URBAN SYSTEMS DYNAMICS AND EMERGENT MORPHOLOGIES UNDER THE NEOLIBERAL SOCIO-ECONOMIC RESTRUCTURING

MOSCOW AND SHENZHEN AS CASE STUDIES

by

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Abstract

In recent years urban planners have seen critical changes in the scales, pace, and trends of urbanization, resulting in suppressed urban patterns and the emergence of distinctive types of urban dynamics. A possible interpretation of this process is that it represents a "radical socio-spatial restructuring under the regime of global neoliberalization", a phenomenon that is being widely discussed by many influential planners, urban geographers, and sociologists.

My overarching research agenda is to develop a new analytical framework for comparative quantitative analyses of neoliberal urbanization pressures that cause the emergence of distinct patters of urban dynamics and morphologies. By comparing different experiences of ongoing urban transformations around the world and studying the mechanisms of their emergence, we can identify contemporary trends, monitor critical changes and shape a better future for our cities.

Using China as a basis of comparison, my thesis seeks to challenge the unproductive and homogeneous patterns of urban dynamics that emerged during neoliberalization in Russia. The controversial and extremely heterogeneous model of Chinese urbanization cannot be applied universally, but valuable lessons can be derived.

My work aims to explore specifics of two different patterns of neoliberal transitions in Moscow (Russia) and Shenzhen (China) in 1992 and 1978 respectively. By focusing on detailed scales of restructuring of urban settlement typologies I identify the characteristics of socio-spatial patterns prior to confronting the transition and its resulting outcomes. While considering potential context specific properties of East Asian urbanization, I am making an attempt to extrapolate this vernacular experience into generalized theory. Connecting and quantifying local and global dimensions of urban transformations helps me build a comprehensive theoretical and quantitative framework for a more profound understanding of ongoing socio-spatial restructuring.

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Dedication

I want to dedicate my thesis to the beloved Zak for the strongest patience he showed by working with me from the first proposal to my defense, for his incredible support and resilience.

Terminology and definitions

1. **Complex system** – any system featuring many actors and components which interact in different ways, causing the emergence of novel types of dynamics
2. **Critical transition** – abrupt and mostly irreversible shifts of a system into an alternative stable state
3. **Neoliberal transition** – the set of policies and guidelines created by the European liberal scholars attempting to find a middle way between the conflicting philosophies of classical liberalism and collectivist central planning
4. **"Neoliberalization"** - the term created for specifying the character of neoliberal transition by extrapolating its qualities to the large scales urban transformations (like "neoliberal urbanization")
5. **Capitalist urbanization** – urbanization under the regime of market capitalism
6. "**Production of space"** – the term created by Henri Lefebvre, specifying the capitalist character of ongoing process of urbanization
7. **Socio-spatial dynamics -** processes responsible for the socio-spatial changes in the urban system (densification, urban expansion, and etc.)
8. **Settlement typology -** classification of different spaces according to their association with certain socio-spatial and economic categories like urban/rural, high density/low density and etc.
9. **Typological unit -** settlement unit or built-up entity, considered as a part (piece) of the settlement typology of the city during the certain period of time
10. **Socio-spatial complexity -** characteristic of the socio-spatial system that consists of a number of different actors (in the case of the thesis – typological units), which interact between each other in many different ways

Chapter 1 - INTRODUCTION

Global discourse: urbanization as a radical socio-spatial restructuring

The last two centuries of urbanization were a distinct process in history; now, more than a half of the world population lives in urbanized areas (Brenner & Schmid, 2014). Particularly, in recent years the planners have been deeply concerned with low-density homogeneous patterns of urban expansion, seen as "excessive or wasteful use of land" (Anas & Pines, 2008). A possible interpretation of this type of modern urbanization process is that it represents a radical socio-spatial restructuring, a paradigm that is being widely discussed by many influential architects, urbanists, sociologists, and economists (pioneered by Lefebvre, Harvey, Castells, Soja, and enriched by Brenner, Schmid, Peck and others).

