accumulation fund, China development bank, social housing fund from the Beijing municipal government. The investment would be paid back on the long term through several mandatory contributions of existing residents and new renters/buyers in the new high-end or affordable dwellings built to financially compensate the rehabilitation. In case a rehabilitation project was not financially feasible it could even be compensated with the profits of another project.

Although the model of Hui is realistic in the long term, it requires changes of legislation and the financial connection of multiple rehabilitation projects. This makes his strategy difficult to realise on shorter term.

Moreover, parts of the model do not offer a direct solution to the case of the early high-rises. Mentioned already was the too high-density on site to build the conventional large compensation housing. Thus resulting that mostly high-rise projects would need financial compensation from another project, making it a difficult strategy on the long-term and impossible on short-term. Furthermore

the model is incompatible with the prerequisite of a top-down rehabilitation process on the scale of the building and da yuan and bottom-up process on the scale of the dwelling. Hui does introduce a participation model to involve resident (owners) in the process, and offers choice menus (regarding the type of physical intervention made in their dwelling and the costs) (Hui 2012, p. 679-682, 648-654), but the proposed financial model is still fairly top-down.

The financial role of the residents is best described in the financial part of the re-housing model. Hui's (2012, p.x) identified the former public housing as an important locus of housing re-socialisation. So he connected the re-socialisation scheme to rehabilitation of former public housing by providing a (re-)housing model for rehabilitation processes. The financial strategy of the model uses the land ambiguity: the fact that former public dwellings were sold without a land lease, for the re-socialisation. The model offers home owners two options:

*1. To acquire the right to retain their dwelling as a commercial dwelling homeowners do not only need to pay for the rehabilitation of their dwelling, but also need to pay their land-lease, and the renovation costs for the communal parts.*

*2. The second option is to merely pay a subsidised fee for the renovation of the dwelling. However in the latter case the dwelling would become part of the affordable housing stock and owners will lose their "investment".*

This re-housing system invades rather crudely the current status quo and therefore the "rights" of the home-owner. In case the homeowners were actually the same people who purchased the dwelling cheaply during the housing reform and

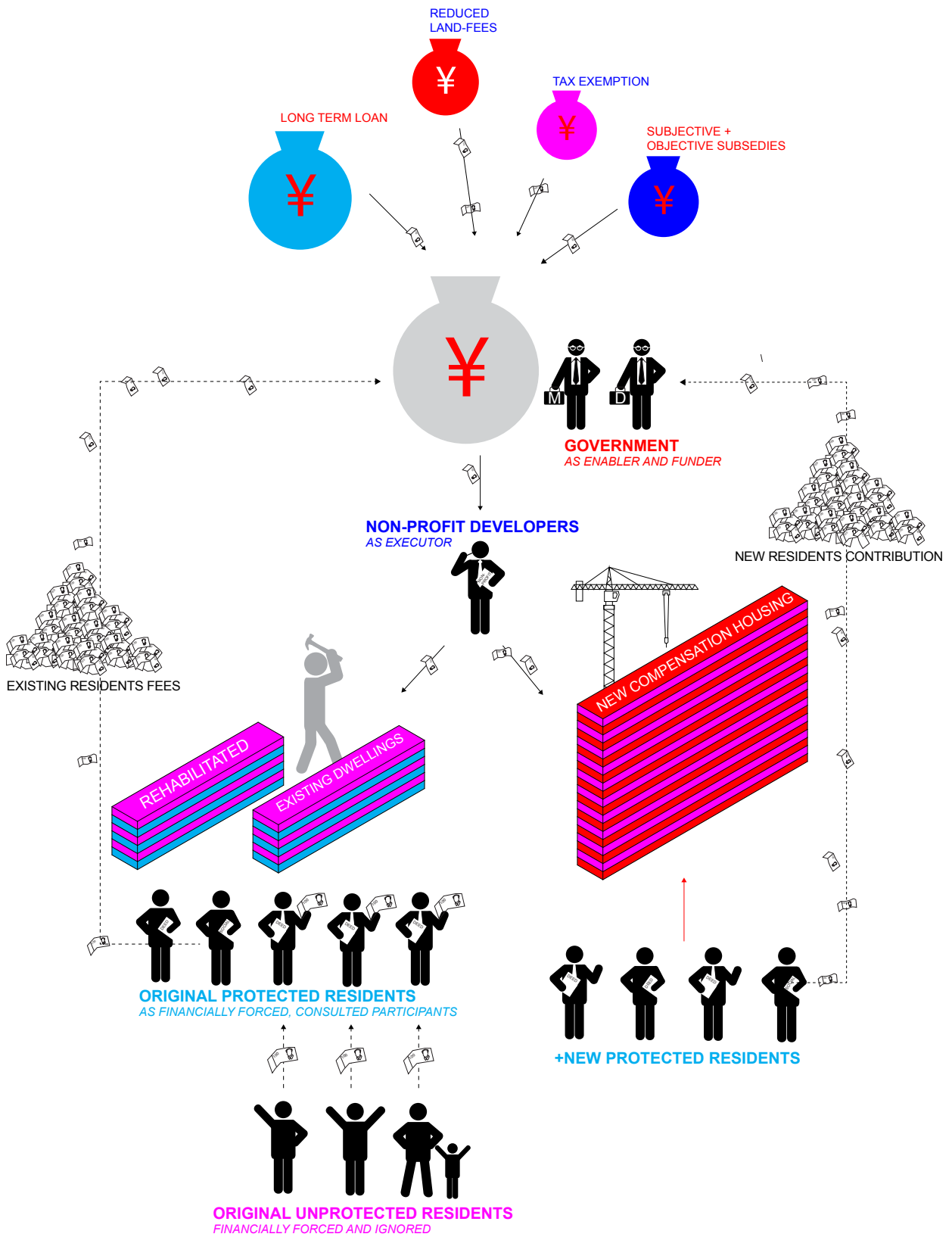


Figure 7.1: Financial model for the rehabilitation of the former public housing of Beijing as proposed by Hui (2012)

then profited from public property during the boom, this demand would be just. But many of these dwellings have been resold for (full) market prices on the secondary housing market since the reform. These new owners paid full market price and this proposition destroys their financial investment. Moreover the model is more punitive than enthusing, and profit based which would be the basis to get out of the current impasse. Not to mention that non-owner (unprotected) residents would have none or minimal influence on their change in their living environment and perhaps the price of their monthly rent.

To develop a financial model which fits all the early high-rises prerequisites, and be applicable on short-, and long-term, new tools need to be researched.

### 7.1 Adding room for investment – Adding stakeholders to strive for a common good

Especially on a short term, a challenge in the ear-

ly high-rise rehabilitation is the difficulty to obtain enough financial investment to finance the rehabilitation. Furthermore in many cases it will be problematic to make the repay of the investment on the plot scale.

Therefore, instead of proposing a more traditional financial model based on the participation of conventional stakeholders, it is proposed to involve more stakeholders in the rehabilitation process. The approach diversifies the financial responsibility. The underlying idea, to find hidden capital was proposed in a renewal theory in the Netherlands. The value oriented neighbourhood approach developed in the recession, aimed to involve the end-user and external market parties to create more financial capacity on a short-, and even long-term (De Kam, 2008, p.4).

The financial model of Hui (2012) involved 4 main stakeholders:

1. Non-profit developers (executers)

Figure 7.2: Power versus interest grid with added stakeholders: communal grounds + building scale

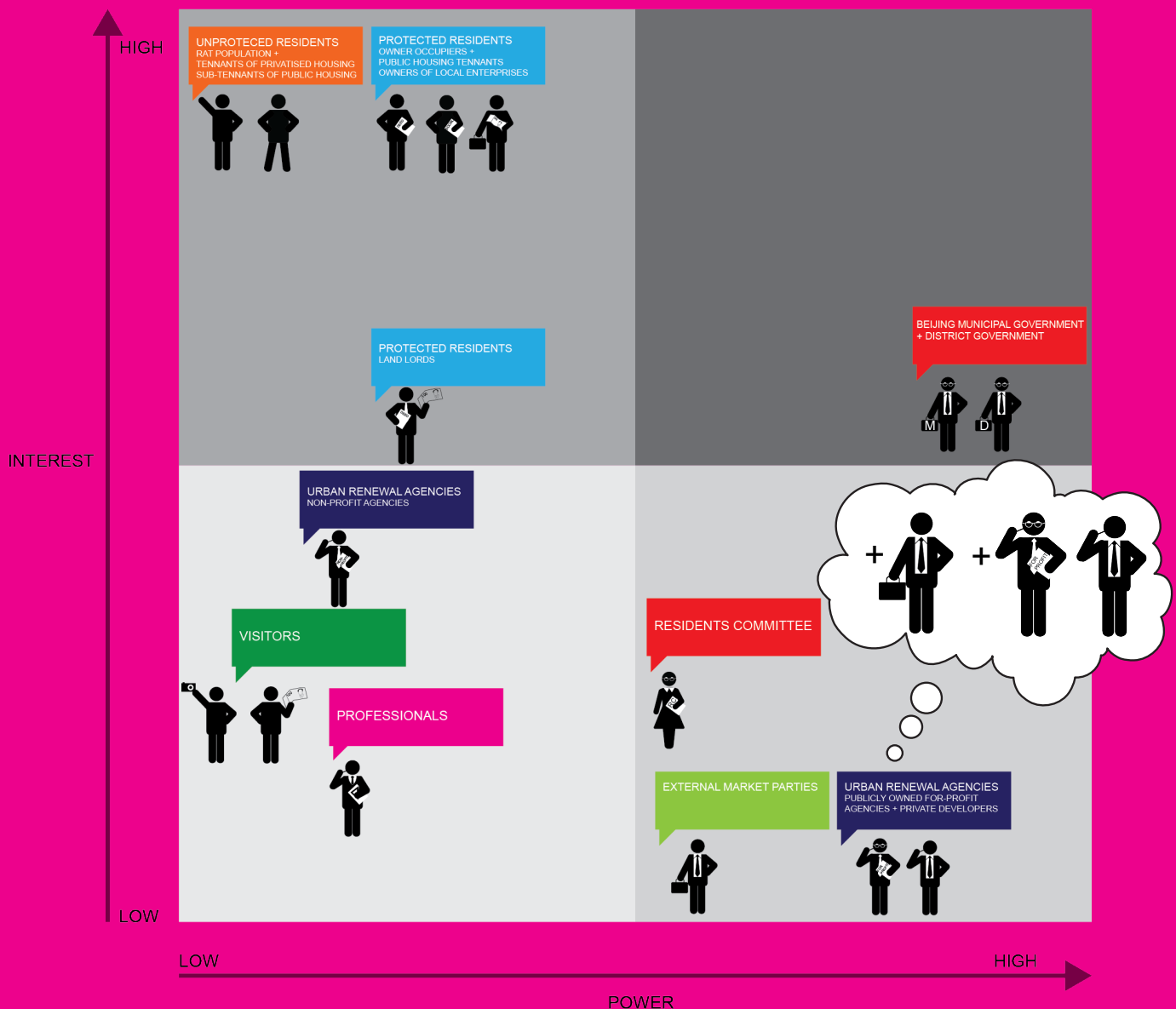
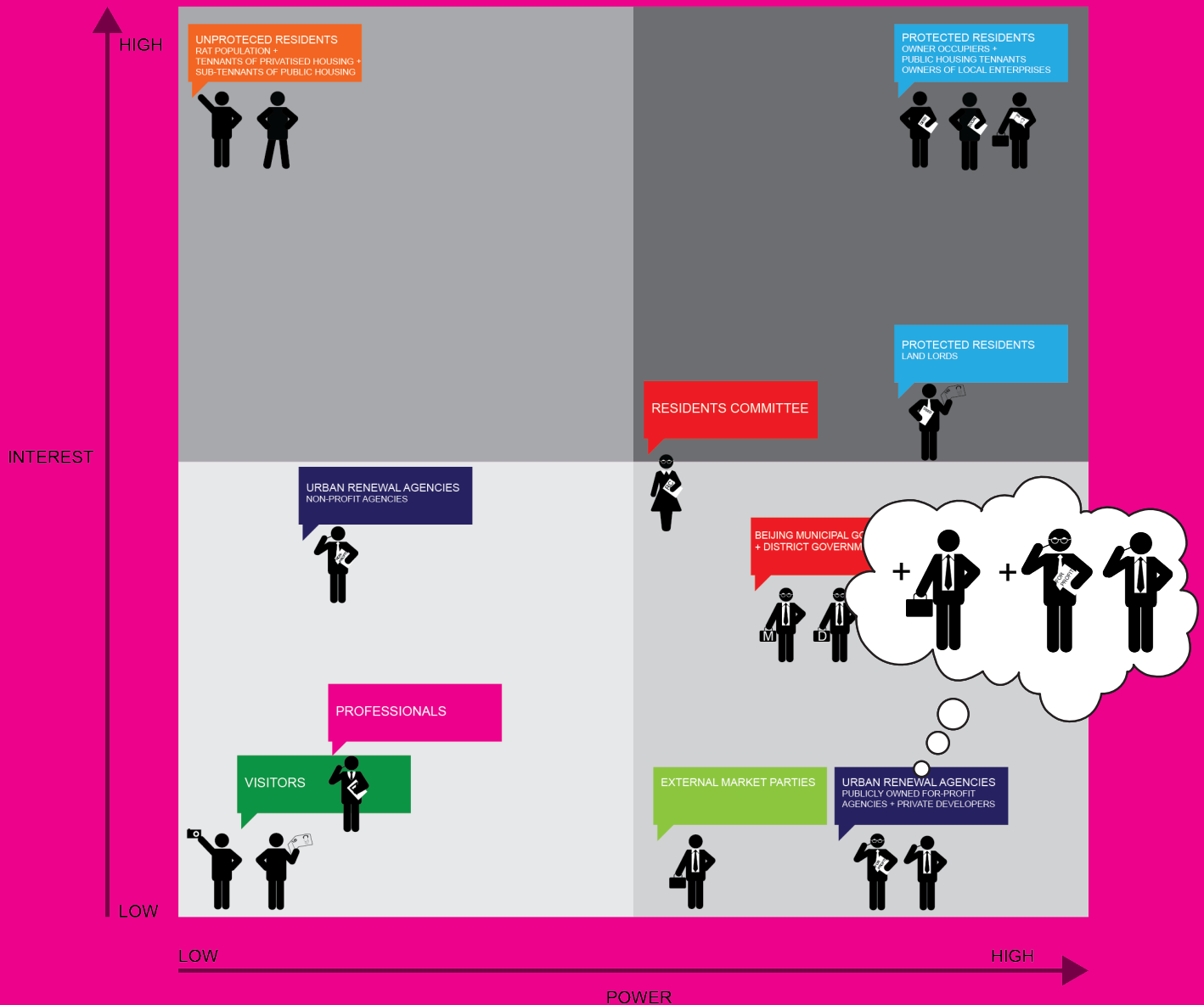




Figure 7.3: Power versus interest grid with added stakeholders: dwelling scale



2. Government as financial and legislative enablers
3. Residents as financially forced and consulted participants.

To find more financial means, more stakeholders should be enthused to help in the rehabilitation. In the value oriented neighbourhood approach, profit developers and external market parties were being involved. Professionals were challenged to come up with solutions and also residents were given a more participatory role.

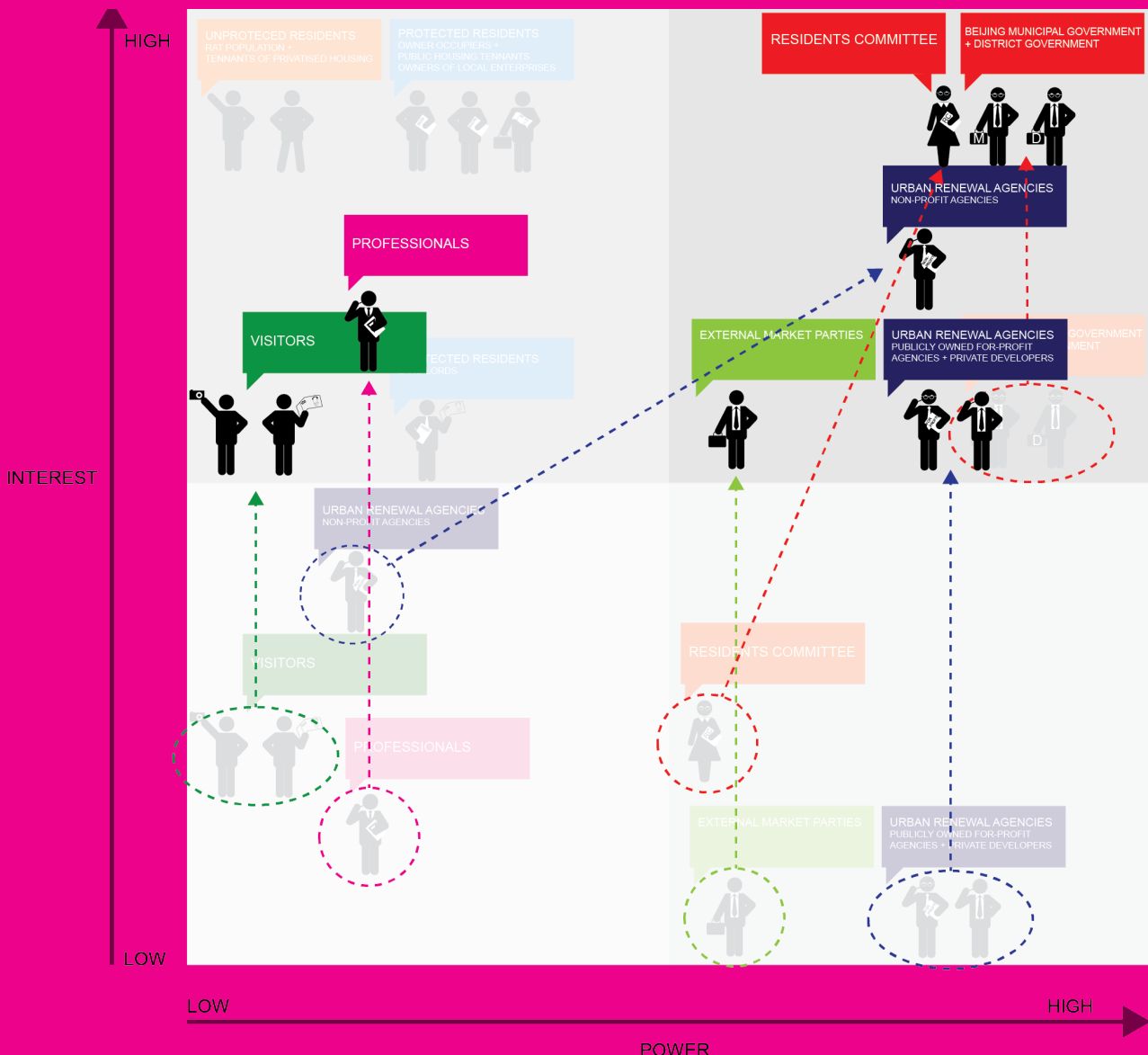
Reasonably one might ask if it is such a good idea to involve even more parties, as it proved that many rehabilitation projects were already stopped because the existing parties could not reach an agreement. Adding more stakeholders does not make reaching an agreement easier.

To be able to solve the existing impasse and even be able to find an agreement between the newly

added stakeholders, the technique of finding “the common good” is introduced (Bryson et al., 2002). The technique aims to develop a coalition or co-aligned groups which can be inspired to strive towards a common goal (in this case the rehabilitation of the early high-rises). To find this common goal a study of the power versus interest grid (see figure 7.2-7.3) is made to identify the supra-interests: Interests they have in common. The research is designed to understand how to satisfy the interest of the individual stakeholder and to advance the common goal (Bryson, 2004, p.35-36).

In this case the common good should be the rehabilitation of the early high-rises. But observing the power versus interest grid, it is impossible to find sufficient overlapping interests between the stakeholders to support the rehabilitation process as common good.