- *Taking into consideration the radical character of these urbanization processes, many scholars refer to the ability of urban environment to respond drastically to the world's socio-economic changes and shocks, resulting in the emergence of unpredictable kinds of urban dynamics and morphologies, sometimes beneficial but sometimes destructive.*

Homogeneous patterns of urban dynamics respond poorly to unpredictable changes (Scheffer et al., 2012). I argue that heterogeneity of underlying urban pattern plays a crucial role in the ability of socio-spatial system to encounter changes in the way that is beneficial for future development.

In my opinion, contemporary urbanization has two central aspects. First, in comparison to 20th century capitalist industrialization, the new form of ongoing democratic transformation influences urban environments globally (Fig.1.1). But even under the widely democratic regime of urbanization, space is still claimed by capital to promote profit making, and thus, "democratic space" is not necessarily usable by most of the population. Capitalistic processes are highly connected to the underlying urban patterns, resulting in the trends of privatization, social polarization, gentrification and social exclusion (Brenner & Theodore, 2002), which partially accounts for the underlying reasons for low density mono-functional patterns of urban expansion.

Secondly, even though predictable and guideless development of urban systems by hierarchical typologies is weakening, giving way to a shift towards uneven and complex

stretching of urban fabric, the field of urban studies continues to be grounded upon a mapping of distinct human settlement spaces, which was more plausible in the early 20th century than today (Batty, 2001; Brenner & Schmid, 2014; Merrifield, 2012; Sassen, 2010) (Fig. 1.2).

- *The rapidly increasing complexity, pace and instability of economic and socio-spatial changes requires a more adaptive approach to urban analysis.*

Figure 1.1 *The first major aspect of ongoing process of urbanization lies in capitalist urban restructuring*
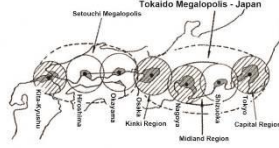
Figure 1.2 *The second major aspect of ongoing process of urbanization lies in a shift towards uneven stretching of urban fabric*

New trends in urban expansion and global democratization of space have promising potential, but can also lead to the problems of continuous recreation of "discrete morphological hierarchies" and capitalist "production of space" (Fig.1.3, 1.4). This dichotomy cannot be solved but can be challenged and, eventually, balanced.

POTENTIAL:

ASPECT #1
New scales of ongoing urbanization process

ASPECT #2
Global democratization of space

PROBLEM:

ASPECT #1
Places are studied as discrete geographic entities

ASPECT #2
Places serve for capital accumulation
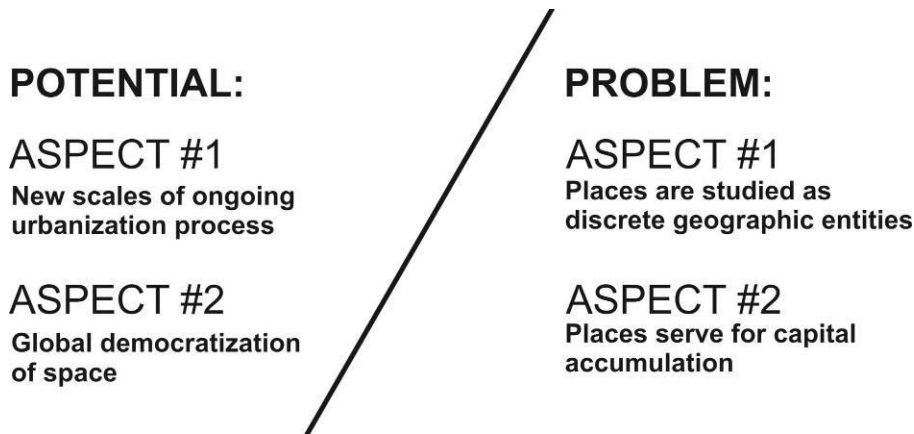
Figure 1.3 *Critique of the modern capitalist urbanization and dichotomist character of its process*

In this research I call for an experimental reconceptualization of the modern urbanization process, which should be grounded upon the notion of *complex transitions*, with a focus on emergent patterns of unique urban dynamics and morphologies. Building on these priorities I plan to create a comprehensive theoretical and methodological framework for analysis of contemporary urban transformation processes.

- *"Studying the process of global socio-spatial restructuring across scales and cases is a key to recognizing major tendencies, monitoring important changes and predicting future developmental trends in our cities" (Bretagnolle, 2002).*

From the perspective of transition theory (reviewed by Næss & Vogel, 2012) the process of urbanization is a result of multi-level interaction between underlying urban patterns and outside or inside forces, which can create a top-down pressures on the urban system. Moreover, the pattern itself can become destabilized due to inner tensions or bottom-up fluctuations (Batty, 2001). This character of urbanization process as a *multi-level complex transition* can result in uneven rates of urban growth and emergence of novel types of urban dynamics, which are unpredictable but sometimes beneficial. In some cases, such transitions result in low density mono-functional patterns of suburban growth ("*bedroom neighborhoods*" in Post-Soviet

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countries) or on the contrary extremely heterogeneous forms of urban expansion that has emerged in different forms on the outskirts of South East Asian cities ("*desakota*").
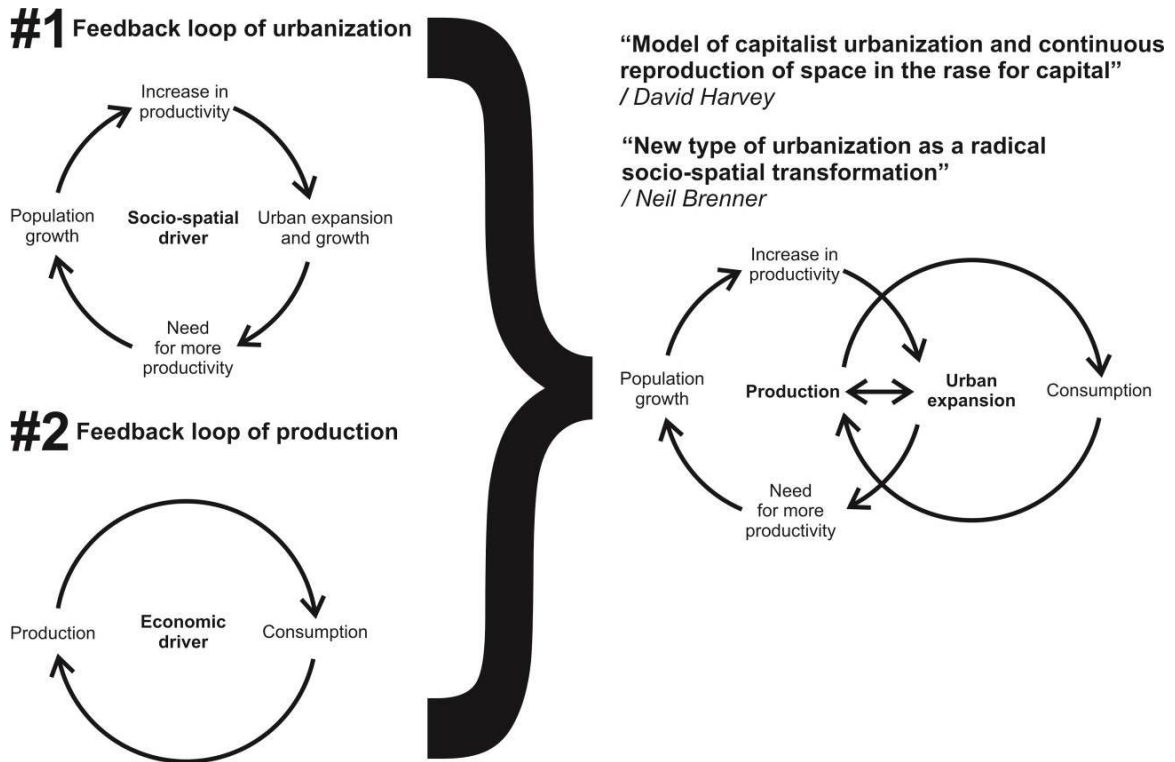
Figure 1.4 *Conceptual interpretation of the process of urbanization through the positive feedback loop analogy*