Figure 7.4: Desired power versus interest grid: communal grounds + building scale

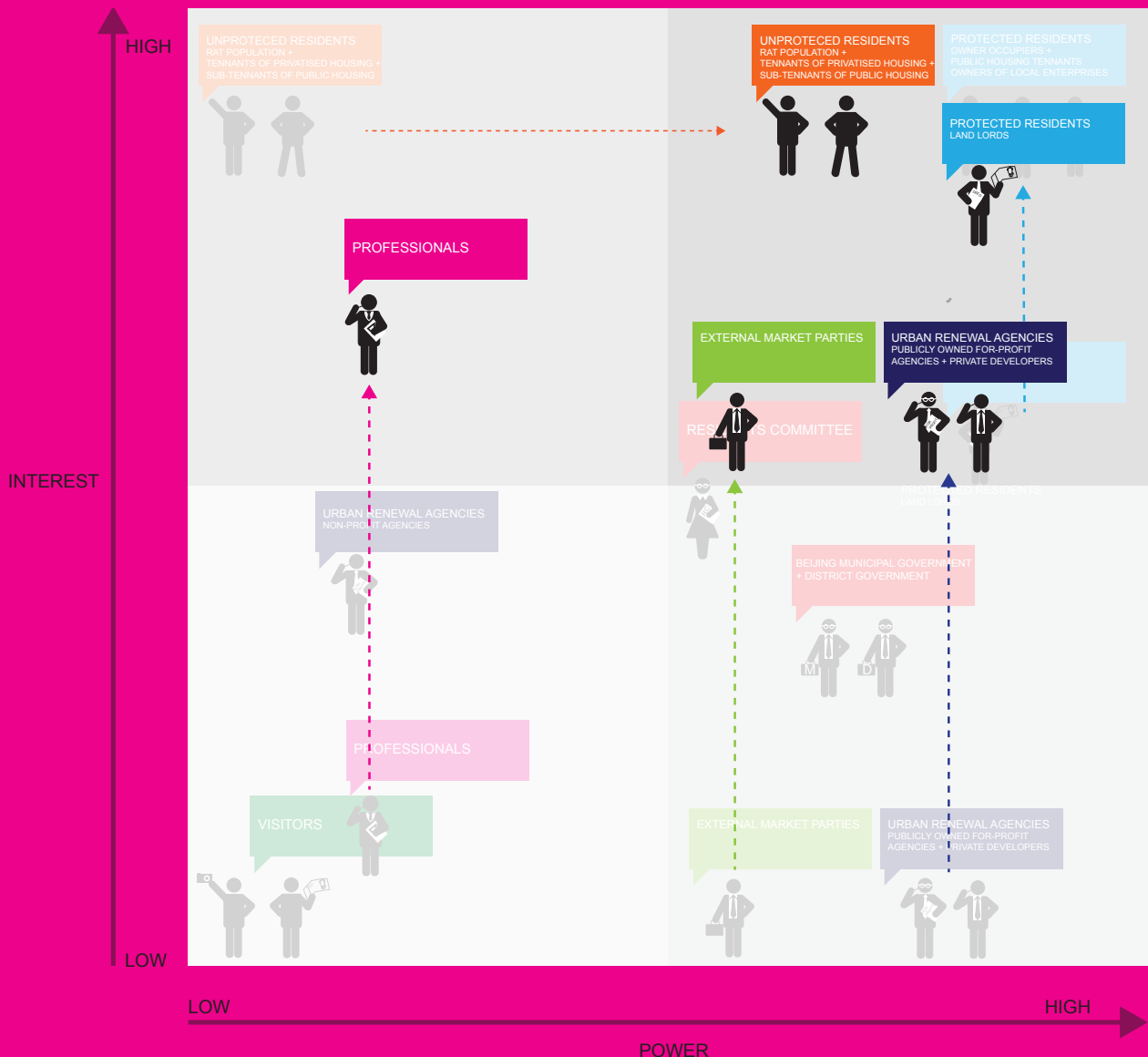


When reviewing the power versus interest relations, it is clearly visible that those with the highest interests in the rehabilitation process (such as unprotected residents, and on buildings scale also protected residents) have little power in the process. As well as the most powerful stakeholders (governments and urban renewal agencies, external market parties) have limited to average interest in the rehabilitation of the high-rises. To increase the success ratio of a rehabilitation strategy it would be necessary to increase the interest of several of the stakeholders in power in the rehabilitation process. It will on the other hand be necessary to empower or involve those with the highest stakes and insufficient power, to prevent them from being unable to pursue the implementation of their interest. This results in a desired interest versus power grid for both the scale of the da yuan and building, as well

as the dwelling scale (see figure 7.4-7.5).

How to achieve this desired grid is the important question. The empowerment should follow from an endorsement from those in power to those who currently have none. This process could be as simple as facilitating (using a facilitative leadership style and/or developing game rules to stimulate participation of the “to be empowered party”, or as complicated as developing new legislation. The enthusing could be achieved by ensuring that more (individual) interests of the “to be enthused stakeholder” are satisfied whilst rehabilitating. How it is possible to enthuse stakeholders to strive to the common good will be researched in the remainder of the chapter.

Figure 7.5: Desired power versus interest grid with added stakeholders: dwelling scale





### **7.3 Merger of interest to support the common good**

The theory of the merger of interest as mentioned by prof. van Hall (2009) looks for business opportunities by striving for a simultaneous care for several interests. Her aim is to create a sustainable shift in thinking, from taking care of business interest alone to taking care for both the interests of the people, environment and economical interest. Using the model van Elkington (see figure 7.6), she argues that this approach is more than finding a way to accommodate people and planet interest in a profit oriented project, but by finding the merger, the outcome becomes more than the sum of the separate parts.

The theory of accommodating more interests, to create a merger of interest for a stakeholder, in the rehabilitation of the early high-rises might be an interesting approach to enthuse them. For those stakeholders the interest of the rehabilitation, the improvement of the living environment, alone is not enough. Hall suggests looking for win-win situations for stakeholders (Hall, 2009, p.34). The remainder of the chapter looks to several possibilities of creating win-win situations to enthuse both the existing stakeholders and added stakeholders of the rehabilitation of the early high-rises.

#### **7.3.1 To birds one stone approach – Linking national, municipal or social challenges with rehabilitation**

Hui (2012, p.582) proposes to free financial capital by finding subsidies of the municipality which could also be applicable in the rehabilitation process. As an example Hui names barrier free subsidies which are available to make buildings more elderly friend-

ly (Hui, 2012, p.742, 752-753). When the rehabilitation of the entrance, for example, does not only rehabilitate but also makes the entrance more elderly friendly, subsidies can be acquired.

Looking at it from the merger of interest theory, this two-bird in one stone approach could do more than just free capital, it can make stakeholders overall more interested in completing the rehabilitation as it also fulfills interests they find crucial.

In the case of the early high-rises it means finding opportunities for stakeholders to fulfill secondary interests or goals during the rehabilitation process. With most stakeholders the secondary interest can be identified in a dialogue. In case of the governmental stakeholders many of these interests can already be found in their policy. Examples which could already be explored are how national and municipal goals such as the provision of more affordable housing, making housing elderly proof, improving social-spatial integration and making housing more sustainable can contribute.

#### **7.3.2 Financial motivation – profitable business cases**

The financial incentive has proved extremely important in realising (sustainable) interventions in existing housing stock (Hall and Sprundel, 2014, p.162). So to enthuse existing stakeholders, and attract other stakeholders to participate in improving the existing living environment, it is important to add a financial incentive to make the rehabilitation a profitable business. Many business cases could be developed. Two precedent strategies will be discussed to serve as examples.

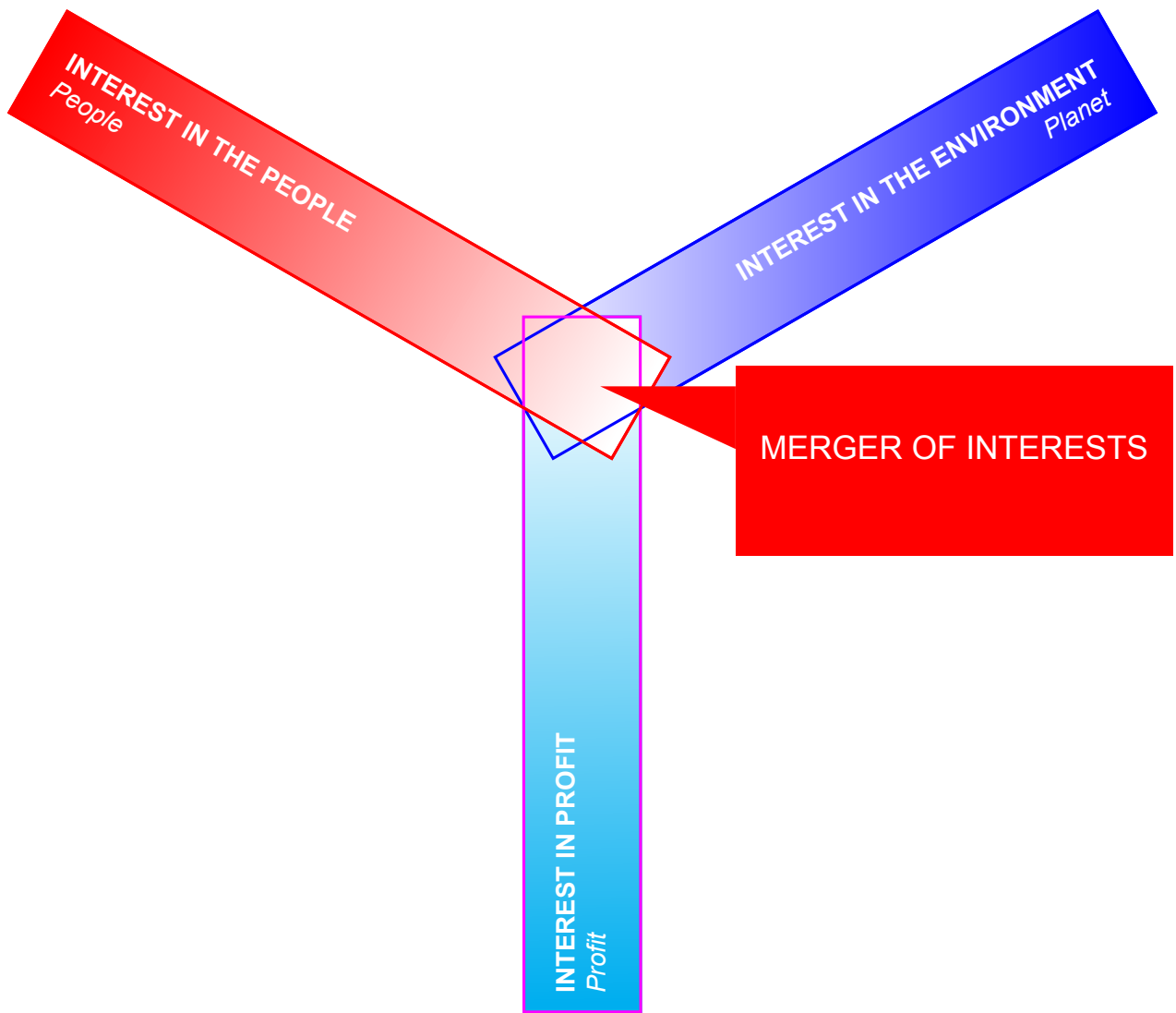
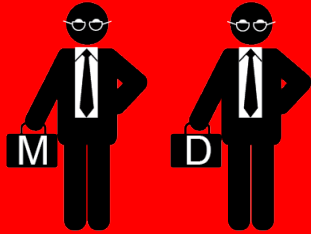


Figure 7.6: Merger of interest according to the Elkington model (Image adapted from Hall, 2009)

# EMPOWER! + INCREASE THE STAKES



Increase interest by linking governmental targets to the rehabilitation challenge:

1. Creating affordable housing
2. Making the housing (development) more sustainable
3. Making housing elderly friendly
4. Creating a profitable businesscase to create an alternative income source.



Empower and raise the interests of the residents or Shequ committee to become the link between rehabilitation policy and the people.

1. Empower the committee to represent the residents in the rehabilitation process.
2. Through governmental influence: make the rehabilitation process a key task of the committee



Increase interest of the professional world to help find clever solutions to the challenge of China's crumbling high-rises

1. Employ professionals to help the search for clever solutions or organise competitions to generate ideas.
2. As the challenge becomes a rehabilitation assignment more attention will naturally arise from the professional world.



Increase interest of the (for profit) renewal agencies as added stakeholder

1. develop interesting business cases to attract investments and create value.



Increase interest of the external market parties as added stakeholders

1. develop interesting business cases to attract investments and create value.



Empower and raise the interests of non-profit renewal agencies to become the executors of the rehabilitation

1. Empower the agencies to execute the rehabilitation process.
2. Through governmental influence: make the rehabilitation process a key task of the renewal agencies.



### *Case 1- Energy efficient financing*

For a decade China heavily subsidised to guarantee low electricity prices. The price of electricity – controlled by the National Development and Reform Commission (NDRC) – has been kept low (Rutkowski, 2014). So low in fact, that the average financial returns of electric power producers and distributors have been below the production cost (Kahrl et al., 2011). This has been changing. In 2012, NDRC introduced a three-tiered electricity pricing model to charge higher rates to households consuming more electricity. More market reforms of the sector have, and will continue to loosen price controls (Rutkowski, 2014).

Moreover, even though economic growth curves are now less steep, energy demand is still on the rise. Not only is the demand growing from industrial sectors, also in the residential sector energy demands rise as the living standard keeps increasing (Stocking and Dinan, 2015, p.2-3). Increase in demand and loosening price caps, have already resulted in increased energy prices over the decades (Fridley et al., 2014, p.28-34, Kahrl et al., 2011), and is most likely to continue over the years.

Similarly there is an increase visible in water prices. Many cities are short of water yet its prices are heavily subsidised. Higher tariffs are implemented to compensate. (Anonymous, 2010)

The early high-rises were constructed with poor thermal characteristics (Hui, 2012, p.254-257) caused by lack of insulation in the façade, roof, windows and cellar, and lack of draft proof details. Relatively to thermally friendly later generation's high-rises, energy consumption for heating and cooling is bigger in these dwellings. The energy cost makes up a larger portion of fixed household expenses. When energy prices increase, and consumption increases, fixed household expenses rise, even though the quality of living remains the same. Especially for the increasing number of lower economic classes residing there this could lead to increased fuel poverty amongst the residents.

In the Netherlands similar situations were to be found in the post-war housing estates during the current recession. Energy prices increased heavily especially between the period of 2001-2008. Lower income groups (living on social benefits) usually

live in older and less insulated dwellings and are paying as much as 10% of their income on energy costs. Influenced by the political concern on the unemployment in the construction sector and the fact that existing housing stock is responsible for over 40% of the energy consumption, 30% of the CO2 emissions, goals towards the energy performance of Dutch housing were made. In 2020 all new built housing is to be energy neutral, on average social housing stock has to have energy label B, and 80% of the commercial housing has to have label C. To realise the goals business cases to improve

the thermal qualities of the existing housing were made. (Hall and Sprundel, 2014, p.158-159)

Although the way of financing is different for different residential sectors (public social housing, privately owned social housing, commercial housing, rented property) the model is similar. The investment pays itself back. A dwelling is renovated to make it more energy efficient or even to produce energy. As a result energy bills are lower. The financial investment is then paid back from (part of) the difference. This way buildings could be improved, residents living quality is increased without rising

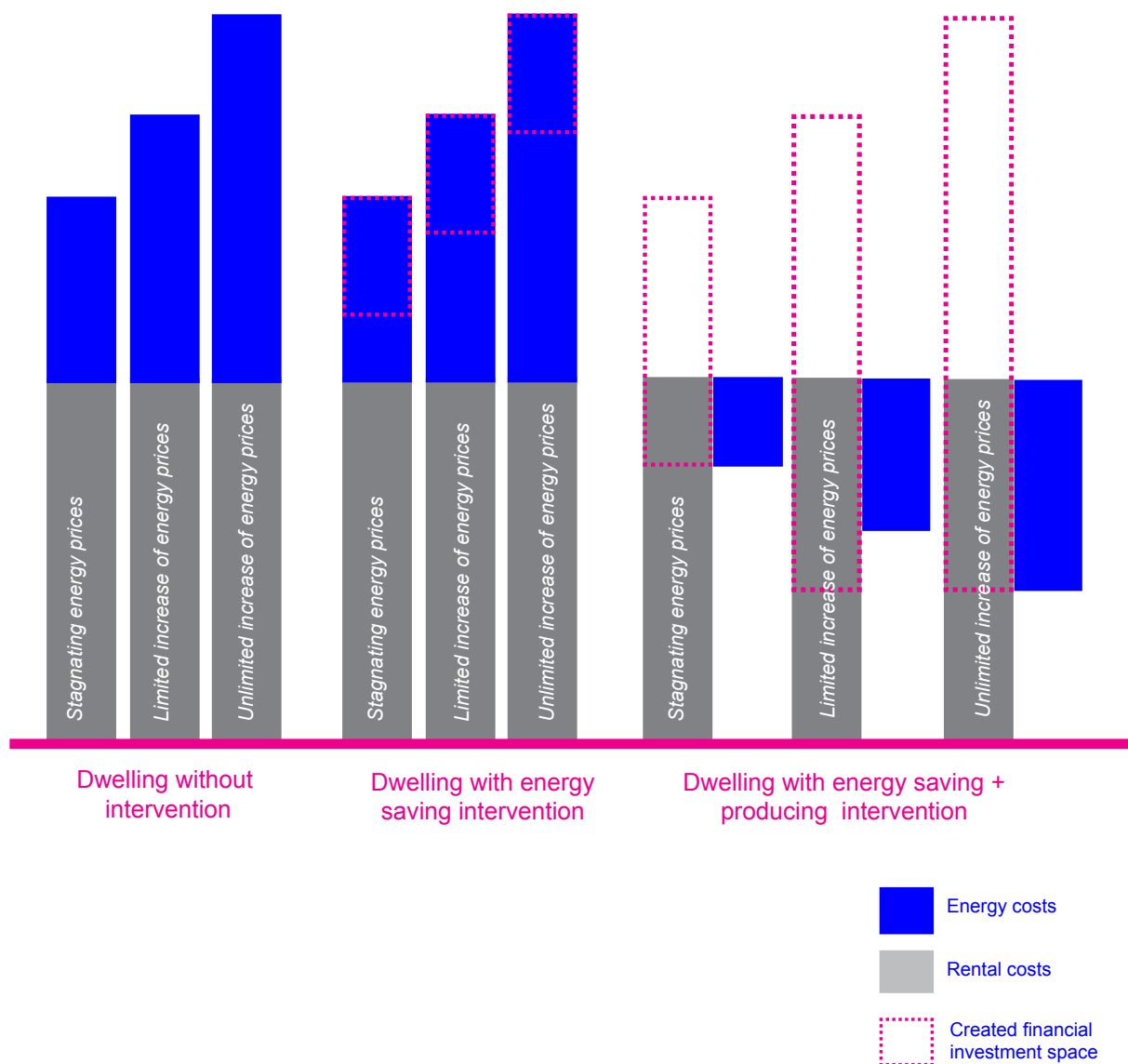


Figure 7.8: Self financing model: effect of stagnating or growing energy, and energy reducing or producing interventions on the fixed household expenses

living expenses. Although this financial construction works in times where energy prices remain stable, this model is even more lucrative when energy prices are rising (see figure 7.8).

The financing method of the upfront investment depended on the residential sector. For commercial housing, landlords of public owned social housing and renters a system of controlled public loans has been made, the latter two can apply as well for subsidies to support financing. For public social housing the “zero on the meter” financing has been made. These renovations had the main aim to reduce the energy bill of the resident to zero. The former energy bill is paid to the housing corporation instead.

The average energy bill is 150 euros. When using this amount corporations took the business case, as well as the ability to finance the investment into account. The monthly amount was enough to finance roughly 40 thousand euros. The business case needed to comply with a financial yield of 5.25%, resulting in an investment capacity between 40 and 60 thousand euros. (Hall and Sprundel, 2014, p.164-167)

During the zero on the meter renovation sustainable interventions are intertwined with the normal renovations of the dwelling. Although the zero on the meter renovation would be 25 thousand euros more expensive than a normal (mandatory) renovation the business case is still highly attractive. Normal renovations would be financed from the capital of the corporation, whereas the zero in the meter renovation are financed from the fee paid by the resident. As the zero on the meter renovations are only 25 thousand euros more expensive, 15 thousand euros are available to co-finance the normal renovations (Hall and Sprundel, 2014, p.166).

The early high-rise dwellings in China are mostly privatised, so an adapted construction should be applied. As is the case with the energy renovations in private housing in the Netherlands, public controlled loans could help finance a zero energy rehabilitation for the early high-rises in China. The financing is not supposed to be applied on dwelling scale but the energy renovation should be executed (by a third party) on the building scale.

Residents together re-pay the difference of their energy bill to pay off the loan. Depending on the investment capacity the zero on the meter rehabilitation could for example include placing double or triple paned windows, insulating and renewing the façade, make the (ventilation) more energy efficient, and replace the infrastructure to waste less water and energy.

#### *Case 2 – The other New York*

Financial compensation strategies are relatively conventional to make the financing of an unprofitable (renovation) project self-sustaining. Hui (2012, p.730) proposed to compensate between sites and building redevelopments. A demolished low-rise could be replaced with a dense high-rise which would generate profits, from which the unprofitable rehabilitation of mid-rise could be financed. The former means that this rehabilitation site which in overall also makes profit could help finance another rehabilitation site which has no means to compensate enough on the plot.

As most of the high-rise sites are already extremely dense, the top-down oriented compensation technique from Hui is impossible on many sites. There is simple to little space to make large scale, top down, compensation buildings. This means that all of the high-rise rehabilitation projects are financed off site and are dependant on the success of other projects. It is not hard to imagine that on a short term this might be an unconvincing compensational financial model.