This research is based on a comprehensive comparative analysis of two types of different socio-spatial transitions under the regime of market capitalism, one with homogeneous urban topologies (Post-Soviet type of modern urbanization) and another one with extremely heterogeneous urban fabric and patterns of urban responses to the process of neoliberalization (Chinese type of urban restructuring). Using the unique model of Chinese neoliberal urbanization as a basis for comparison I determine how and why Russia has responded to the neoliberalization with low-productivity and homogeneous patterns of urban growth. By implementing historical land use data from Remote Sensing, GIS spatial distribution methods and theoretically derived frameworks I aim to compare the trends in urban systems dynamics which emerged under the pressure of global regime of market capitalism. This approach can enrich the knowledge on *urbanization as a complex critical transition* and expand our spatial imagination to the more experimental and conceptual type of urban analysis. Moreover, using this knowledge we can

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generate recommendations to the just neoliberalizing countries with the aim to change their strategies of urban development, to increase resilience and citizen's wellbeing.

Two analytical frameworks: literature review

The conceptual basis of this study relies heavily on two bodies of theory: Complexity theory and Critical urban theory, which have distinctively different approaches to analysis of socio-spatial transformations.

Critical urban theory is based upon post-1968 leftist or radical urban studies. Critical urban theory rejects inherited disciplinary divisions of labor and statist, technocratic, market driven and market-oriented forms of urban knowledge (Brenner, 2009) and studies the process of urbanization as a critical socio-spatial restructuring under the regime of market capitalism.

I argue that it is important and necessary to study the ongoing process of urbanization with this perspective in mind. Under conditions of increasingly generalized, worldwide urbanization, the project of critical urban theory has been intertwined as never before (Brenner, 2009). As manifested by many influential scholars from the view of critical urban theory - urbanization, and the definition of this process itself, should be critically reconsidered. The modern process of urbanization is not only "the condition of urban environment of being urbanized" (defined by the World Bank), it is now interwoven with current trends of capitalist economic restructuring covering urban areas globally. Because the trends of capitalist urbanization create a large impact on urban pattern and city dynamics, it is crucial to study the underlying conditions and urban system's reaction to this process, with the aim to recognize trends and monitor changes. While this thesis is only partially based upon Critical urban theory and more grounded upon the Complexity theory, the following studies were analyzed (Neil Brenner & Theodore, 2002; Horlitz & Vogelpohl, 2009; Merrifield, 2011, 2012; Roy, 2009; Sassen, 2000; among others).

By studying urbanization process I confront the dilemma: even under global democratization of urban environment, space is still claimed by capital to promote profit making. Even though the relationship between territory and capital is required for generating long term well-being, we should raise the question on how to promote a *democratic* capitalist urbanization.

- *By trying to expand the notion of urbanization from geographical to fundamentally social, these urban theories and thoughts enrich the field of urban studies and future urban planning.*

From the perspective of *Complexity theory* (and in some cases urban geography), urbanization trends have been extensively studied using frameworks of vertical hierarchies and functional redistribution (Christaller, 1966), cycles and bifurcations (Bretagnolle, 2002), positive feedbacks (Batty, 2001), and wave-like diffusion of growth (Bretagnolle, 2006), among many others. These approaches to understanding urban dynamics can be divided into two major contra-positions, which seem to characterize most urban systems from the morphological point of view.

The first approach covers quantitative aspects of urban size and growth from the perspective of hierarchical character of functional redistribution (Berry & Garrison, 1958; Christaller, 1966; Meijers, 2007; Taylor, Hoyler, & Verbruggen, 2010). Considering "hierarchy" as a main property of a system, we can label this type of urban dynamics as "vertical" (Bretagnolle & Pumain, 2010). Most often this theory defines the structure of urban system as created and managed from top-down.

The second distinctive approach considers urban dynamics as a sequence of changes in complex system stimulated through top-down/bottom-up perturbations. This approach gives more emphasis to bottom-up processes, and recognizes how top-down planning interacts with existing bottom-up complexity to determine the outcomes of urbanization. In this view, many processes are potentially non-linear and sometimes can lead to unpredictable results with complete restructuring of the initial system (reviewed by Scheffer, 2009). In this case the urban system is self-regulated through multiple interactions between actors (components of the system), the strengths of which can reverse or support critical perturbations (Batty, 2001; Scheffer et al., 2012). This approach I relate into a second major analytical framework that this study is based on.

- *Complexity theory studies the urbanization process as a process of complex transition (Scheffer, Carpenter, Foley, Folke, & Walker, 2001) which supports the idea of systemic collapse or prosperity as an unpredictable outcome after transition.*

Combining these two powerful systems of knowledge I argue, that contemporary process of urbanization should be studied as a complex socio-spatial transition under global market

capitalism that has a potential to result in different socio-spatial outcomes, sometimes beneficial but sometimes harmful.

Object of the study and a research question

Combining and adapting these two analytical frameworks to the cases of neoliberal urban restructuring can help to frame the research and create a common metrics for analyzing two different case studies. The regions included in this study were chosen not only because they have similar economic histories of socialism before confronting neioliberal urban restructuring. These two examples of capitalist transition can be considered as two "pioneer" experiences of "actually existing neoliberalism" (neoliberal policy was created by the Western countries to provide the guidelines to capitalist transformation of yet non-capitalist economies). In short, both countries went through neoliberal restructuring and experienced the shift in the pressure from the top-down government and central planning control, to a multi-stakeholder approach and mass-privatization. I would note, that this transition influenced Russia and China in distinctively different ways, including impacts on urban dynamics, patterns of urban morphology, and prerequisites for future development. My interest in these two distinctively different examples of neoliberalization came from a unique possibility of not comparing the experiences itself, but *conceptualizing these experiences into a theoretical framework* for analysis of major trends of neoliberal urban restructuring.

- *The research question I raise is why do some socio-spatial systems react poorly to neoliberal changes and some respond to them with tremendous success?*

The importance of neoliberal socio-spatial transition in China lies in the emergent complex phenomena, the mixture of many distinctively different urban-rural spaces, each of them can be characterized as densely populated area with self-sufficient economy, mobility of population, and high adaptability of urban processes. These areas, combined together, form massive regional systems, known as "extended metropolis", which contributes substantially to the incredible growth of the Asian economy (McGee, Ginsburg, 1991; Campanella, 2008; Gee, 2010; Xie, Batty, & Zhaoz, 2007; Xie, Yu, Bai, & Xing, 2006).