Although the conventional compensation might be very difficult a new approach could offer solace. The community growth corporation (CGC) model is a hypothetical model developed in collaboration with SITU studio, Jesse Keenan (of the Centre for Urban real-estate) and the Furman Centre. The model bridges social and financial capital. It is a strategy that is aimed to maintain, improve and create more affordable living spaces in the dense city of New York. The financial part of the model is based on the legislative principle of transferring excess FAR. FAR or Floor Area Ratio defines how much built-up area is allowed to be constructed on a certain area of land. Many of the existing (affordable) housing do not use the allowed FAR completely. It is also unlikely these excess increments will



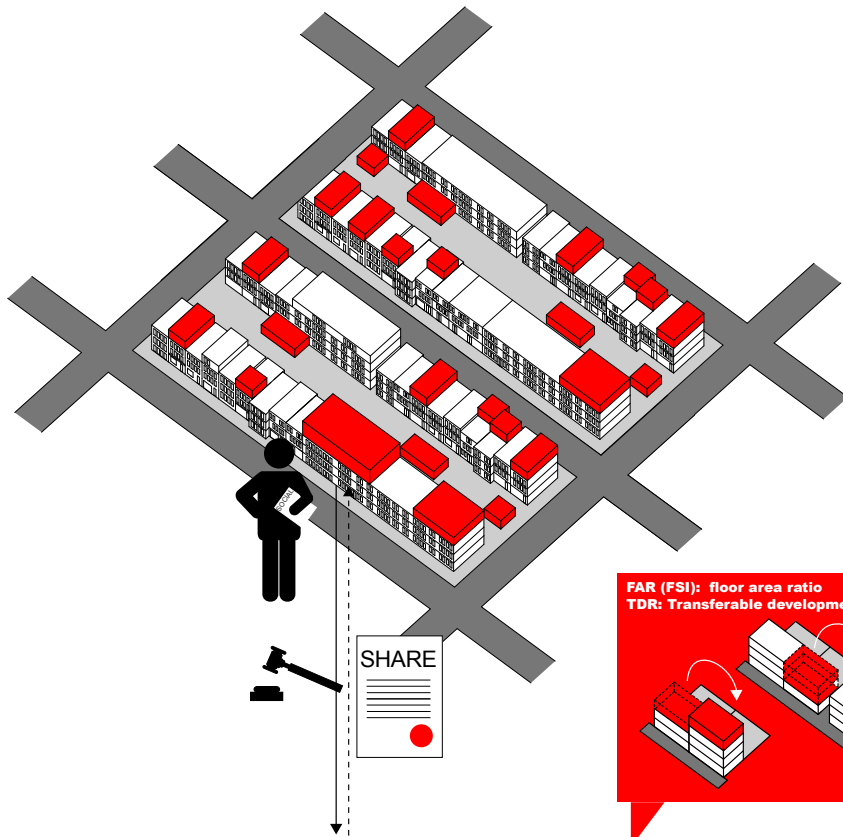
be built in the future as the economic investment would often be higher than benefits of the gained space. The model allows landlords from social housing projects to auction their unused FAR to the FAR bank, in exchange for shares in the CGC. The excess FAR in the bank would then be auctioned off. Part of the FAR would be auctioned to the highest bidder. The winner can use it on a receiving site in an adjacent neighbourhood that can accommodate higher density mixed income development. This transaction of FAR is what generates income. Part of this income can then be given back to the CGC shareholders in the form of re-investment options to improve their affordable housing stock. The income also allows part of the FAR to be re-placed on local receiving sites in the neighbourhood. With the use of prefab modular systems, and DIY construction methods a new typologies of incremental affordable housing, community facilities is generated on top of the roofs, vacant sites and backyards. (Keenan, 2014, Studio, 2014)

Although the model would not be directly applicable in the rehabilitation of the early high-rises in Beijing it does offer interesting insights. It suggests a way to provide financial means to realise an unfeasible investment. Where the unfeasible investment in the New York model was the maintenance of the existing affordable housing stock, the new construction of affordable housing and the provision of community facilities, in Beijing it is the improvement of the decaying high-rises, including creating new affordable housing and community facilities. Inspirational is that the model works in an already dense urban fabric and without demolishing large parts of a site. This was of course the problem why the conventional compensational model could

not function in the early high-rises. So by adapting the conventional compensation model with aspects of the community growth corporation model we can develop a financial compensation model suited to the early high-rise housing context. The following aspects could be applicable or adaptable to develop a financial model in Beijing.

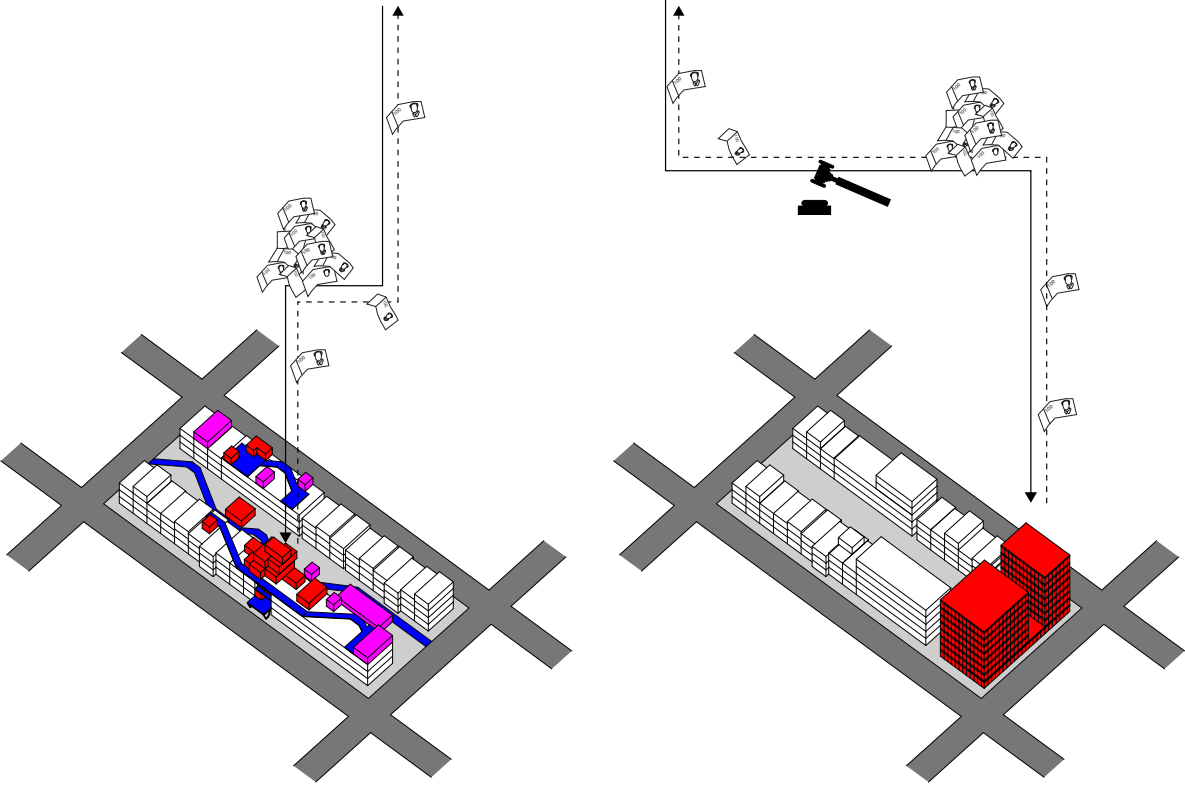
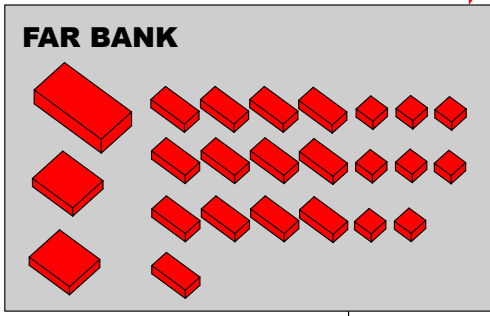
Firstly the financial capital used in the New York model: the excess FAR can also be found on the plots of the early high-rises. In New York the excess FAR per site was often unusable, as plots are smaller. The model then allows to transfer the excess FAR to local, low density receiving sites or high density receiving sites in adjacent neighbourhoods. The necessity to transfer the excess FAR in Beijing is not as vital for a compensational model. The high-rise typology is larger in its outlay, which means that on site the excess FAR could already be quite substantial, and could become one and the same with a low or high density receiving site. So the FAR deposited in the Beijing FAR bank would be non-transferable and already have a locus making the compensational model closer to a conventional approach. On the contrary with the conventional model where demolishing of existing buildings was required, the locus (like in the New-York model) is found in the existing urban fabric on (small) vacant sites, rooftops, basements and communal grounds.

However who owns the spaces of excess FAR, and so the locus of (compensational) development is more ambiguous than in the New York model. In New York landowners would auction their excess FAR to the bank. In the case of the early high-rises the different and often ambiguous ownership models ask for adaptations in the mod-



**FAR (FSI): floor area ratio**  
**TDR: Transferable development rights**

A red box containing a diagram that illustrates the concepts of Floor Area Ratio (FAR) and Transferable Development Rights (TDR). It shows two building models: one with a smaller footprint and one with a larger footprint. Red arrows indicate the transfer of development rights from the smaller building to the larger one, resulting in increased height and density.



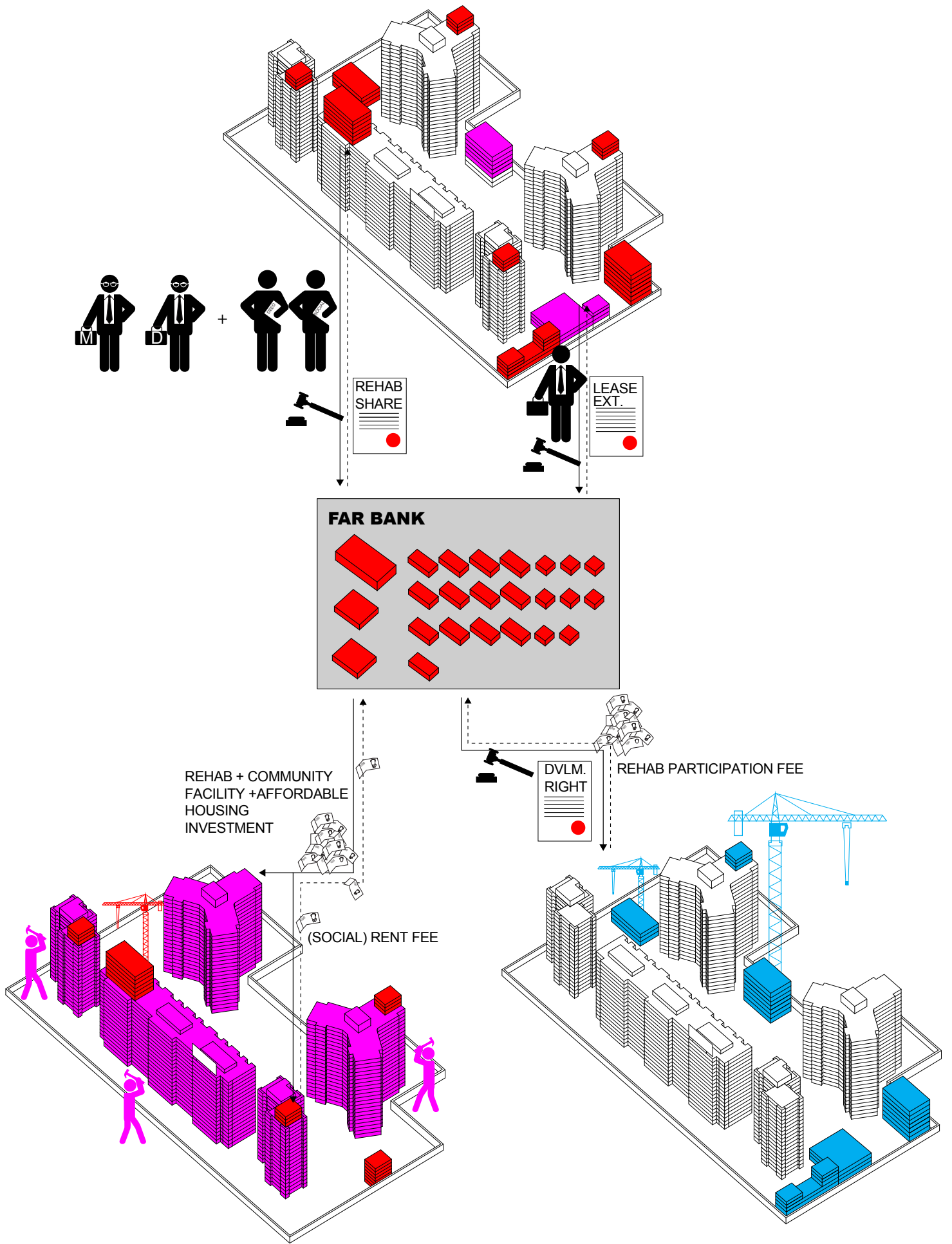


Figure 7.10: Compensational model for the early high-rises in Beijing



el. In case of the first generations there is a joint ownership where only dwellings belong to the residents, the communal grounds as well as communal building elements still technically belong to the government. In case of the transitional generations land could have been leased to residents, meaning that they have rights to the use of land and their buildings for a set amount of time. Furthermore side buildings on the site might have third party ownerships over their building. So proposed is that businesses can exchange their excess FAR (if usable) to the bank for an extension of their lease. Government and residents, in consultation can determine the excess FAR to be deposited in the bank in exchange for rehabilitation shares.

These excess FAR can then, like the New York model suggests, be partially auctioned to the market parties who, pay a lease and rehabilitation fee. This means they pay a significant amount to aid the rehabilitation. Partially the excess FAR will be used to accommodate construction which are part of the rehabilitation, such as the provision of re-location and new affordable housing or community facilities. Furthermore the earnings of the auction to market parties can be used to partially fund further rehabilitation costs.

The community growth corporation's ideas on transferability of the locus of the FAR might not be necessary or practical in the early high-rise context, the transferability of profits might be. Even though the financial model of the early high-rises strove to improve feasibility on short term, by making each site financially self-sustaining, it might not be possible in all cases. Some sites have less possibility to make a strong business case or reach a merger of interest. For example some sites have

more excess FAR or are located in places where the excess FAR would be significantly more valuable. Instead of taking these differences into account when distributing the dividend back to rehabilitation of the site, dividends should be (partially) transferable to sites with less (valuable) FAR or a more unfeasible financial construction.

### **7.3.3 Motivation on the short and long term – Ideas on cyclical value creation**

To increase interest from all stakeholders to participate, to invest in the rehabilitation of the early high-rises and to find a way to make the financial model self-sustained, the theory of value oriented neighbourhood approach will be discussed.

The theories of value oriented neighbourhood approach were developed in a context of economic recession where many existing (Dutch) neighbourhoods were suffering from socio, economic and physical decay. The theory was developed from a need to find a more sustainable way to deal with land exploitation for existing urban neighbourhoods. The theory was seen as a way to involve new parties in the interventions and exploitation (De Kam, 2008, p.4), to overcome the (financial) impasse which existed between the conventional parties, align interest amongst divided stakeholders and form social commitment towards solving the social problems in the neighbourhoods (Van Leent, 2006, p.4, De Kam, 2008, p.4-5).

The theory is based on the theory of change (De Kam, 2008, p.8-9) which maps the possibilities of how an intervention or action (input) leads to a change or results (output) with which, desired goals or effects (outcome) are realised. From the theory of changes the model of value creation in neigh-

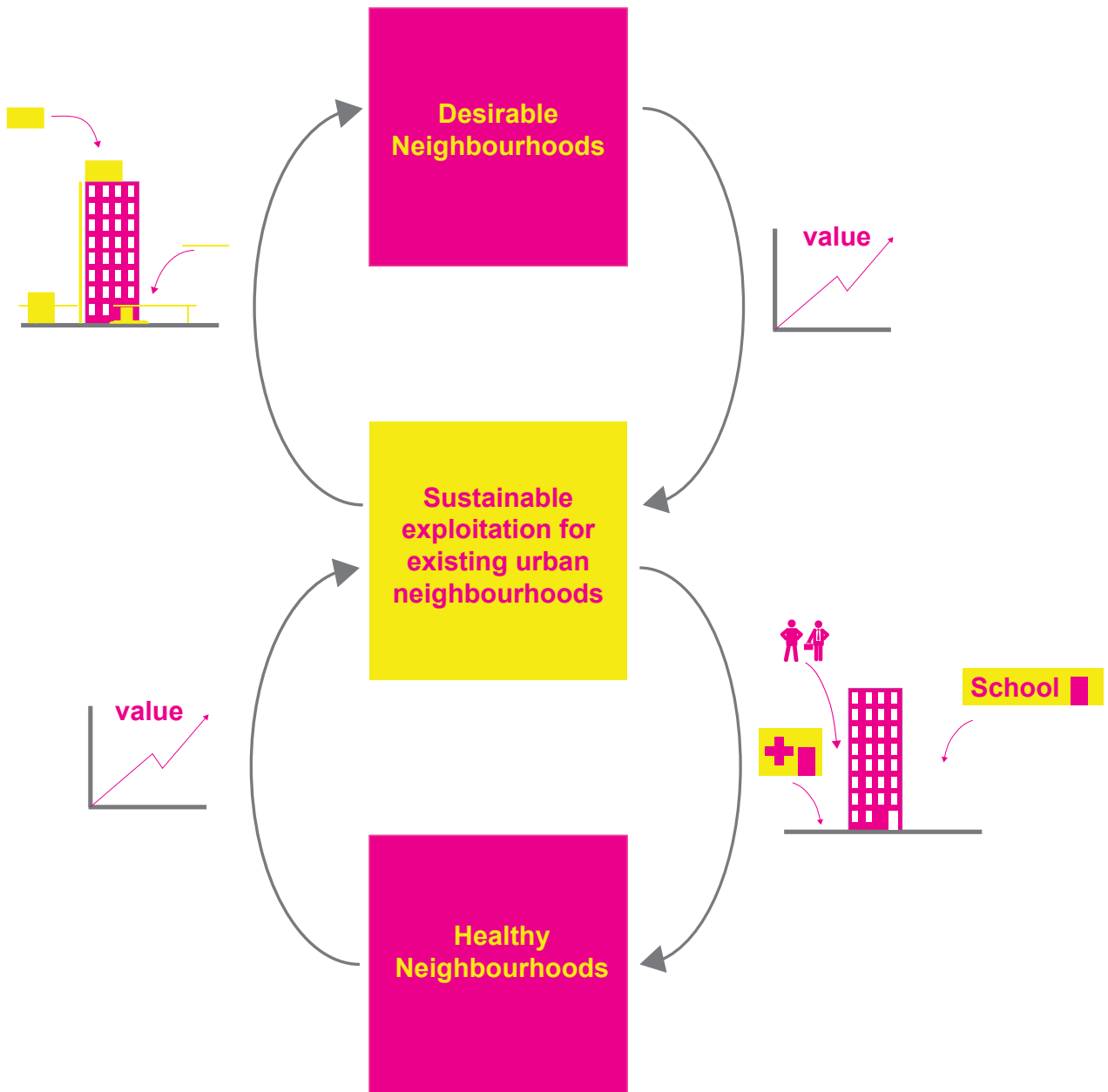


Figure 7.11: Value oriented neighbourhood model (developed by Mulder, 2006)

bourhoods has been developed by Mulder (2006). This model exists of two cycles: healthy neighbourhoods and desirable neighbourhoods, which aim to strengthen each other. The first of the cycles: the healthy neighbourhood cycle is necessary to tackle softer social problems caused by advanced social-spatial segregation resulting in clusters of lower social strata in decaying neighbourhoods. It requires that investments are made to stimulate the resident as a producer in the neighbourhood. These investments aim to increase the level of participation in a neighbourhood, and so lead to a lower exploitation cost. The second cycle enables investments to the resident as consumer of the neighbourhood. These investments are aimed to increase the (physical and social) quality of the neighbourhood to improve living quality and the image of the neighbourhood, and subsequently the value of real-estate. As the latter cycle is dependent on the value residents give to the interventions, the approach asks to incorporate wishes and demands of the residents.

An interesting aspect of the theory is that it was developed in a time of economic recess, a time when finding investors in renewal proved difficult. The idea that every time the cycles have been completed the value of the neighbourhood rises, had benefits in this context. This means that the financial strategy allows to spread financial risks in "phases". So a small investment in the beginning can work as a catalyst to instigate the value creation cycle. The creation of value can in its turn free new means to reinvest in bigger interventions. As value increases over time more stakeholders can be attracted to invest. In its turn a positive financial cycle is created where over time more and more

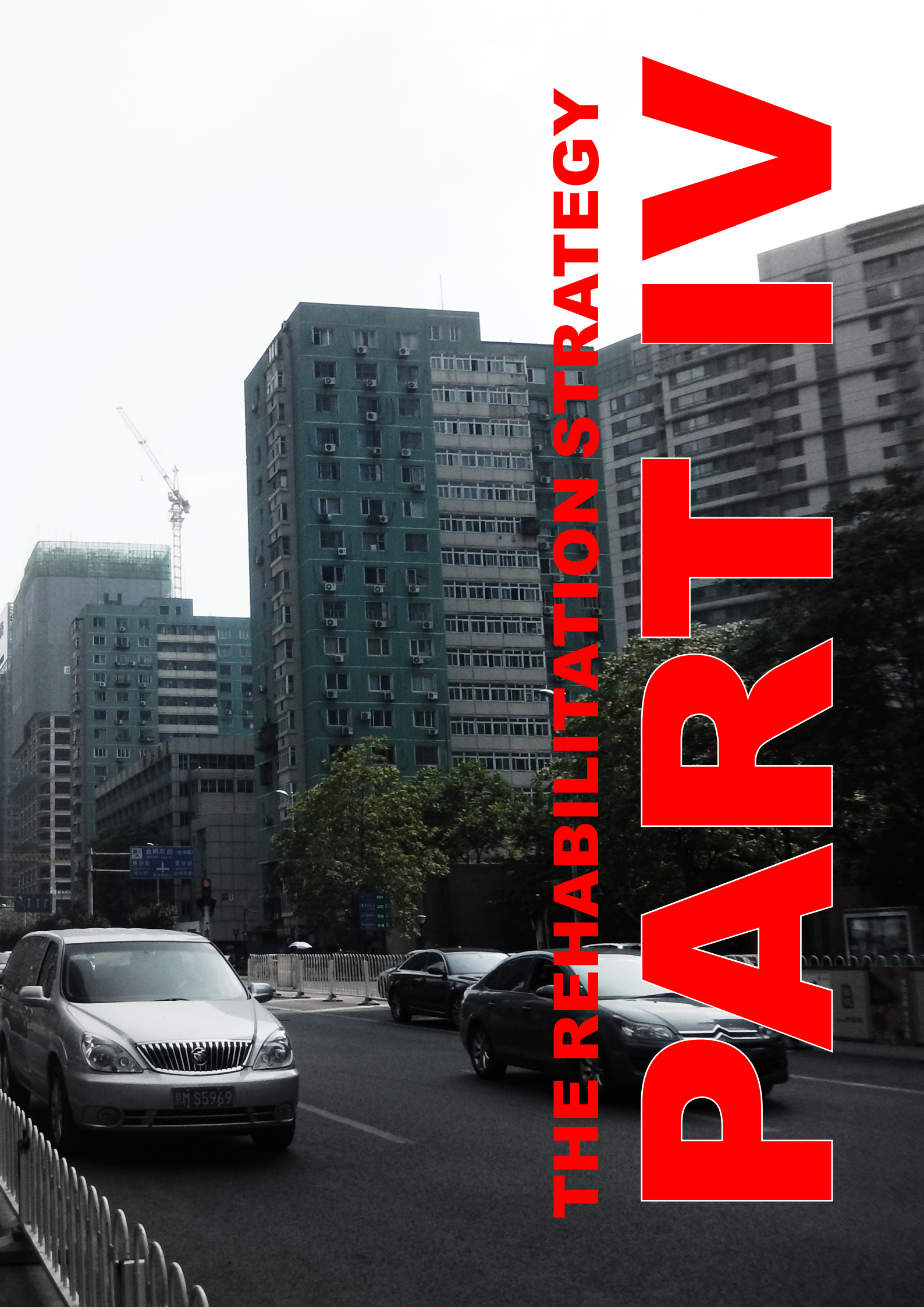
investments become possible.