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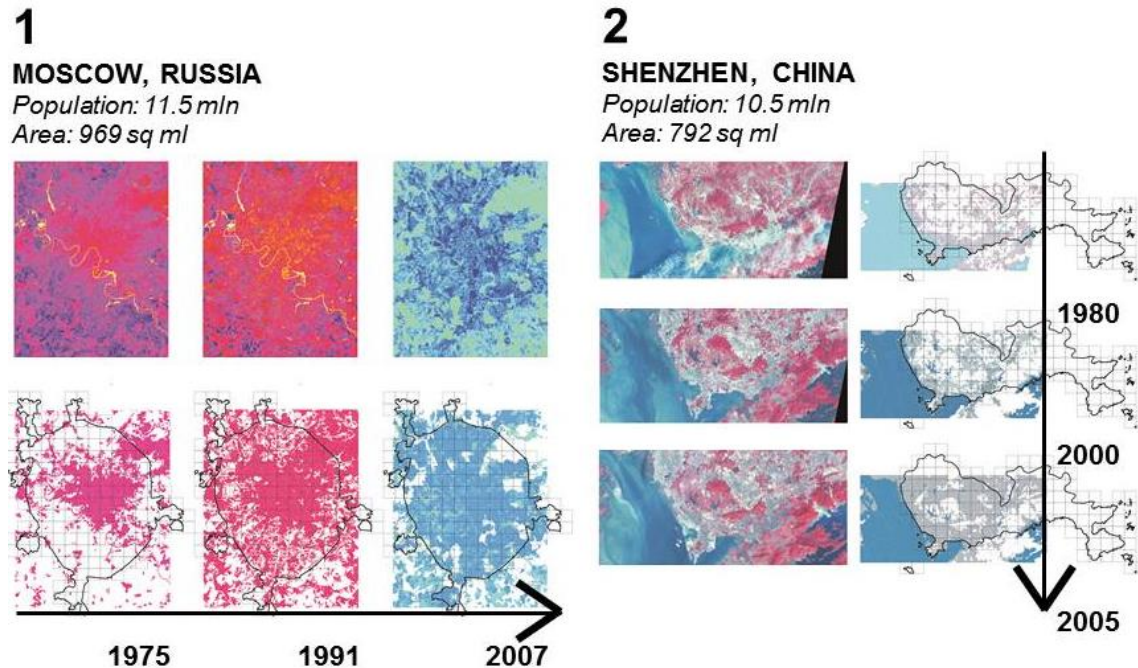
Figure 1.5 *Remote Sensing methods can be used to track general morphological changes in urban dynamics: Landsat 7 TM imagery of urban changes in Moscow and Shenzhen from 1975 to 2005, and conceptual classification of urban expansion patterns using Erdas Imagine software (with 5km grid)*

In the case of Russia the process of capitalist restructuring caused a number of urban challenges, which partially has resulted in low-density homogeneous environments on the outskirts of Russian cities after 1950's and the even more stagnant condition of "*bedroom neighborhoods*" during the post-socialists restructuring crisis of 1990's (Hirt, 2013; Pivovarov, 2003).

The examples of China and Russia effect billions of people, and present a clear dichotomy of two distinctively different urbanization processes in response to neoliberal restructuring (Henderson, Appelbaum, & Ho, 2013). The dilemma of desirable and undesirable outcomes under the similar types of transitions supports the hypothesis that exceptional kinds of urban dynamics emerge under the modern neoliberal socio-spatial restructuring, in contrast to the long-held assumption of predictable Western urbanization experiences and approaches (Brenner, 2013). From the perspective of complexity theory such patterns of dynamics are the distinctive features of complex adaptive systems. Their ability to exhibit emergent properties, or, as quoted by Batty and Torrens (2001), to give rise to "surprises" for the observer.

Many scholars consider these complex kinds of transitions to be "vernacular" (Xie et al., 2007) and it is risky and difficult to extrapolate the experience of extremely heterogeneous and unique capitalist urbanization in China to the examples of Russia and the U.S. (Xie et al., 2006). However, important lessons can be derived from such comparisons.

- *A comprehensive comparative analysis of two types of neoliberal space-economy transitions has the potential to create a new conceptual typology of urban systems dynamics that evolved under a critical space-economy restructuring.*

By implementing land use models from Remote Sensing and GIS spatial distribution methods I aim to measure the trends in urban systems dynamics of two urban regions: Moscow (Central Russia) and Shenzhen metropolitan area, a part of the massive Pearl River Delta (South East China) that evolved under the pressure of critical space-economy restructuring in early 1990's and late 1980's respectively (Fig. 1.5). This approach can enrich the knowledge on *urbanization as a complex socio-spatial transition under global market capitalism* with distinctive trends in underlying urban dynamics and types of urban morphology.

Two major approaches to analysis of transitional outcomes

The process of urbanization under neoliberal transition in Russia and China in the end of the 90s and the 80s respectively determined the tendencies of their future urban development, with results that we are still experiencing right now. Many scholars debate the reasons for distinctively different outcomes of this transition in Russia and China. These debates are mostly based on the two opposing positions.