Parts of this theory are definitely interesting for the financial strategy component of the early high-rises. The idea of phased development, consisting of catalysed cycles resulting in growing value and investment opportunities suggests a realistic approach to catalyse rehabilitation on short term and slowly develop to more long-term strategies. Another interesting aspect is the desirable neighbourhood cycle. Although the healthy neighbourhood cycle was beneficial in the west, the type of investment in this cycle might not yet be necessary, as social problems in the early high-rises are much less severe than those in the marginalised problem neighbourhoods in the west. The second circle however proves more applicable in the early high-rises context. Many of the early high-rises do not answer anymore to current housing demands, are in a process of decay, and therefore suffer from a deteriorating image. Subsequently their financial growth and current (re)investment capacity is limited. By catalysing and investing in the improvement of the living environment to match the resident's demands, the experienced value will rise, increasing later investment capacity and eventually starting an upward spiral for the early high-rises.









**THE REHABILITATION STRATEGY**

**PART IV**





8.0





## THE REHABILITATION STRATEGY



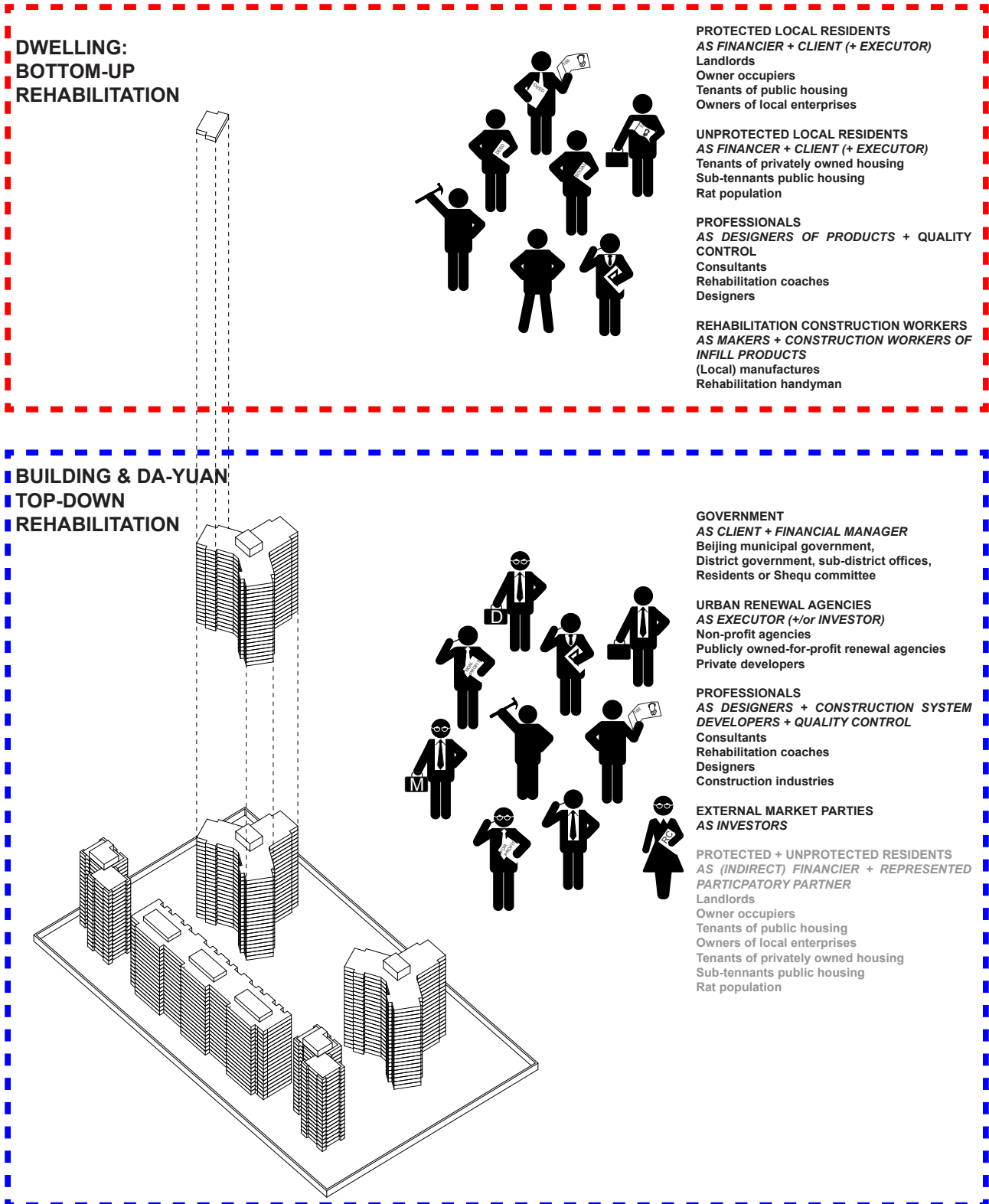


Figure 8.1: A dual strategy

## 8.0 A HANDS-ON REHABILITATION STRATEGY

In this chapter an integral rehabilitation strategy will be formed in accordance to the determined prerequisites from part 2 of this research and the developed strategic tools researched in part 3 of this thesis.

### 8.1 Basic framework of the rehabilitation

The rehabilitation strategy is of a dual nature, it consists of partial bottom-up rehabilitation on the scale of the dwelling (by residents), and top-down on the scale of the building and the da-yuan (see figure 8.1). This separation accommodates the power distribution of the two scales. The use of a dual rehabilitation strategy can work in the current status quo as on the long-term. Moreover the approach offers many architectural and financial opportunities.

The second characteristic of the strategy is that it will consist of phased cycles (see figure 8.2). The phases allow the strategy to be applicable in the current status quo, as well as in an ideal future situation. As many of the challenges in the high-rises can be traced back to policy, or habits on an urban or societal scale, problems can be most efficiently solved on this scale. In the current status quo, problems are not (sufficiently) tackled on this scale, so problems need to be alleviated (or solved if possible) on the scale of the high-rises. When the problems in this scale, such as housing affordability, long term oriented real-estate market, sustainability etc. can be solved within a national or urban framework the approach of the rehabilitation can be adapted. In the current status quo many factors need to be carefully balanced to find a feasible solution to a difficult puzzle. In the "ideal" societal context more ideal solutions can be striven for. The change of policies, legislations is a long and difficult

process. The phases allow for a gradual change in society, legislation and policy to take place (if it takes place at all), whilst allowing to commence alleviating problems in the current status quo right now.

The phased strategy allows for a cyclic process of value creation to take place. Where investments might be considered unfeasible in the current status quo, the interventions proposed for the rehabilitation could be of a more conservative nature: to efficiently increase the living quality for the smallest investment possible. As cycles of value creation complete, the appreciation for the high-rises increases. So the real-estate value and investment possibilities rise. This allows to propose more ideal, more long-term, and more expensive interventions. In this way the phased approach increases the financial feasibility, as it spreads investments and the financial risks over a longer period.

To break the current financial impasse and especially the unwillingness to invest from residents, a catalyst is necessary. By commencing the rehabilitation on the scale of the building and the da-yuan, value and investment opportunities are created to commence the rehabilitation on the scale of the dwellings. The executed top-down and bottom-up together create a higher combined value, which allows for the rehabilitation to move into the next phase, where the cycle is repeated. Where in the first phase a higher catalyst is necessary to commence the value creation, as the phases pass the need for a catalyst decreases. In the final phase a self-supporting upwards spiral is formed which guarantees a continuing cycle of value creation (see figure 8.3).

There are four proposed phases within the

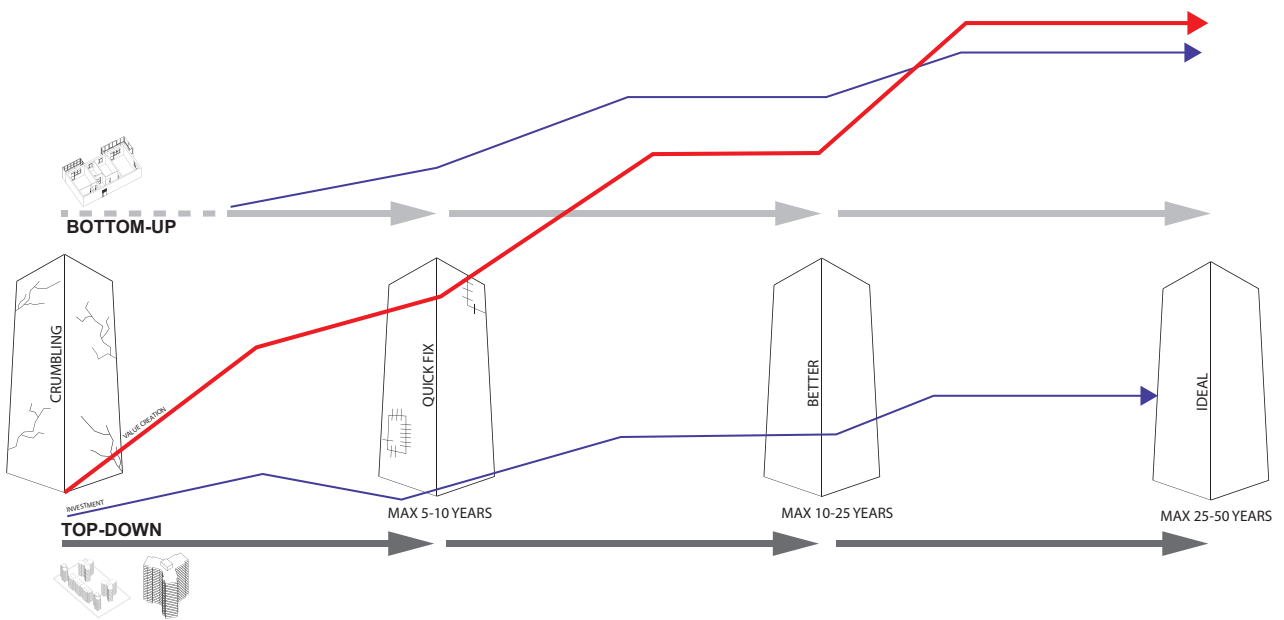
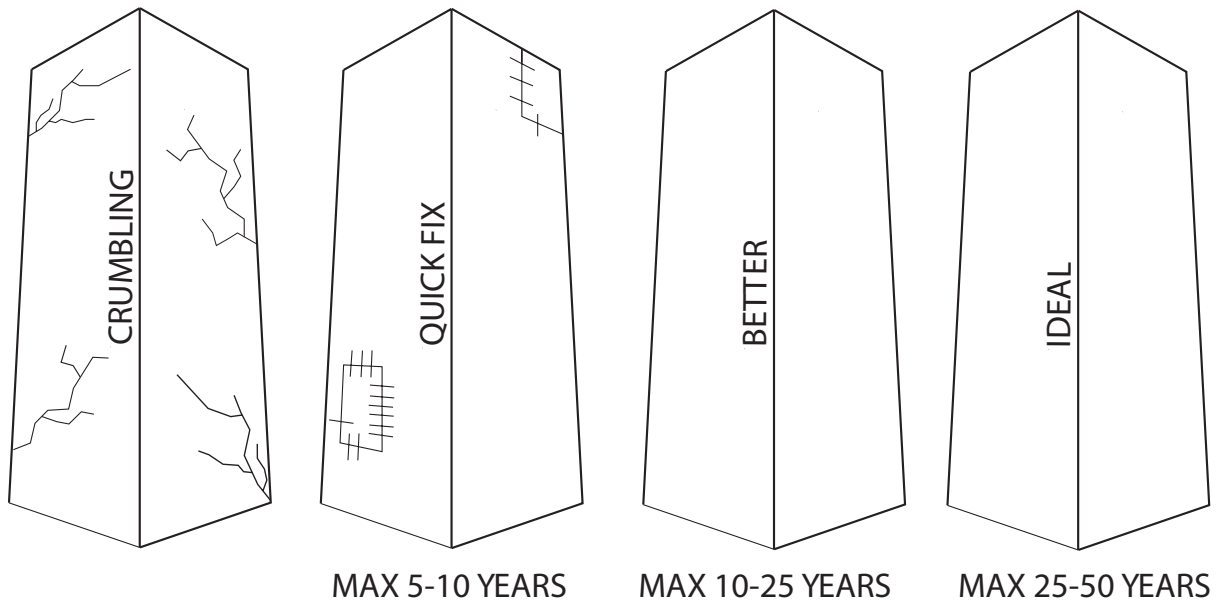


Figure 8.2: Phases of the rehabilitation strategy

Figure 8.3: Cycles of top-down and bottom-up investments versus the overall value creation



strategy (see figure 8.2). “Crumbling” is the current status quo. The second phase “fixed” is the first step in rehabilitation, taking place (for all high-rises) within 5-10 years. This phase works to alleviate problems on a short term, within a current reality. The tools proposed in this phase are quick fixes: they offer fast and cheap solutions in order to improve conditions on a short term. On a 10-25 year timespan when funds can be accumulated through value creation and aided by newly passed legislations, “better” solutions are proposed in the like-named phase. In the final phase “ideal” interventions are proposed assuming that changes on societal scale will have taken place and investment acquisitions is no longer problematic.

Although it should be the ambition to realise a rehabilitation process where all the cycles are passed for all of the high-rises it is important to notice that the passing of each phase constitutes a significant increase in the quality of the physical and socio-economic living environment. So although the strategy is in fact only completed when an upwards spiral of value creation is created, the completion of a phase can in fact already be considered as the completion of a project.

## **8.2 The societal organisational component of the strategy**

To really solve some of the problems in the high-rises changes on the national, urban or societal scale are necessary. Where the first phases of the strategy accommodate the alleviation of problems without changes in policy, changes are a necessity to solve the issues of speculation, lack of affordable housing and sustainability in the early high-rises. The re-socialisation model as proposed by Hui (2012) offers a feasible and workable approach to limit speculation in housing and guarantee sufficient affordable housing on a long term (25-50 year). Therefore the strategy suggests to have a complete implementation of Hui’s (2012) housing re-socialisation model in the ideal phase. In between those phases an intermediate will be observed. In the “better” phase some legislation will have been passed to allow for some of the problems to be alleviated of plot, but no complete solution will have been found which could justify problems to be solved off-plot of the early high-rises.

## **8.3 Physical component of the strategy**

The physical strategy responds to the opportunities coming from the use of a partial bottom-up and top-down strategy and the desire of stakeholders to improve (and keep improving) the living environment to their current demands. With the use of an adapted Open Building method continuous incremental change will be stimulated.

The strategy separates the living environment into the category of tissue + carrier and infill. The division is made according to the spheres of influence of residents, and public and/or private parties. The tissue + carrier is defined as the communal grounds, and in the building, the construction, infrastructure, thermal barrier, roof, circulation areas and communal spaces. The infill are all the systems, finishes within in the border of the dwelling: separating walls, services facilities (bathroom/kitchen), branching infrastructure in the dwelling, doors, dwelling extensions and furniture. The infill will be rehabilitated bottom-up by residents, allowing residents to participate in their own time, choosing when they can invest.

### **8.3.1 Rehabilitation of the dwelling (infill)**

To stimulate the rehabilitation of the infill by residents the rehabilitations should be made as affordable and easy as possible. Furthermore solutions should be made as attractive as possible by responding to the diversifying individual demands of the residents. The solution lies in the development of a new infill industry offering standardised customisation in infill systems. As the designs of the early high-rises follow standard designs, they are built with a 0.3 grid, and all suffer from similar problems, the solutions can be also standardised. The standardisation will allow mass production of infill solutions, which can greatly reduce the cost of infill rehabilitation. It also allows to develop standard rehabilitation (re)construction procedures which simplify the process. Although the solutions and rehabilitation method can be standardised, it is a mistake to assume one solution can fit the needs of all. The solutions should allow for changes according to the individual needs of the residents. To create such an industry it is proposed to develop an infill system industry according to an (adapted) IKEA like business model.

## RE:VIVE YOUR DWELLING

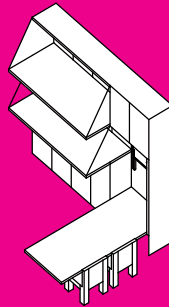
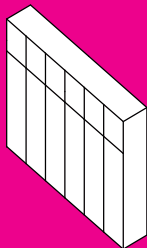
# A MORE EFFICIENT DWELLING

Figure 8.4 (pages 172-175): Examples of interventions suggested in the RE:vive catalogue

Each of the residents will receive a RE:vive catalogue filled with solutions to adapt their housing to their (future) demands. The solutions proposed in the catalogue aim to solve the different problems of the high-rises (and adapt them to current demand) by proposing solutions such as dwelling, storage and facilities extension packs, lay-out reorganisation products, flexible dwelling infrastructure placement systems, multi-use effi-

cient furniture (see figure 8.4). Different lines of products will be offered suitable for application in different phases of the rehabilitation. For use in the earlier phases, fast, efficient and cheap solutions will be developed in the “fixed” product lines. These solutions can be replaced over the years by “better or ideal” product lines which offer more advanced and expensive solutions.

1

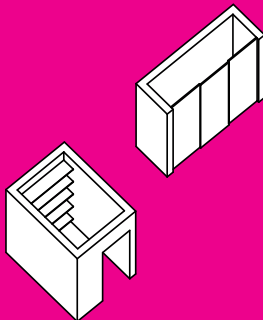


### 1. Room in a box / Room in a closet

Using smart, transformable, multi-functional furniture systems to make more efficient use of the room.

Implementation difficulty: Easy

2

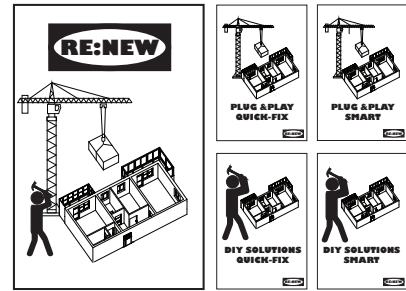


### 2. Storage rooms

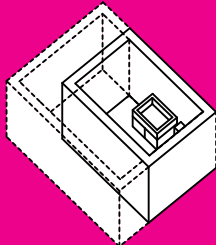
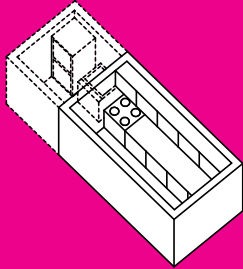
Making the use of rooms more efficient by adding storage space which can de-clutter living spaces. Storage spaces can be added by adding rooms, or closets in, or outside the dwelling space.

Implementation difficulty: Easy

## Catalogue for residents



3

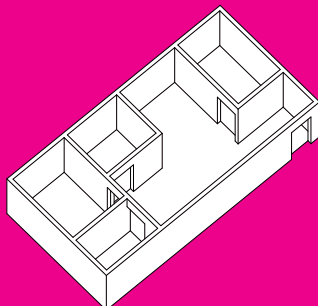
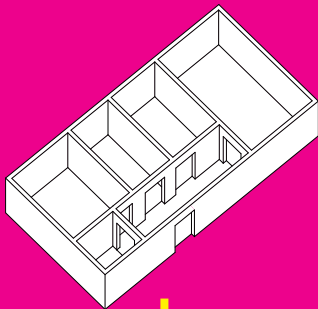


### 3. Service spaces enlargement

By making bigger kitchens and bathrooms, the service spaces can give enough space to fit modern fixtures and appliances. In some cases the enlargement could be made within the existing constructive grid and dwelling boundaries however in most cases extensions or rearrangements need to be made. In the latter cases the implementation is much harder.