The first major position is taken mostly by sociologists and usually refers to the quality of initial conditions. Economic and political situation, cultural background and history were important components of the differences between the two transitional outcomes (Lawrence, 2012; Pivovarov, 2003). Because the context of this research is grounded in architectural and urban theory, I analyze the concept of "initial conditions" from the perspective of socio-spatial morphology. In particular, I study the physical dimensions of two urban settlement typologies in Moscow and Shenzhen, temporal changes in built-up and population densities, and diversity of urban settlement systems prior confronting neoliberal restructuring.

The second position, which is taken mostly by Western economists, is that the policies and tactics governments adopted and enacted during the neoliberal transition played a more crucial role in the restructuring outcomes than the underlying conditions did (Henderson et al., 2013; Ma, 2002). Since the current thesis is only partially centered on political and economic theory, I summarize the basic information and try to extrapolate these context specific facts to a more theoretical understanding of the strategies and approaches to socio-spatial restructuring.

Research design and methodology: two scales of data analysis

1. **SMALL SCALE SOCIO-SPATIAL DYNAMICS UNDER THE PRESSURE OF NEOLIBERALIZATION**

   Analysis of the properties of the two settlement typologies and temporal changes in their built-up and population density.

2. **LARGE SCALE SOCIO-SPATIAL DYNAMICS UNDER THE PRESSURE OF NEOLIBERALIZATION**

   Analysis of the temporal trends in spatial distribution of these typological units in the territory.

   Besides general linear population distribution methods we need to imply additional more adaptable metrics to accurately determine how urban areas change over time. Many quantitative methods for measuring urban dynamics were considered for inclusion in the study. Among them were – rank size rule by Zipf (reviewed by Batty, 2001), the Pareto law adjusted to the population size distribution (reviewed by Pumain, 1982), Hoover or Gini indexes (reviewed by Bretagnolle, 1999), Agglomeration Index for measuring urban concentration (reviewed by Uchida et all, 2008), and many others. However as literature review has shown, many methods are limited and analyze the linear character of processes of urban dynamics and discrete morphological hierarchies. For this study, more adaptive methods are needed.

   Actor-network theory tries to explain how spatial networks come together to act as a whole. The theory also tries to study the capacity of the system to react to change. Due to the complexity of this theory and difficult statistical analysis, a more basic method of measuring urban dynamics is taken for this current research, with the option to use actor network theory in

future analyses. With the goal to analyze the trends of neoliberal transitions in socio-spatial systems I conduct a multi-scalar analysis of urban system's restructuring.

At first I study the fine-scale socio-spatial transformations and temporal changes in the diversity of the settlement typologies. In particular I analyze each component of the settlement typology during certain period of time in terms of its diversity, population and built-up density, and a driving economic force. It is very important to expand your spatial view and try to identify the trends of changes in the overall heterogeneity of settlement typology leading to the restructuring period. Initial heterogeneity of the components influences the result of neoliberal restructuring critically.

Then, I analyze the pattern of spatial distribution of the components in the territory with the aim to measure modularity of the system prior confronting critical socio-spatial restructuring. In other words I analyze two different models of urban development (Moscow and Shenzhen) from the point of view of their ability to encounter neoliberal change without loses. Modularity or in other words heterogeneity of the inter-component's links helps to strengthen the system by increasing its ability to adapt gradually to changing conditions and perturbations.

In this analysis we have a chance to connect local components diversity with large scale patterns of spatial distribution and system's modularity in order to measure the underlying reasons for different outcomes under critical neoliberal space-economy restructuring. Connecting and quantifying local and global dimensions of urban transformations helps me build a comprehensive theoretical and quantitative framework for a more profound understanding of ongoing socio-spatial restructuring.