Implementation difficulty: medium

4



### 4. Big living room lay-out

By rearrangement (and addition) of floorspace it is possible to rearrange spaces to create an apartment with the big-livingroom, small bedroom model, no hallway model. This model matches current demand and modern lifestyle. To change the lay-out, it is most likely that openings need to be made in the load bearing walls. This makes the intervention more costly and technically difficult (as too many aligned openings can weaken the construction)

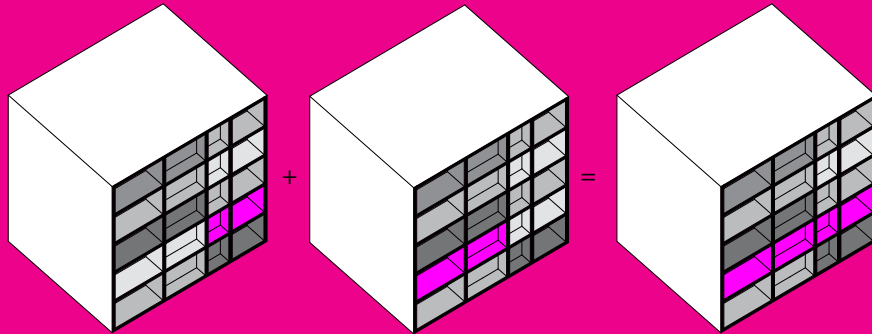
Implementation difficulty: medium



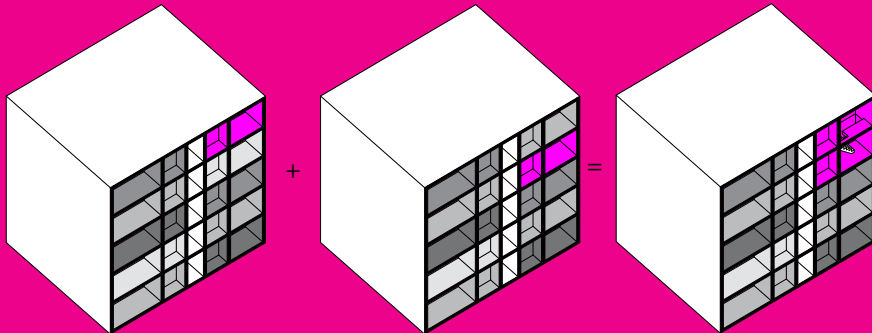
RE:VIVE YOUR DWELLING

# CREATING MORE SPACE

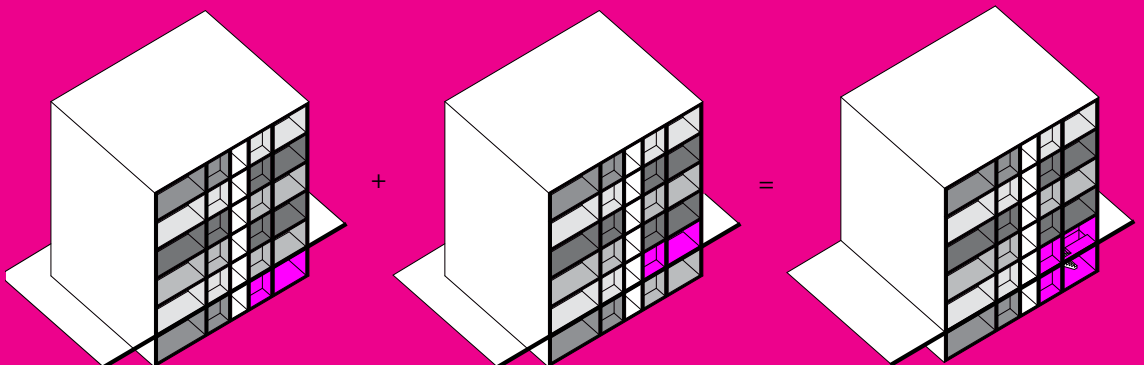
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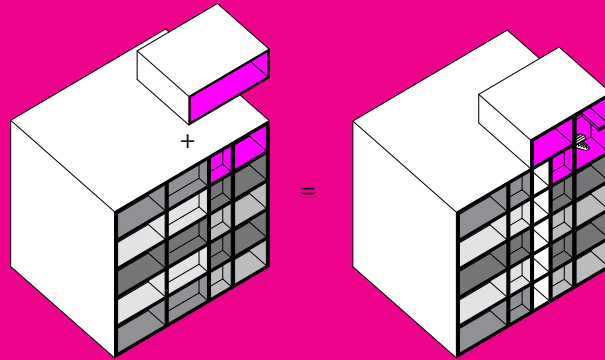
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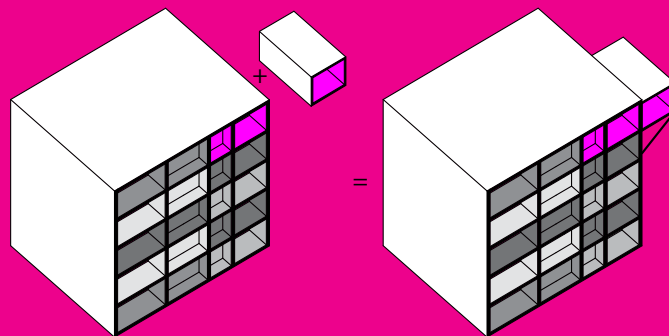
3



4



5



### 1. Horizontal merging

By combining two apartments on the same floor into one apartment a middle or big size dwelling can be created. In most cases this means that breaks need to be made through load bearing walls.

**Implementation difficulty:** medium

### 2. Vertical merging

By combining two apartments on different floors into one apartment a middle or big size dwelling can be created. A stairwell needs to be made through the concrete floorslabs to merge dwellings vertically.

**Implementation difficulty:** medium

**Note:** Interventions 2 will merge two apartments into one. This can help the diversification process of dwellings but when too many apartments merge it results in loss of too many dwellings. This is undesirable for the quantity of affordable housing, and to maintain the required density of inner-city locations. Therefore the merging of apartments needs to be strictly regulated.

### 3. Basement conversion

By combining an apartment and a (substandard) basement space into one apartment, a middle or big size dwelling can be created. A stairwell needs to be made through the concrete floorslabs to do a basement conversion

**Implementation difficulty:** medium

### 4. Rooftop conversion

By combining an apartment with a rooftop extension a middle or big size dwelling can be created. A stairwell needs to be made through the concrete roofslab to do a rooftop conversion.

**Note:** Interventions 1-4 require breaks through load bearing walls and slabs. As too many breaks can cause the construction to lose strength the merging of apartments needs to be strictly regulated.

### 5. Addition

By combining an apartment and (horizontal) addition into one apartment, a middle or big size dwelling can be created. In some cases existing doorways can be used to connect the addition with the original dwelling. In some cases the original non-loadbearing (concrete) facade panels need to be modified to make the connection and guarantee ample of light penetration. **Implementation difficulty:** medium

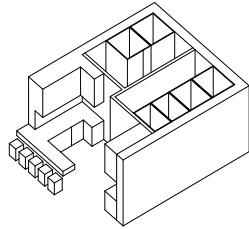
### 8.3.2 Rehabilitation of the communal grounds (tissue) and da yuan (carrier)

To rehabilitate the carrier (or support) the two-birds-one-stone toolboxes are to be used. To increase affordability part of the tools in this toolbox could be developed as well into standardised solutions and constructions systems. Standardisation of solutions (including mass production) would be

especially relevant on the tools applicable on the building scale. On the scale of the da yuan some solutions could be completely standardised, but many solutions need to be adapted, to some extent, to the restraints of the location. Therefore the standardisation of solutions in the da yuan could focus more on standardised construction system as opposed to the standardisation of products.

BUILDING + DA YUAN

## DA YUAN + BUILDING REHAB TOOLBOX SAFE AND MORE AFFORDABLE

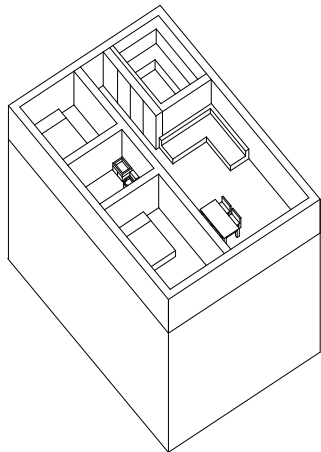


**Tool: Public toilets, kitchens, laundrettes blocks**

**Affordable benefit:** Guarantee the safety and hygiene of basementdwellers now.

**REHAB benefit:** Updating the communal corridor.

**Implementation difficulty:** Easy  
**REHAB ratio:** +



**Tool: Extra affordable housing**

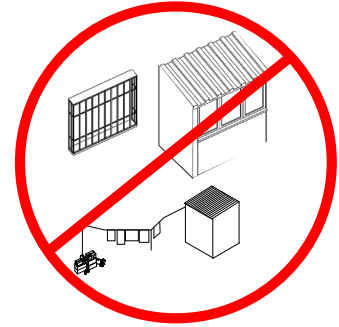
**Affordable benefit:** Relocating the basement and (illegal) sub-standard dwellings on site and offering extra affordable housing to alleviate the affordable housing shortage.

**REHAB benefit:** Adding new compensation dwellings catalyses further (re-) development.

**Implementation difficulty:** Easy  
**REHAB ratio:** +

BUILDING + DA YUAN

## DA YUAN + BUILDING REHAB TOOLBOX MODERNISING IMAGE



**Tool: Clutter + illegal and sub-standard additions removal**

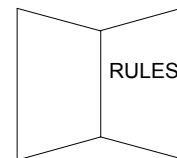
**Note:** Removed space should be compensated with tools (add formal storage, add covered (bike) parking, and add compensational affordable housing).

**Image benefit:** Tool battles the visual decay and consequential image of poverty.

**Safety benefit:** By removing clutter and illegal occupied spaces emergency exits will be accessible again.

**REHAB benefit:** Remedying the aesthetic, and functional decay of the building and da yuan.

**Implementation difficulty:** Very easy  
**REHAB ratio:** +



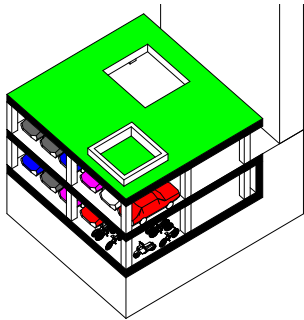
**Tool: Playrules on aesthetic quality and land-use**

**Image benefit:** Tool battles the visual decay and consequential image of poverty.

**REHAB benefit:** By implementing a set of rules the further visual, and functional decay of the building and da-yuan can be prevented.

**Implementation difficulty:** Easy  
**REHAB ratio:** +





**Tool: Adding and covering (and underground) car parking and (!) bike parking**

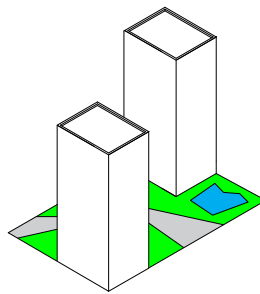
**Image benefit:** Tool battles the visual decay and consequential image of poverty by upgrading the da yuan and building.

**Green benefit:** If combined with tool greening, heat island effect can be remedied.

**REHAB benefit:** Remedying the aesthetic, and functional decay of the da yuan and communal corridor.

**Implementation difficulty:** (If covered) easy / (if underground) medium

**REHAB ratio:** ++



**Tool: Adding and covering (and underground) car parking and (!) bike parking**

**Image benefit:** Tool battles the visual decay and consequential image of poverty by upgrading the da yuan and building.

**REHAB benefit:** Remedying the aesthetic, and functional decay of the da yuan and communal corridor.

**Implementation difficulty:** (If covered) easy / (if underground) medium

**REHAB ratio:** ++



**Tool: Facade renewal**

**Note:** Should be applied to all the facades (and not just those facing the main infrastructure) to achieve rehab and green benefit.

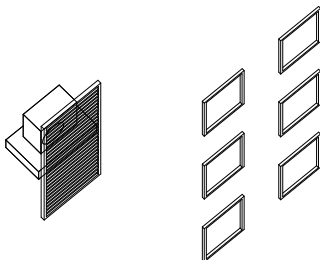
**Image benefit:** Upgrading the facade can give a modern image to the city.

**Green benefit:** If re-insulation, insulating glazing and/or double facades tools are applied for this tool, energy consumption can be reduced.

**REHAB benefit:** Remedying the aesthetic, and functional decay of the shell.

**Implementation difficulty:** Easy-medium

**REHAB ratio:** ++



**Tool: Unification of windows and airconditioning units**

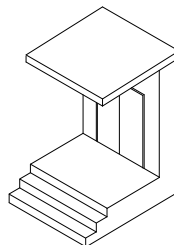
**Image benefit:** Tool battles the visual decay and consequential image of poverty by unifying (and covering) facade elements.

**REHAB benefit:** Remedying the aesthetic, and technical decay of the shell.

**Green benefit:** When double glazing is applied energy use can be reduced.

**Implementation difficulty:** Easy

**REHAB ratio:** +



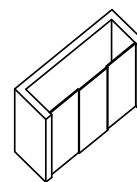
**Tool: (Impressive) entrance upgrade**

**Image benefit:** Tool upgrades the image of building by making a upgrading the entrance and making it more impressive.

**REHAB benefit:** Remedying the aesthetic, functional and technical decay of the entrance area.

**Implementation difficulty:** Easy

**REHAB ratio:** ++



**Tool: Adding formal storage space**

**Image benefit:** Tool upgrades the image of building by clearing da yuan and communal corridor of visually decay from clutter.

**REHAB benefit:** Remedying the aesthetic and functional decay of the da-yuan and communal corridor.

**Implementation difficulty:** Easy

**REHAB ratio:** +

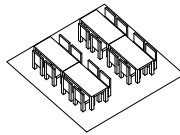
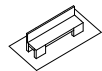
### 8.3.3 Two bird, one stone rehabilitation toolboxes

The toolboxes are named according to the secondary interest they aim to fulfill. In the description of each tool the secondary benefit will be described first, followed by the primary rehabilitation benefit. The description is followed by an indication of the implementation difficulty varying from very easy, easy, medium to hard. This indication depends on

the estimated costs, the conventionality of the technology, and the difficulty to realise the construction. This indication can help distinguish which tools would be best to use in which phase of the rehabilitation. So where in the fixed phase it would be more realistic to apply tools with the indication very easy and easy, later phases could offer more freedom to apply tools with difficulty level medium and hard. The tool description is concluded with the RE-

BUILDING + DA YUAN

## DA YUAN + BUILDING REHAB TOOLBOX PARTICIPATION + INTEGRATION



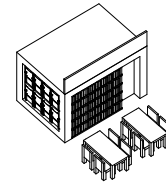
#### Tool: Small and larger scale communal areas

**Integration + participation benefit:** Adding small and larger sized communal areas such as benches or (pop-up) communal livingrooms helps residents to make connections to each other. In doing so it de-anonymise residents from each other and form attachments for their living environment, and so increase feeling of responsibility for it. Sense of community and responsibility will increase level of participation with the rehabilitation.

**REHAB benefit:** With the placement of small communal spaces the aesthetic, and functional decay of the da yuan and communal corridor can be remedied simultaneously.

**Implementation difficulty:** Very easy

**REHAB ratio:** +



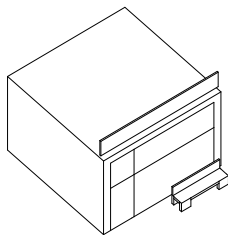
#### Tool: Pop-up community facilities

**Integration + participation benefit:** Adding small and sized pop-up communal facilities such pop-up or moving communal centres, libraries, kindergartens helps residents to make connections to each other, increase feeling of responsibility for their living environment, and so participation in rehabilitation.

**REHAB benefit:** With the placement the lack of community space and amenities in the da yuan and communal corridor can be remedied.

**Implementation difficulty:** Very easy

**REHAB ratio:** +



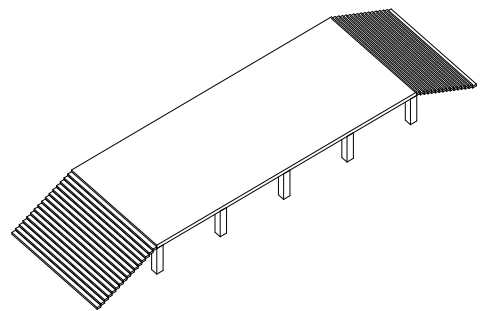
#### Tool: Community facilities

**Integration + participation benefit:** Adding small and larger sized communal facilities such as permanent communal centres helps residents to make connections to each other, increase feeling of responsibility for their living environment, and so participation in rehabilitation.

**REHAB benefit:** With the placement of small communal spaces the aesthetic, and functional decay of the da yuan and communal corridor can be remedied simultaneously.

**Implementation difficulty:** Easy

**REHAB ratio:** +



#### Tool: Deck for community space

**Integration + participation benefit:** By adding more square meters for community space in overcrowded da-yuans helps residents to make connections to each other, increase feeling of responsibility for their living environment, and so participation in rehabilitation.

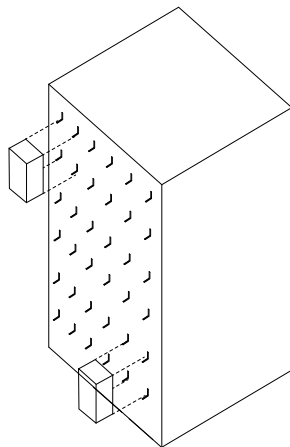
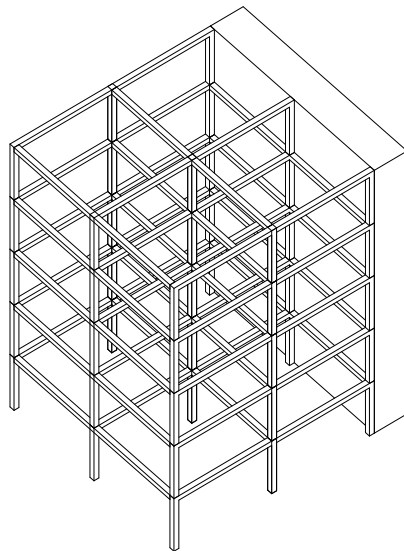
**REHAB benefit:** With the placement of the deck the aesthetic, and functional decay of the da yuan can be remedied.

**Green benefit:** In case of combination with the tool greening the heat island can be reduced.

**Implementation difficulty:** (If small) very easy/ larger (medium)

**REHAB ratio:** +

# DA YUAN + BUILDING REHAB TOOLBOX DWELLING DIVERSIFICATION



## Tool: Dwelling diversification and densification facilitator

**Dwelling diversification benefit:** By adding a super structure, or (capsule) extension attachment points residents (and other parties) can easily extend (and so diversify) their dwellings. It also offers space to add new dwellings to densify, and place compensational dwellings.

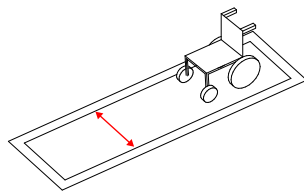
**Safety benefit:** with use of the megastructure compromised load bearing construction can be strengthened. Also a place for emergency stairs can be made in the new structure.

**REHAB benefit:** With the use of the tool the facade can be renewed simultaneously (either upgrading the existing or adding a new second facade at the end of the megastructure), with the use of the megastructure new infrastructure can be placed.

**Implementation difficulty:** (Depending on size) medium / hard

**REHAB ratio:** +





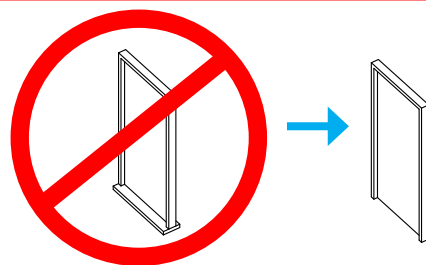
**Tool: Wheelchair and walker wide design**

**Elderly friendly benefit:** Making the dwelling easily accessible to the elderly by (re)designing with ample of width in the accessroute to accomodate wheelchairs and walkers. This allows elderly residents to remain self-sufficient longer.

**REHAB benefit:** Depending to which extend correction of the original design is needed. Most commonly clutter in corridors should be removed to make walkways more accessible, which helps remedying the aesthetic decay of the corridors.

**Implementation difficulty:** Easy / hard (depending on intervention)

**REHAB ratio:** + or N/A



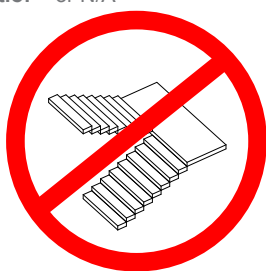
**Tool: Barrier free (re)construction**

**Elderly friendly benefit:** Making the dwelling easily accessible to the elderly by (re)modelling access ways to have no barriers such as thresholds.

**REHAB benefit:** With the remodel of all access routes new doors and floors placed will simultaneously remedy the aesthetic and technical decay of the da-yuan, entrance, circulation area and communal corridors.

**Implementation difficulty:** Easy / medium (depending on intervention)

**REHAB ratio:** +



**Tool: zero stairs high-rise**

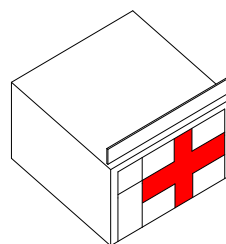
**Elderly friendly benefit:** Making the dwelling easily accessible to the elderly by (re)modeling accessways to have no stairs.

**Note:** Although most high-rises have elevator access some high-rises have only duplex dwellings these high-rises might be less suitable to apply elderly friendly tools.

**REHAB benefit:** When making accessways zero-steps they can simultaneously be upgraded.

**Implementation difficulty:** Easy / medium (depending on intervention)

**REHAB ratio:** +



**Tool: Communal home nurse**

**Elderly friendly benefit:** The communal home nurse facility helps elderly residents to be self sufficient longer.

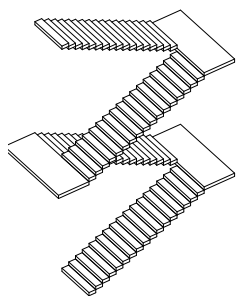
**Implementation difficulty:** Easy

**REHAB ratio:** +

HAB ratio. This rating ranging from a double plus, to plus, to plus minus, to minus, indicates the ratio to which the tool is beneficial to the rehabilitation in relation to the secondary benefit. The higher the REHAB ratio the more useful the tool is to directly help with the identified functional, aesthetic or technical challenges of the early high-rises. These tools should be preferred and allow more “financial compensation”.

The first toolbox is the safe and more affordable housing toolbox containing tools which aims to provide more safe affordable housing in the early high-rises. The tools of this toolbox firstly aim to improve the poor condition of the basement and sub-standard dwellings which are currently found. Secondly they aim to increase the amount of proper affordable housing to offer relocation dwellings residents of the sub-standard dwellings which need

BUILDING + DA YUAN  
**DA YUAN + BUILDING REHAB TOOLBOX**  
**SAFE HOUSING**



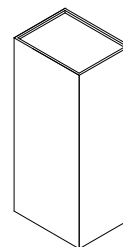
**Tool: (Accessible) emergency stairs**

**Safety benefit:** In many cases enough emergency stairs are present but renovating the stairs and making emergency exits accessible is necessary to guarantee safety of residents during an emergency. In some cases new stairs should be added.

**REHAB benefit:** The renovation of the staircases and access can help with remedying the aesthetic decay in the circulation areas.

**Implementation difficulty:** Easy / medium (depending on intervention)

**REHAB ratio:** +



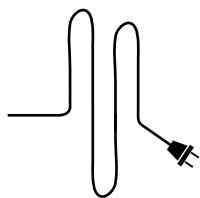
**Tool: Load-bearing construction renovation**

**Safety benefit:** The load-bearing construction should if necessary be renovated, to ensure it can reach and surpass their intended 50 year lifespan.

**REHAB benefit:** The renovation of the construction can offer a chance to aesthetically upgrade the load-bearing walls and elements. Or even catalyse further rehabilitation.

**Implementation difficulty:** Easy / medium / hard (depending on intervention)

**REHAB ratio:** +/- or +



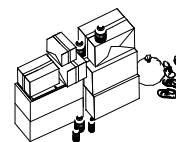
**Tool: Unsafe infrastructure renewal**

**Safety benefit:** By renewing unsafe electrical wiring and outdated piping the safety of residents can be guaranteed.

**REHAB benefit:** The renovation of the electrical wiring can offer a chance to aesthetically upgrade the da yuan and shell. The renovation of the infrastructure offers possibilities to simultaneously enlarge capacity of the infrastructure to remedy the functional decay of the infrastructure.

**Implementation difficulty:** Easy / medium (depending on scale of the intervention)

**REHAB ratio:** +



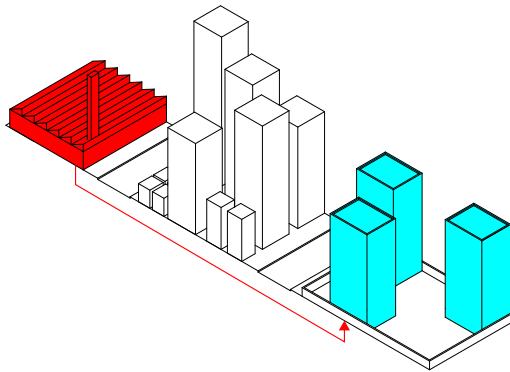
**Tool: Redesigning garbage disposal**

**Safety benefit:** Garbage can now be found in small mountains at poorly designed and undercapacitated disposal areas. Redesigning disposal areas (with larger and / or underground containers) makes the da yuan and buildings more hygienic and so safe.

**REHAB benefit:** The redesign of disposal areas can simultaneously help with the aesthetic upgrade of the da yuan and building.

**Implementation difficulty:** Easy

**REHAB ratio:** +



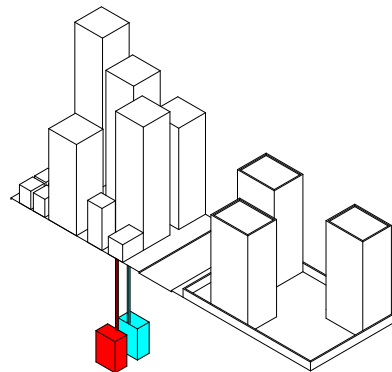
**Tool: Use of sur-plus industrial warmth**

**Green benefit:** Reducing energy consumption by reusing the sur-plus heat of industry.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Hard

**REHAB ratio:** -



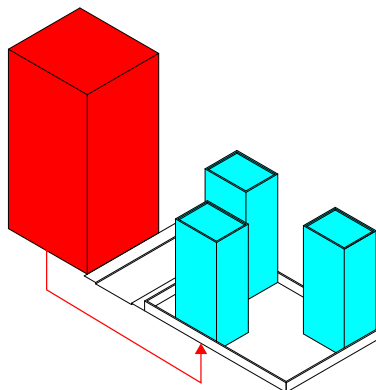
**Tool: Aquifer thermal energy storage**

**Green benefit:** Reducing energy consumption by warmth/cold storage and recovery from storage in the aquifer. Storage in the aquifer is very efficient but needs to be applied on a bigger scale (neighbourhood).

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Hard

**REHAB ratio:** -



**Tool: Usage of sur-plus warmth from offices**

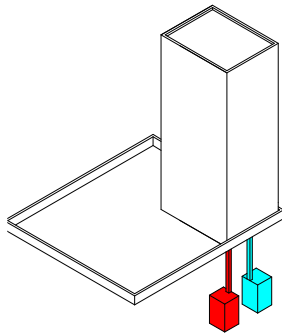
**Green benefit:** Reducing energy consumption by reusing the sur-plus heat of (neighbouring) offices.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Medium

**REHAB ratio:** -



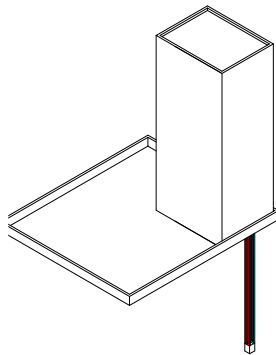


**Tool: Surface thermal heat storage**

**Green benefit:** Reducing energy consumption by warmth/cold storage and recovery from heat storage in a surface ground layer. This variant of heat storage can be applied on a smaller scale than aquifer storage.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Hard  
**REHAB ratio:** -

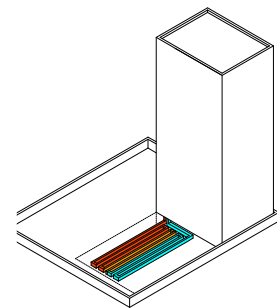


**Tool: Borehole thermal energy storage**

**Green benefit:** Reducing energy consumption by warmth/cold storage and recovery from heat storage in a surface ground layer. This variant of heat storage can be applied on a smaller scale than aquifer storage.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Hard  
**REHAB ratio:** -

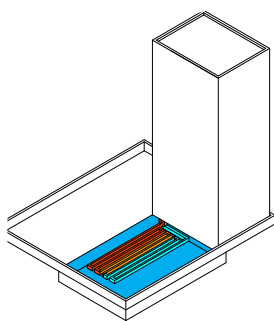


**Tool: horizontal heat exchanger**

**Green benefit:** Reducing energy consumption by warmth/cold recovery from a horizontal surface heat-exchanger. This tool can be applied on a building scale.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Easy  
**REHAB ratio:** -

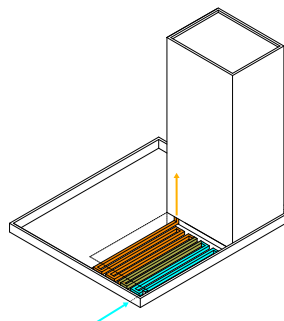


**Tool: horizontal heat exchanger in waterbody**

**Green benefit:** Reducing energy consumption by warmth/cold recovery from a horizontal surface heat-exchanger in a waterbody. This tool can be applied on a building scale.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Upgrading the da-yuan with new water-body.  
**Implementation difficulty:** Easy  
**REHAB ratio:** ++

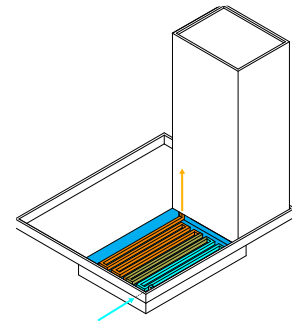


**Tool: Pre-heating and cooling ventilation air**

**Green benefit:** Reducing energy consumption by preheating and precooling ventilation air. This tool can be applied on a building scale.

**Note:** A central ventilation system is needed.

**Implementation difficulty:** Easy  
**REHAB ratio:** -



**Tool: Pre-heating and cooling ventilation air through an (existing) water body**

**Green benefit:** Reducing energy consumption by preheating and precooling ventilation air. This tool can be applied on a building scale.

**Note:** A central ventilation system is needed.

**Implementation difficulty:** Easy  
**REHAB ratio:** -

to be removed in the longer term, as well as help alleviate the lack of affordable housing before the new affordable housing policy can solve the lack of affordable housing on a larger scale.

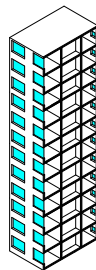
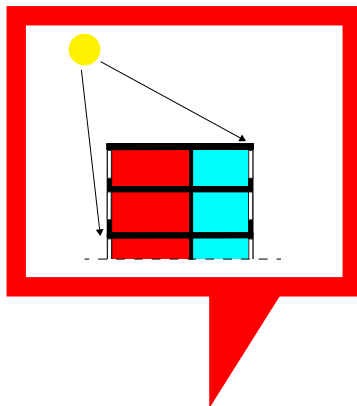
The second toolbox: Modernising the image of Beijing offers tools that help improve the image of Beijing as a modern metropolis as well as rehabilitation. The tools are targeted on improving the aesthetic quality of the da-yuan, shell, entrance and

communal corridor. These kind of interventions are not completely new. When important events took place many of the high-rises in view would receive cosmetic upgrades to improve the image of the city. However most of the time these upgrades were purely cosmetic, and only applied on the part of the façade which was visible to the city, doing nothing to actually remedy the decay of the whole building. To offer a real tool to improve the image of Beijing

BUILDING + DA YUAN

## GREEN REHAB TOOLBOX

### PASSIVE ENERGY REDUCTION



#### **Tool: Facade opening orientation**

**Green benefit:** Reducing heat load by placing big windows on the south facade and small windows on the north facade.

**Note:** Use with tools overhang/shutters to reduce cooling load.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Upgrading windows (and parts of the shell).

**Implementation difficulty:** Easy

**REHAB ratio:** +



#### **Tool: Dwelling lay-out (re)orientation**

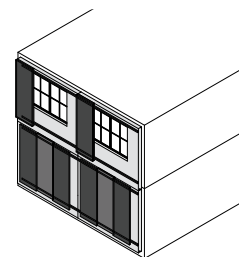
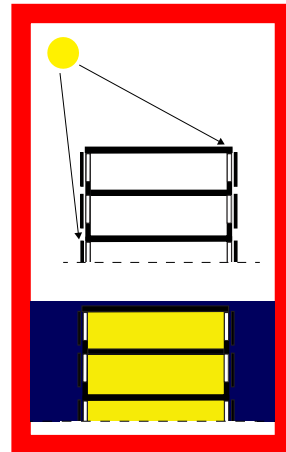
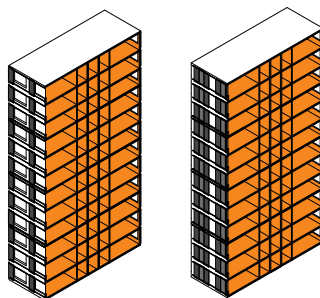
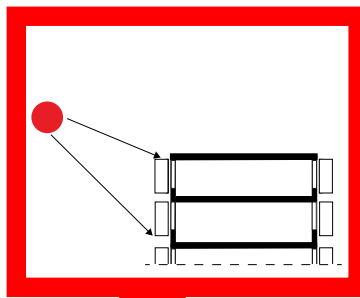
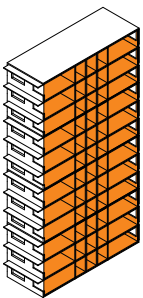
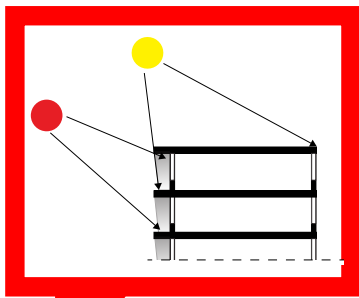
**Green benefit:** Reducing heat load by placing living-rooms on the south and bedrooms / kitchens on the north.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Updating the current unpractical lay-out to match current demand.

**Implementation difficulty:** Easy

**REHAB ratio:** ++



**Tool: Solar overhang**

**Green benefit:** Reducing cooling load by placing overhangs which shield windows from direct sun in summer, but allow the sun to heat the rooms in winter.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Simultaneously upgrading parts of the shell.

**Implementation difficulty:** Easy

**REHAB ratio:** +/-

**Tool: Shutters**

**Green benefit:** Reducing heat and cooling load by placing shutters which can block the sun when the dwelling becomes overheated from sunlight, or keep the warmth during night.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Visually upgrading big parts of the shell.

**Implementation difficulty:** Easy

**REHAB ratio:** ++

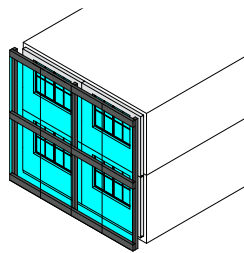
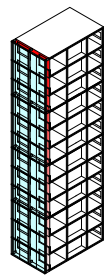
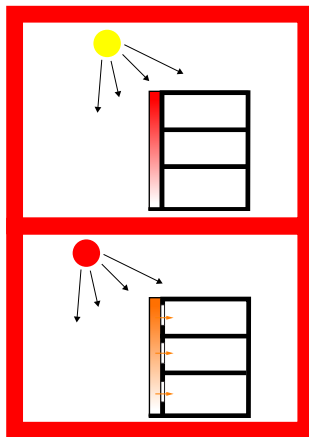
and rehabilitate the early high-rises the tools in this toolbox are not of a cosmetic nature and should be applied to the entire building element (not just the one in main view).

The third toolbox is the participation and integration toolbox which offers physical tools to assist the social-spatial integration of residents by offering meeting places. The intention is to ensure residents to form attachments and so a degree of responsibility to their living environment. A greater

BUILDING + DA YUAN

# GREEN REHAB TOOLBOX

## PASSIVE ENERGY REDUCTION



### Tool: Double facade

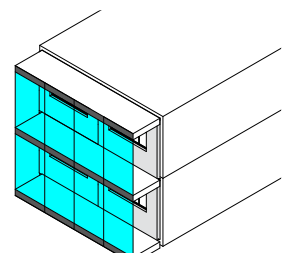
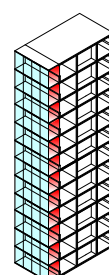
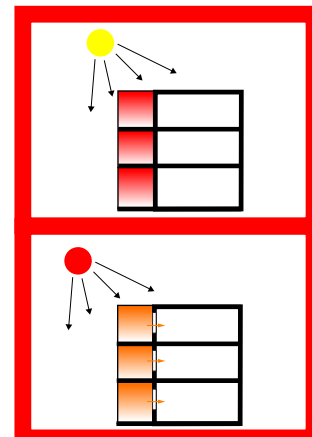
**Green benefit:** Reducing heat and cooling load by placing a double facade. In winter the second (glass) facade will generate heat which can then be distributed to the living spaces. In summer the heat can be extracted before reaching living spaces.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Imago benefit:** Creates a new impressive shell  
**REHAB Benefit:** Creates a new shell with high thermal performance.

**Implementation difficulty:** Easy/medium

**REHAB ratio:** ++



### Tool: Winter garden

**Green benefit:** Reducing heat and cooling load by placing a thick double facade with extra living space. In winter the second (glass) facade will generate heat through sunlight, which can then be distributed to the existing living spaces. It also creates a buffer to outside. In summer the facade could be opened to prevent the rooms from heating up.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

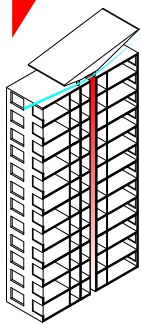
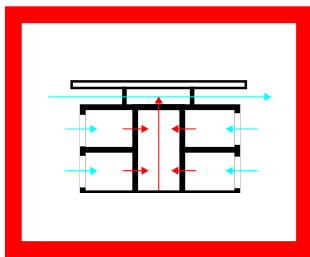
**Imago benefit:** Creates a new impressive shell.

**REHAB Benefit:** Creates a new shell with high thermal performance and can help create larger dwellings.

**Implementation difficulty:** Easy

**REHAB ratio:** ++





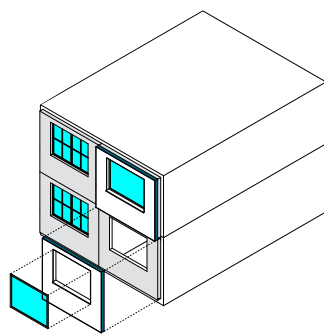
**Tool: Venturi wing**

**Green benefit:** Reducing cooling by using natural ventilation stimulated by the venturi effect.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Implementation difficulty:** Easy

**REHAB ratio:** +/-



**Tool: Re-Insulation and draft proof detailing**

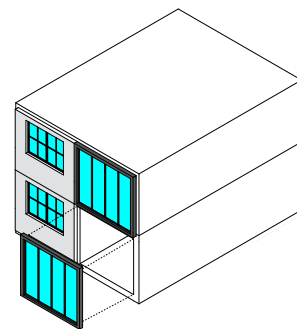
**Green benefit:** Reducing heat and cooling loads (and so energy consumption) by better insulating the shell (with new double or triple glazed windows, insulation and draft proof details).

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**REHAB benefit:** Allows for a complete upgrade of the facade.

**Implementation difficulty:** Easy

**REHAB ratio:** ++



**Tool: New insulated facade**

**Green benefit:** Reducing heat and cooling loads (and so energy consumption) by replacing the old facade with new well insulated (with new double or triple glazed windows, insulation and draft proof details) facade panels

**Financial benefit:** Creates financial room with residents due to lower energy bills

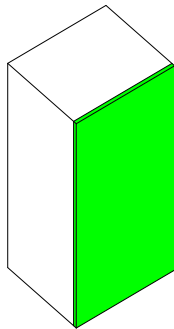
**REHAB benefit:** Allows for a complete upgrade of the facade

**Implementation difficulty:** Easy

**REHAB ratio:** ++

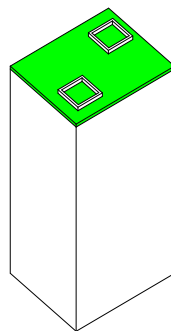
Sense of community and responsibility will increase the level of participation with the rehabilitation.

The elderly friendly toolbox contains tools to make the early high-rises elderly friendly. As concluded in the high-rise typology analysis not all high-rise typologies are suitable to apply these tools on. Typologies with duplex dwellings or (slab) typologies where residents have to use staircases to reach their front door, are not suitable. Furthermore the tools suggested alone do not make the



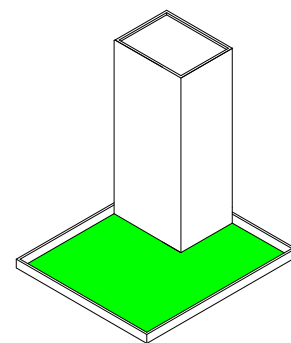
**Tool: Green facade**

**Green benefit:** Reducing heat island effect through evapotranspiration  
**(Extra) image benefit:** Improving the image by adding visible green  
**REHAB benefit:** Upgrading the da-yuan and shell with plants  
**Implementation difficulty:** Easy (Fixed)  
**REHAB ratio:** ++



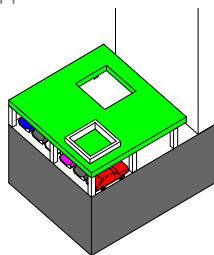
**Tool: Green roof**

**Green benefit:** Reducing heat island effect through evapotranspiration  
**REHAB benefit:** Upgrading by adding more quality community space  
**Implementation difficulty:** Easy (Fixed)  
**REHAB ratio:** ++



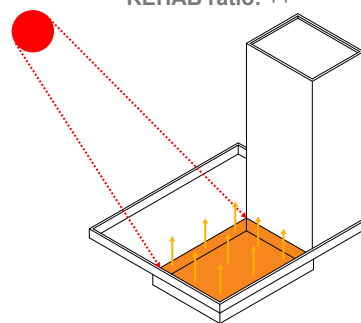
**Tool: Greening the da yuan**

**Green benefit:** Reducing heat island effect through evapotranspiration  
**REHAB benefit:** Upgrading the da yuan by adding more quality community space  
**Implementation difficulty:** Easy (Fixed)  
**REHAB ratio:** ++



**Tool: Reducing heat through evapotranspiration**

**Green benefit:** Adding green surface (facade, roof, park)  
**Implementation difficulty:** (small platf.) easy / (large platf.) medium  
**REHAB ratio:** ++  
**REHAB Benefit:** Upgrading the da-yuan with quality community space whilst increasing/maintaining parking



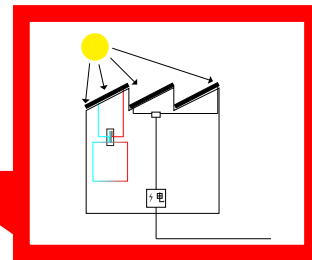
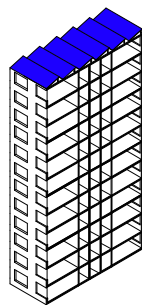
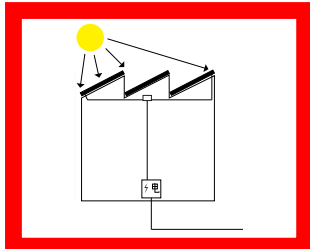
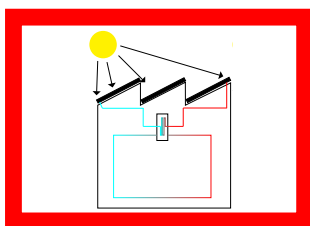
**Tool: Heat accumulation pond**

**Green benefit:** Reducing heat island effect through water evaporation Adding a water body  
**Implementation difficulty:** Easy (Fixed)  
**REHAB ratio:** ++  
**REHAB benefit:** Upgrading the da-yuan with water body

**BUILDING + DA YUAN**

**GREEN REHAB TOOLBOX**

**HEAT ISLAND + POLLUTION REDUCTION**



**Tool: Solar cells, Solar thermal collectors, energy roof**

**Green benefit:** Reducing energy consumption by producing electricity and, or heat with solar cells (PV), solar thermal collectors or an (combined) energyroof.

**Financial benefit:** Creates financial room with residents due to lower energy bills.

**Image benefit:** Give an impression of sustainability.

**Implementation difficulty:** Easy

**REHAB ratio:** -

**BUILDING + DA YUAN**

**GREEN REHAB TOOLBOX**

**ACTIVE ENERGY REDUCTION**

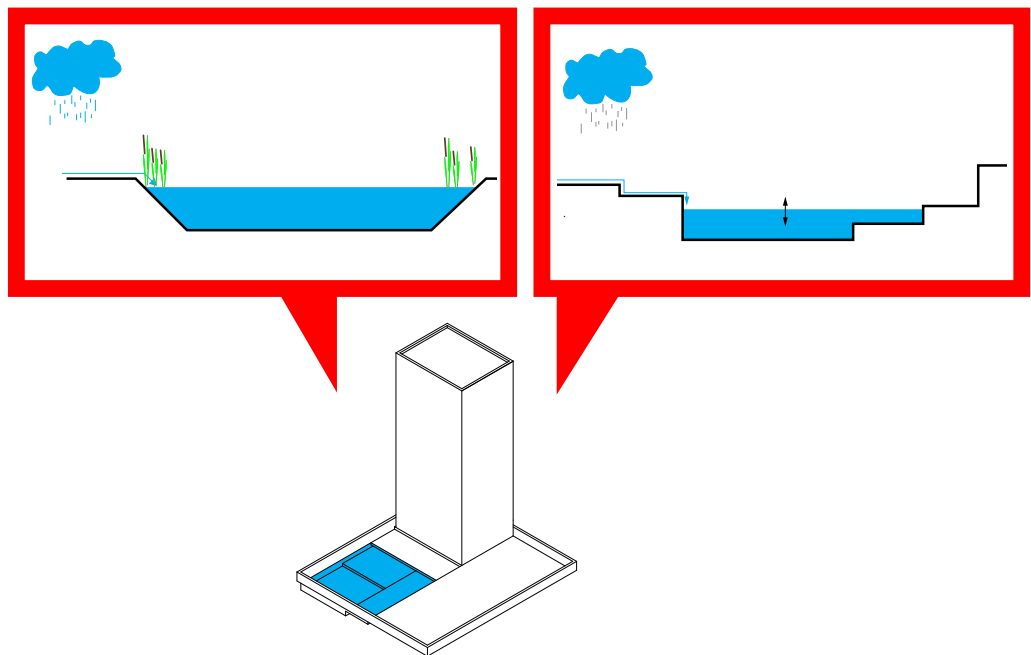
early high-rises elderly friendly as the dwellings will need to be made elderly friendly by residents in a bottom-up manner.

The safe housing toolbox is in fact one of the most important toolboxes. The tools aim to (re) make the early high-rises: constructional safe, safe during emergencies, hygienically safe, so all in all into a safe living environment. If after analysis one of the tools proves a necessity the tool is to be applied rather than be seen as an optional tool.

The final toolbox is the green toolbox. This extensive toolbox suggests rehabilitation tools which also make the early high-rises and so the city a more sustainable living environment. The tools are subdivided in the categories, active energy reduction, passive energy reduction, material (energy) reduction, heat island + pollution reduction, water storage + use reduction, active energy reduction.

BUILDING + DA YUAN

## GREEN REHAB TOOLBOX WATER STORAGE + USE REDUCTION



### **Tool: Rain water storage in exterior waterbodies**

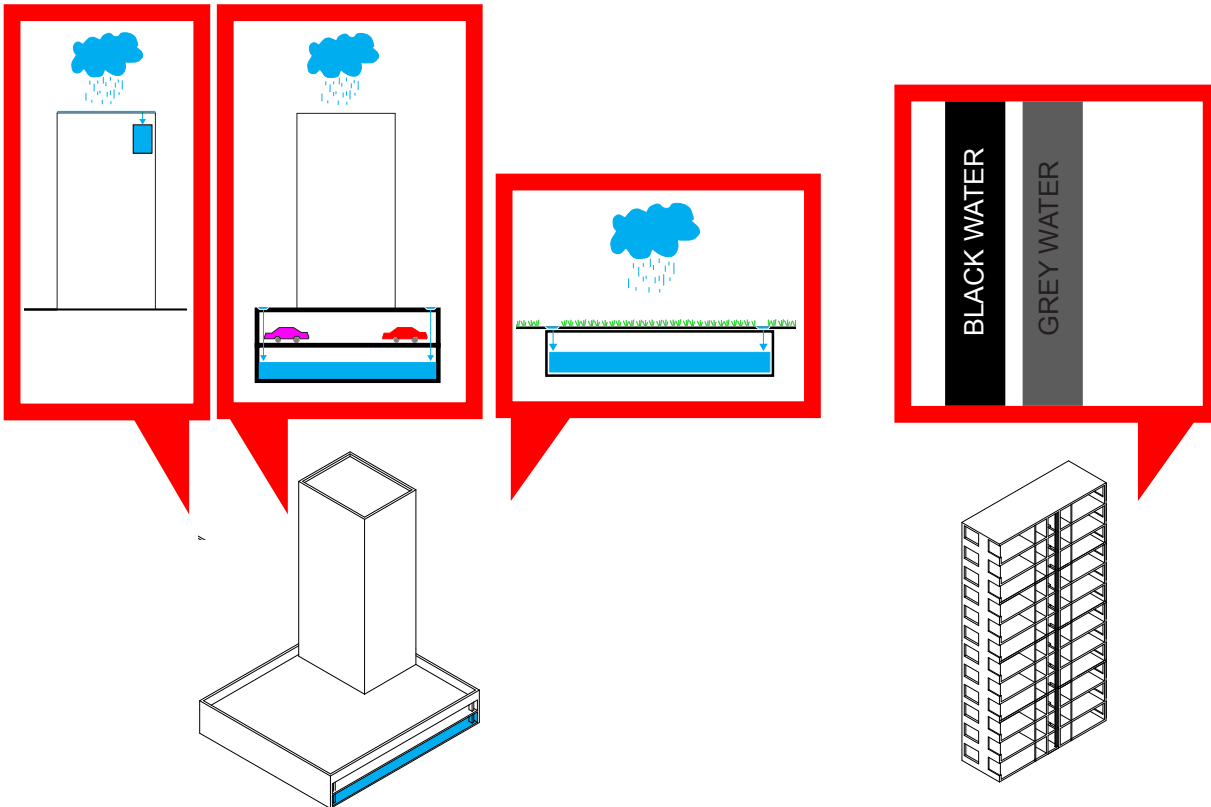
**Green benefit:** Alleviating pressure on the drainage systems during heavy precipitation and if combined with purification tools and introduction of a grey water system could also reduce the overall wateruse.

**REHAB benefit:** Upgrading the da-yuan with new water-bodies (ponds, watersquares).

**Implementation difficulty:** Easy (Fixed)

**REHAB ratio:** ++





**Tool: Rain and grey water storage in covered storage (tanks)**

**Green benefit:** Alleviating pressure on the drainage systems during heavy precipitation and when combined with purification tools and introduction of a grey water system could also reduce the overall wateruse.

**REHAB benefit:** When storage is introduced under the da-yuan, or combined with an underground parking the da-yuan above will need to be renovated simultaneously.

**Implementation difficulty:** (Small tank) easy / (large underground storage (medium))

**REHAB ratio:** ++

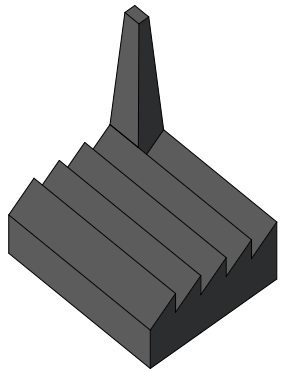
**Tool: Separation grey and black water**

**Green benefit:** Reducing the wateruse by reuse of grey water.

**REHAB benefit:** Introducing the grey water system means an update of the outdated infrastructure and solving the undercapacity of current infrastructure.

**Implementation difficulty:** Easy (Fixed)

**REHAB ratio:** +



**1. OFF SITE INDUSTRIAL PRODUCTION OF CUSTOM TISSUE + CARRIER TOOLBOX COMPONENTS**



**2. ON SITE (MASS) PRODUCTION OF CUSTOMISED STANDARD TISSUE + CARRIER TOOLS + CUSTOMISED STANDARD INFILL PRODUCTS**



**ONLINE HOME ORDER**



**FREE USE OF WORKSHOP FOR HIGH-RISE RESIDENTS**



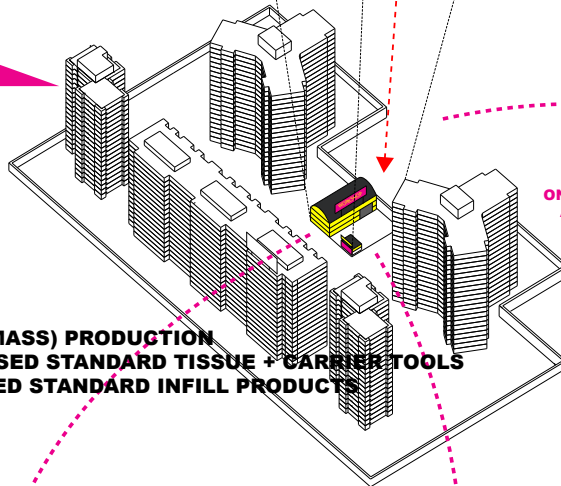
**LOCAL RE:VIVE CONSTRUCTION WORKERS**



**LOCAL RE:VIVE COACH**  
HERE TO HELP + GUIDE + CONTROL

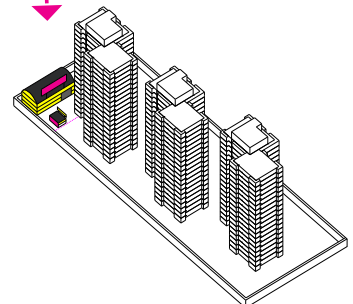
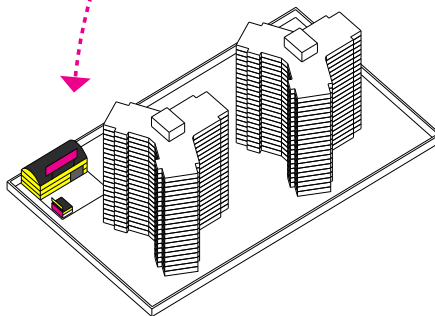


**DISTRIBUTION THROUGH RE:VIVE CATALOGUE**



**ON SITE WORKSHOP AS EXPERIMENT**

**SCENARIO 1 MAINSTREAMING THE EXPERIMENT**  
Towards a local mass-production



### 8.3.4 The industry of the tissue, carrier and infill production + construction

To increase the feasibility of the rehabilitation it would be most reasonable to use industrialised construction methods, and mass production to solve the challenge which on its own was a result of mass production. Not only can the industrialisation of the physical solutions reduce the cost of the rehabilitation, it can make the rehabilitation more accessible and easier to stakeholders. Therefore a rehabilitation industry model is proposed (see figure 8.6):

Tools proposed in the toolboxes for the tissue and carrier which require completely custom construction of parts, which are large and/or difficult (in process or material) to produce will need to be industrially produced off site. Proposed is that as part of the rehabilitation process a (state owned) factory will be used to produce these tools to guarantee affordability.

Tools for the tissue and carrier which are suitable for (customised) mass production, and the customised standard infill systems will be produced

elsewhere. When rehabilitation is just commencing a local, small scaled, mass production industry is proposed. On site a workshop and RE:vive coach will be placed. The RE:vive coach could be incorporated in the shequ organisations, or located in a separate bureau on site. As a coach they form the link between rehabilitation policies and people. They can advise on infill changes, guide resident representation in the rehabilitation process of the carrier and tissue, and will regulate the rehabilitation changes made on infill scale. In the workshop local residents will be hired and trained to produce the suitable tissue and carrier products, and the infill products. Residents can use their RE:vive catalogue, and the RE:vive website to order a product in their workshop. Interior applied infill products will then be delivered in flat pack to their door. These products can be self-constructed with a construction manual and smart (dismountable) connections, or (for a small fee) by the RE:vive workshop employees. Exterior applied infill products will be required, for safety reasons, to be assembled by the RE:vive employees. For the assembly they can

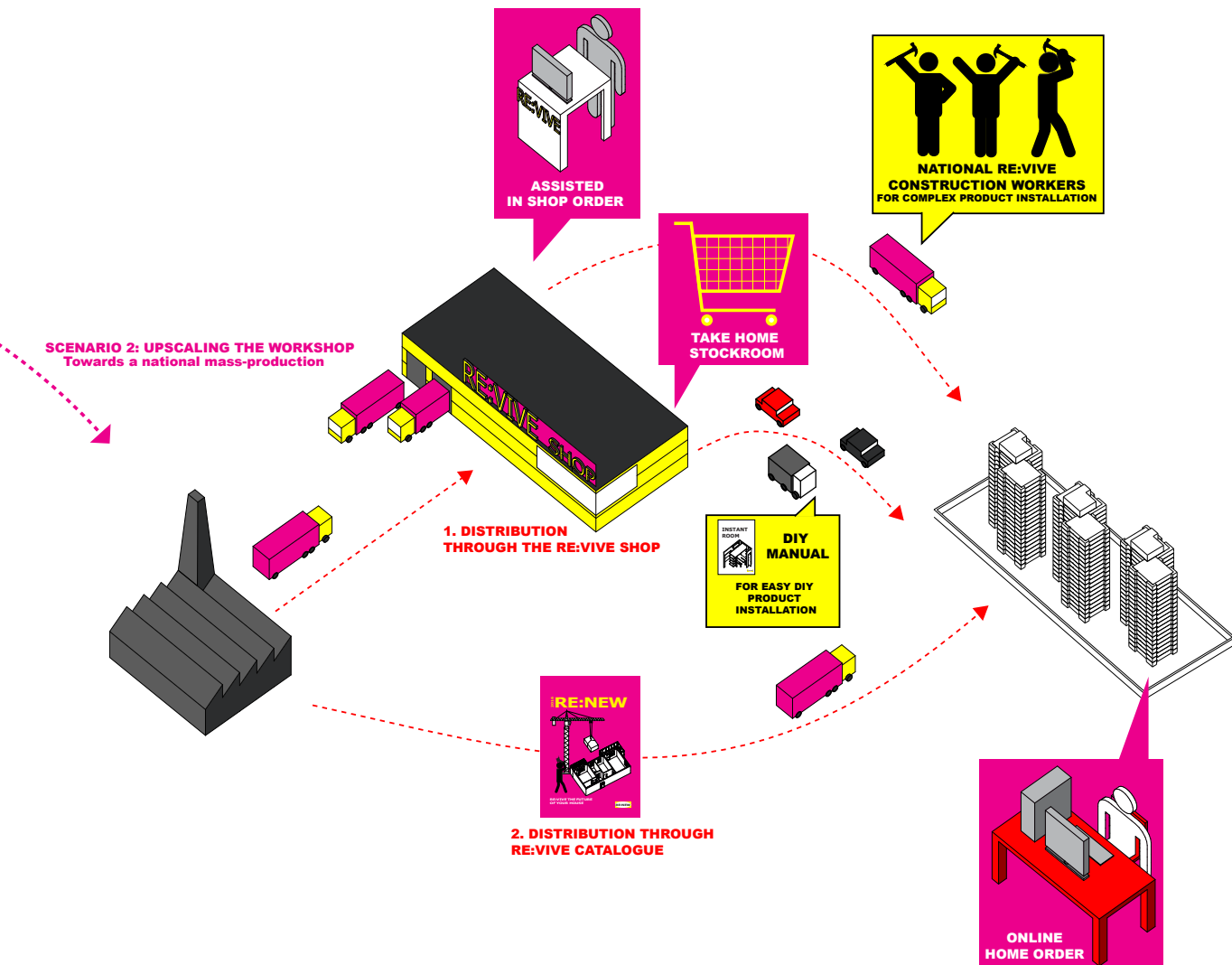


Figure 8.6: Rehabilitation industry model

make use of the RE:vive areal platform and rooftop cranes present on the carrier.

Several scenarios have been developed for the industry to develop from there. Firstly the on site experiment can be mainstreamed to other sites, to develop a local mass production. The second scenario is that the experiment can be up-scaled to a national mass production level. The prior scenario ensures that the rehabilitation can continue to spread with less need for large scale investments. The latter requires interest from a market party/investor to further develop the industry, but could further increase the quality and technological intelligence, availability and affordability of infill solutions (in later phases of the rehabilitation). The up-scaled mass production industry can be formed following the popular IKEA concept which manages to achieve the aforementioned goals in their industry of home furniture. Online or in a nearest RE:vive store a customised infill solution can be ordered for attractive prices. Smaller infill solutions are already available as a flat-pack in the stockroom and can be taken home immediately. Larger solutions can be ordered to be delivered in flat-pack to their home. With a construction manual and smart (dismountable) connections the RE:vive products can be self-constructed in the comfort of a residents home. If a product is too large to take home, it can be delivered. With the delivery a RE:vive handyman can (and with some products, needs to) be ordered to ensure proper installation of the product.

In both scenarios the RE:vive workshop or shop will function as a (regulated) for profit business. The business model should be for profit to guarantee continuous innovation. Innovation of products and services responding to continuously changing demand can help stimulate the continuous updating of dwellings. However the RE:vive company (as well as the workshops) will be regulated to ensure a balance between profit motives and product sustainability and affordability. The products should al-

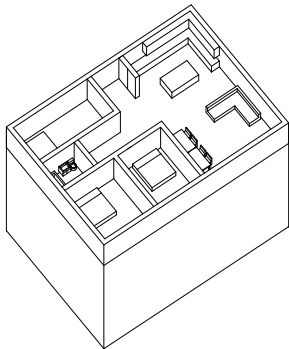
ways be available to the lower economic strata by offering as low as possible prices. Even low pricing might not be enough to ensure product availability for all residents. Therefore if residents cannot afford the prices of pre-made infill products, they are allowed to use the workshop (under supervision) to produce the infill solution themselves in the workshop model. In the second scenario the company could be required to also make full construction manuals available which allows residents to use their own materials to construct some of the products themselves. Furthermore to make products available to temporary residents, products should be (as much as possible) demountable to ensure a high resale value and to increase the durability.

In a final scenario the two models of mainstreaming and up-scaling exist parallel to each other. Imaginable might be that the workshop then focusses more on site specific products or adapting standard products from the RE:vive shop to site specific context.

#### **8.4 Financial model of the strategy**

The base of the financial model (see images 8.7-8.8) is the diversification of the investment. This diversification is proposed to increase the possibility to find enough investment to rehabilitate. The diversification firstly follows the separation of influence sphere in the dwelling and the building/da yuan. Public parties, assisted by the non-profit redevelopment companies as executor, will take the main (financial) responsibility for the rehabilitation on the scale of the da yuan. As suggested by Hui (2012) the public parties will gather initial investment funds from long term public loans, applicable subsidies. Also to facilitate the development of more affordable housing (on plot) as part of the rehabilitation they will need to exempt these developments from land-lease fees and reduce taxes. Residents have the financial responsibility to rehabilitate their own dwelling.





**Financial compensation tool: high-end housing development**

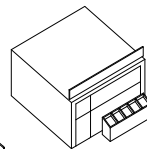
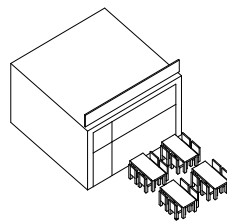
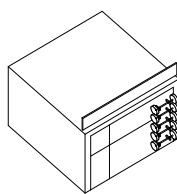
**Social integration benefit:** By adding more high-end housing, higher social strata can be attracted.

**Note:** Image benefit: Note that the amount of high-end development should be controlled to prevent gentrification and the lack of affordable housing development.

**REHAB benefit:** adding new compensation dwellings catalyses further (re-)development.

**Implementation difficulty:** easy

**REHAB ratio:** -



**Financial compensation tool: Commercial space**

**Note:** With the development of commercial spaces the amount and balance between high-end, low-end, small-scale, bigger-scale and functions (stores, amenities, restaurants) should be controlled.

**REHAB benefit:** The lack of amenities and facilities on the da-yuan can be remedied to make the early high-rises a more attractive home.

**Implementation difficulty:** easy

**REHAB ratio:** +

**BUILDING + DA YUAN**

**COMPENSATION TOOLBOX**  
**HIGH-END + COMMERCIAL**

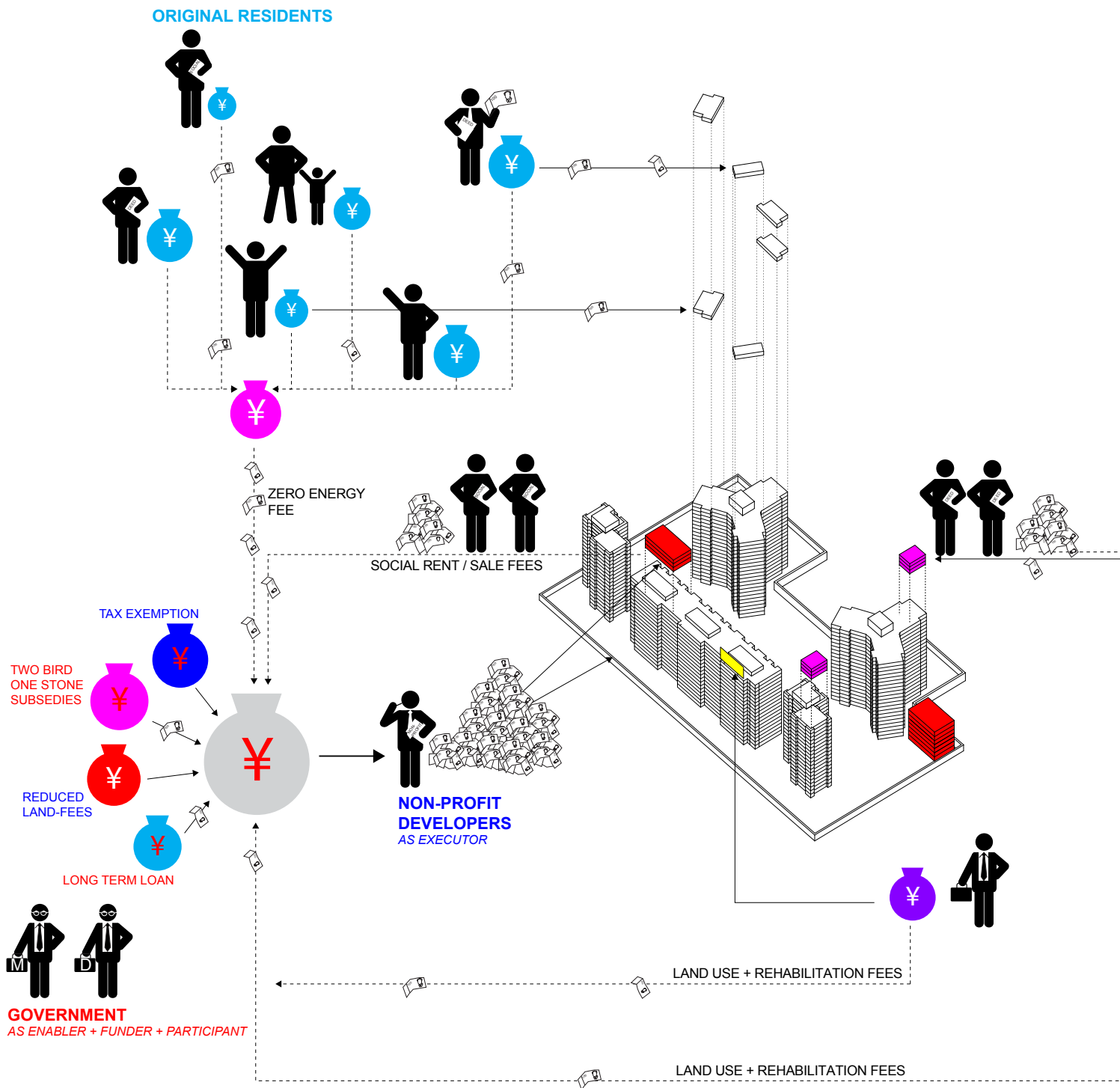


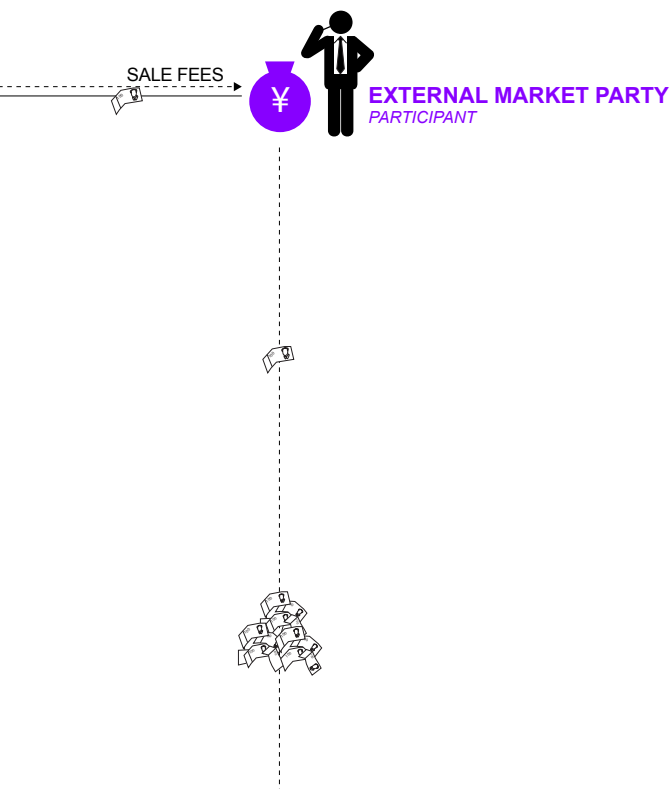
Figure 8.7: Financial model of the rehabilitation strategy: early phases

#### 8.4.1 Finding more investment possibilities with different stakeholders.

To ensure that the unprofitable rehabilitation (including the development of unprofitable affordable housing) becomes feasible, existing stakeholders will need to be enthused, and more stakeholders will be invited to reduce the investment needed from the existing stakeholders.

To interest, enthuse the existing and new stakeholders to invest in the rehabilitation a merger of interest is striven for. The merger of interest aims to combine interests of stakeholders within the rehabilitation to create a win-win situation. To create this merger of interest several tools will be used:

1. The two-bird-one-stone approach, proposing physical rehabilitation interventions which simultaneously fulfill a secondary interest of a stakeholder, has already been explained in the former paragraph.
2. A self-financing investment model proposes interventions which pays back their own investment. One example of a self-financing model is the application of energy reducing (or producing) interventions. When these interventions are placed the lowered energy costs can pay for the intervention. As these interventions need to be made on the building level the financing will need to come from public funds, and will be paid back through the difference of the energy bill by residents.
3. Compensational toolbox (see page 195): This toolbox offers business cases for private and for profit developers, and external market parties. An example of such a business case is that these parties will be allowed to develop commercial housing, retail space, commercial areas, or even billboards on the highly valuable excess FAR in the early



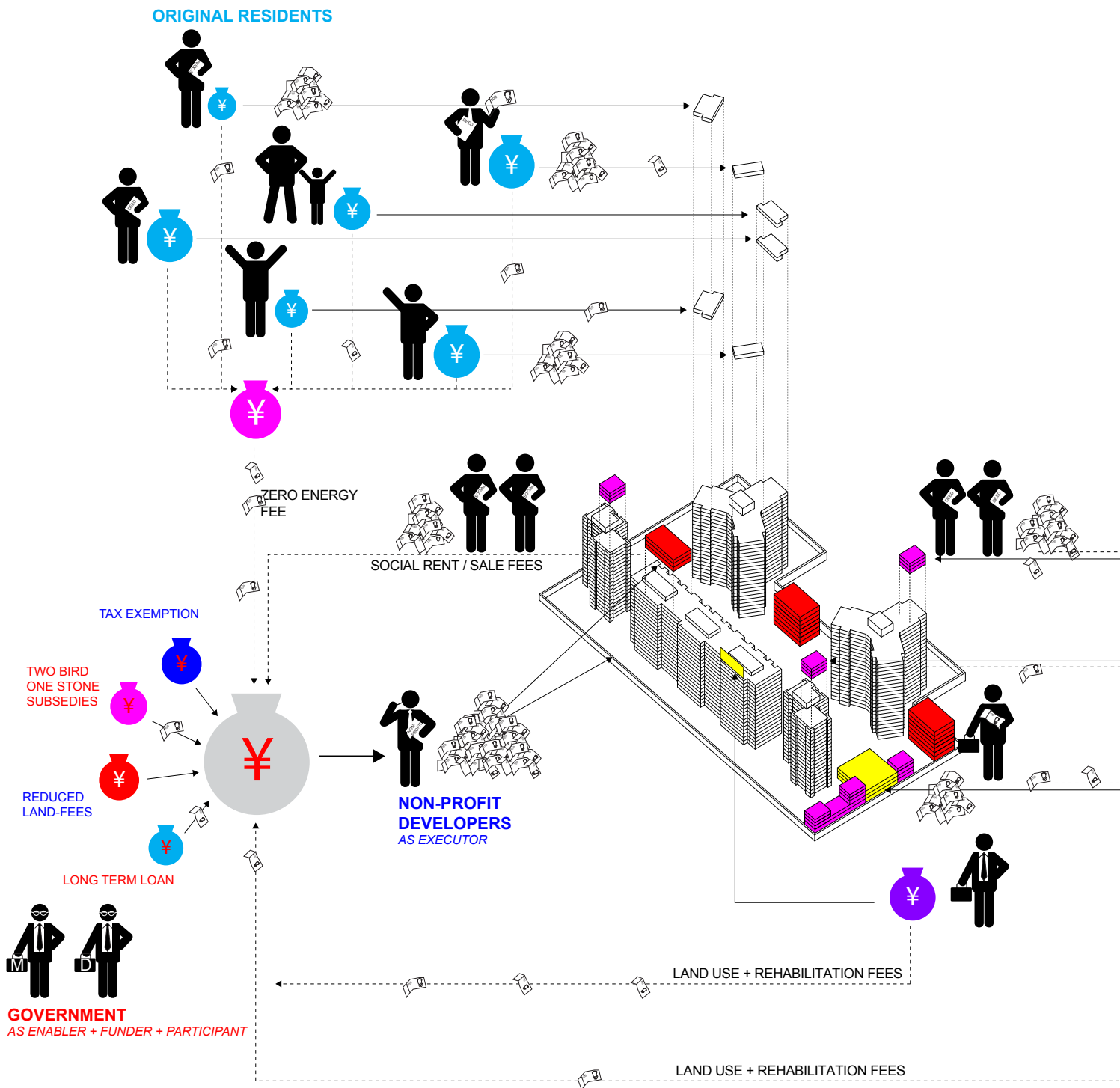


Figure 8.8: Financial model of the rehabilitation strategy: later phases



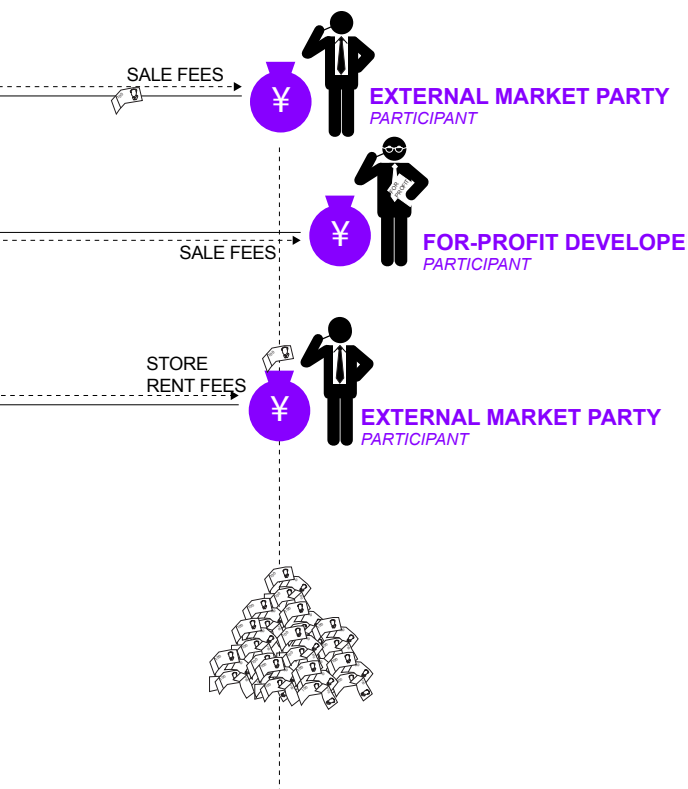
high-rises if they agree to pay a rehabilitation fee. Note that it is unlikely that many new stakeholders can be attracted in the first phase of rehabilitation. Therefore the financial model will need to be catalysed. In the earlier phases the investment by public parties will need to be larger, in later phases the top-down investments can be supported more and more by private parties.

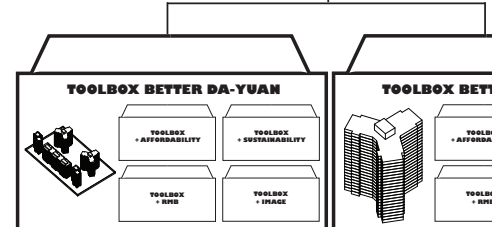
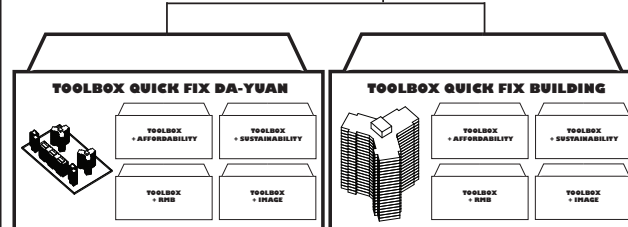
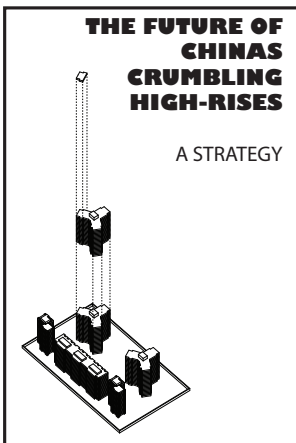
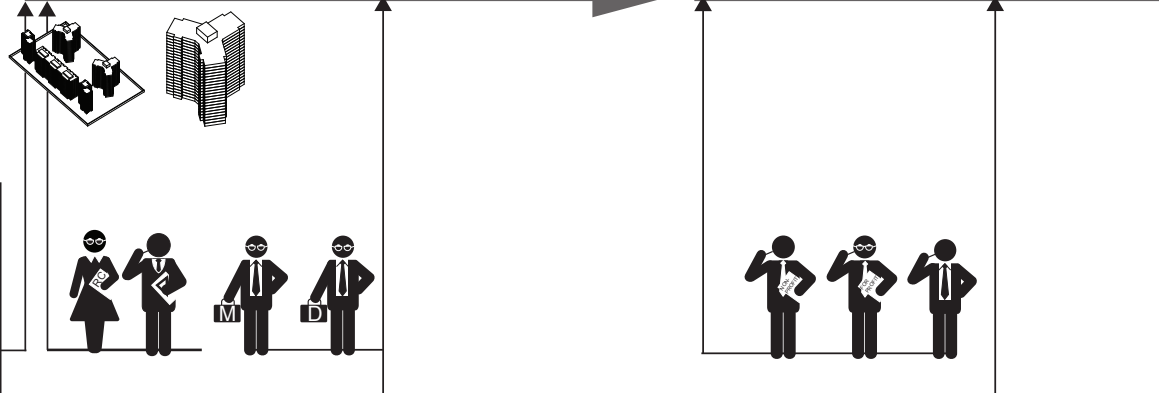
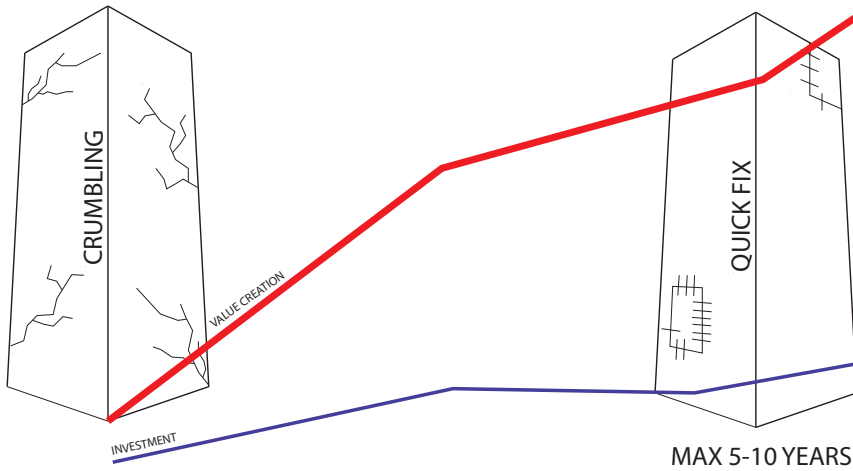
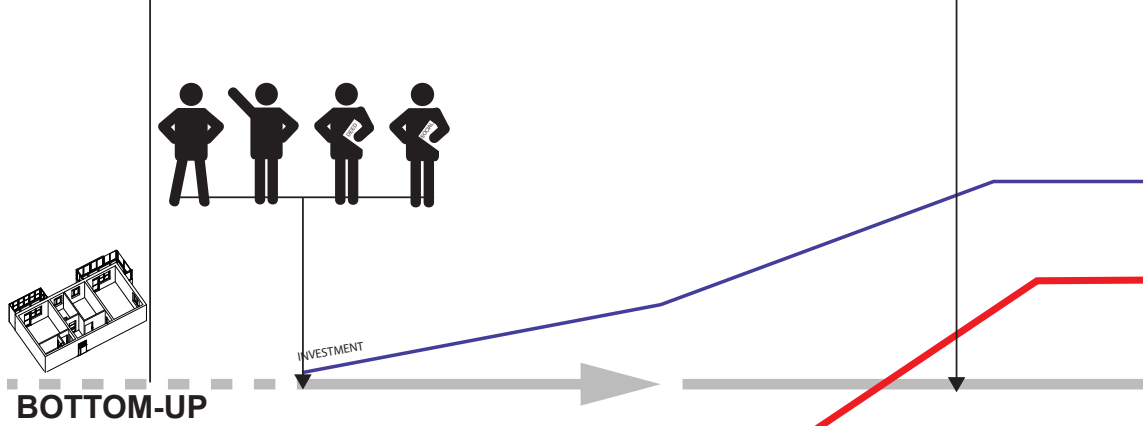
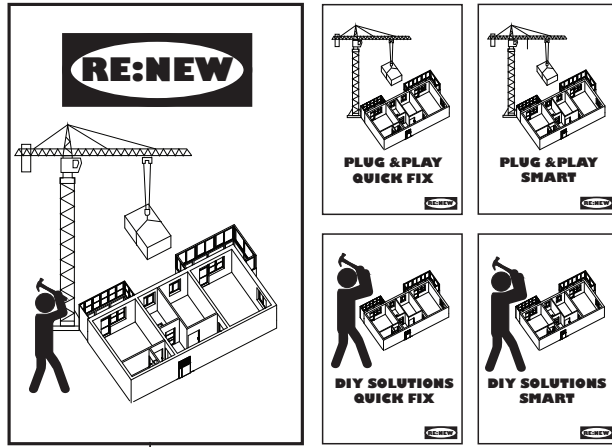
#### 8.4.2 Closing the investment

Although the model is not self-financed it is to be self-sustaining. In first instance the model has been developed to be applied on a plot scale. However some of the urban plot typologies of the early high-rises (see image 3.3) might offer less opportunities to develop win-win situations. In those cases compensation from more profitable rehabilitation cases could be used as compensation for an unfeasible case.

#### 8.5 Rehabilitation in conclusion

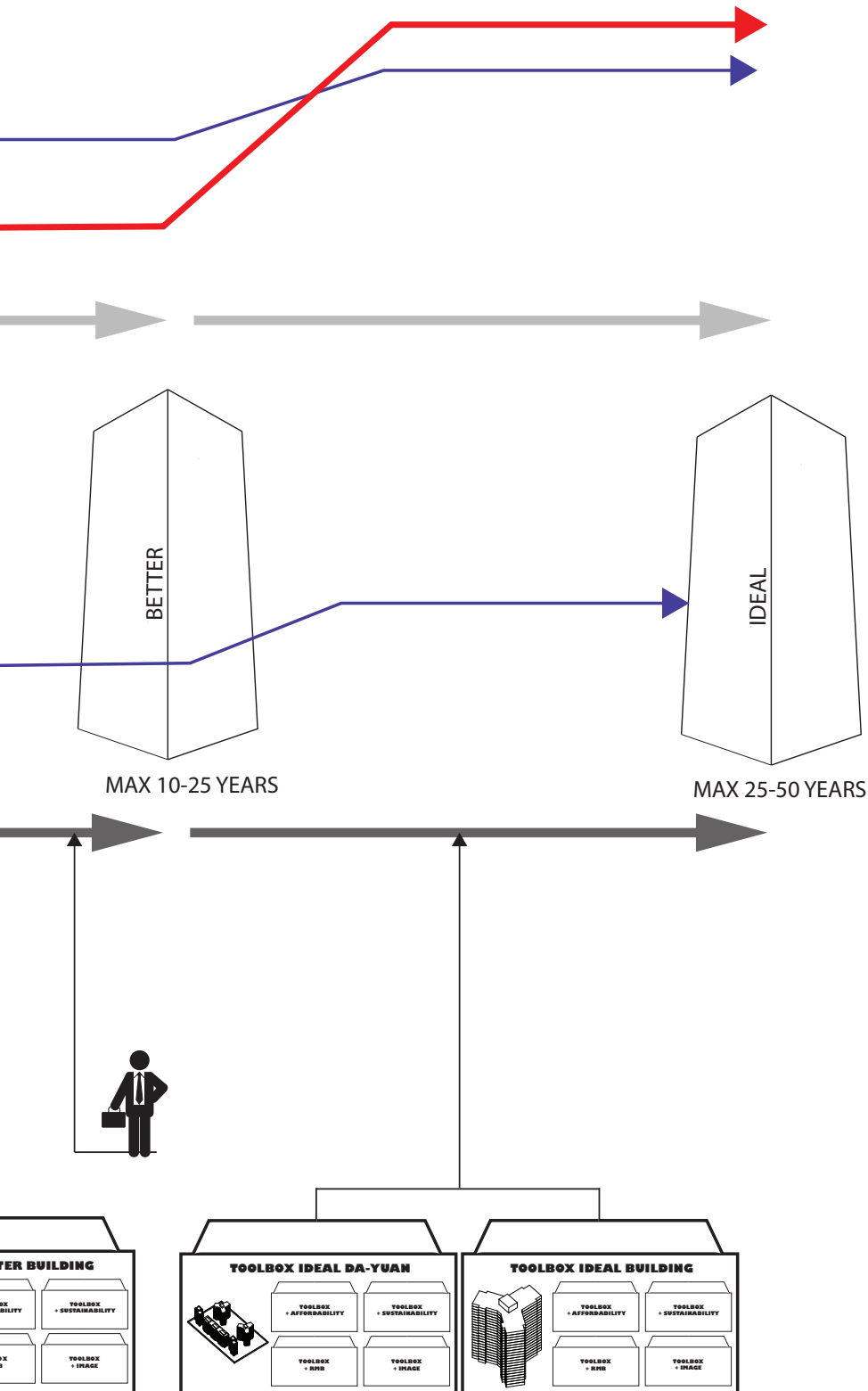
In figure 8.8 the rehabilitation strategy can be found summarised.





# REHABILITATION STRATEGY FOR THE EARLY HIGH-RISES OF BEIJING

Figure 8.8: The rehabilitation strategy









# LITFERRATURE



新华保险

世纪证券



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