Importance of the research

Neoliberal space-economy transitions and correspondent to them novel patterns of urban dynamics will probably remain an important global issue in coming years. Even though this current research and a thesis is based in urban theory, the importance and relevance of this topic is mostly shaped by the current sharp economic and political problems that modern transitional countries face with each passing day. There is a need for conceptual reconsideration of the modern process of urbanization from the notion of the pure morphological urban expansion to

the phenomenon of a radical socio-spatial restructuring under the market capitalism. Otherwise, we risk repeating mistakes that will have negative effects for many people.

Taking into consideration the characteristics of this global socio-economic situation I would highlight two major concerns that call for interdisciplinary discourse among scholars in the fields of urban studies, geography, sociology, and political science.

First of all there is a high need for the new guidelines of proper strategy for neoliberal transitions. Many countries when encountering the neoliberal transition face a problem of unpredictable outcomes, sometimes prosperous but sometimes harmful for urban system. As recently as 2008, Egypt considered implementing a rapid transitional program and mass privatization. Morocco and Tunisia contemplated similar policies following the 2011 Arab Spring (Lawrence, 2012). When such large scale restructuring takes space, there is a potential for unintended consequences (Lawrence, 2012).

Second of all, even though the modern urbanization process is partially responsible for prosperity of socio-spatial systems transitioned to the open market economy, capitalism often doesn't resolve its crisis, but rather, it moves them geographically (Harvey, 2009). As more countries are transitioned to this state, it will be easier for crises to travel among them through a "domino effect" (the pace of crisis expansion was studied by European Bank and published in "Transition report," 1999, "Transition Report," 2008).

Therefore, it is necessary to study these kinds of critical transitions and its socio-spatial outcomes, with the goal to generate a large scale stability and resilience of the socio-spatial systems to unpredictable changes.

- *In this research I make an attempt to create an analytical framework for a more comprehensive analysis of these kinds of complex transitions in our society. I hope my academic and applied contributions into this part of critical urban theory will help to change homogeneous and purely planned urban environment in Russia, into its more democratic and heterogeneous state.*

Chapter 2 - SMALL SCALE SOCIO-SPATIAL DYNAMICS UNDER THE CRITICAL NEOLIBERAL TRANSITION

Critical transitions in complex systems: theoretical background

20 years ago Moscow moved from a long period of a relatively successful urban development towards stagnant, low density and homogeneous patterns of urban growth. Russia (earlier as a part of the Soviet Union) and China were the first two countries to apply the neoliberal policy to post-socialist restructuring and, moreover, have experienced distinctively different economic and socio-spatial outcomes after these critical changes. As discussed in the previous chapter, the divergence of transitional outcomes in the two countries can be studied and approached from many perspectives, which mainly differ between the Western sociologists and economists. If generalizing, most of the discussions and debates about the different reactions of socio-spatial systems on critical neoliberal changes come together into one question:

- *Why do some socio-spatial systems react poorly on changing conditions and perturbations and the others react to them with tremendous success?*

This question creates a major theoretical and logistic challenge to urban planners because the ongoing urbanization reflects the main socio-economic processes resulting in diverse responses, including the emergence of the novel kinds of urban dynamics and unpredictable morphologies, sometimes beneficial but sometimes harmful.

Complexity theory tries to explain how spatial systems and their components come together to act as a whole, including the capacity of the system to encounter change and its reaction to it (Bretagnolle, 2006; Poelmans & Rompaey, 2010; Rhee, 2000; Scheffer et al., 2001; Scheffer et al., 2012; Zhao, 2013). Complex system can be generally described as any system experiencing different interactions in-between its components, which play a role of actors in the system's processes and help to determine systemic reactions to different changes. Due to the differences in the "architecture" of a system and in a character of a change itself systems can react differently to changing conditions and perturbations. The so called "architecture of fragility" has been and is being studied by many, including such as urban planners, economics,

climatology, ecology, and sociology (reviewed by Batty, 2001; Plummer & Sheppard, 2006; Poelmans & Rompaey, 2010; Scheffer et al., 2012).

Changes and perturbations that influence the system sometimes can be caused by a random external pressure. Some systems respond gradually to these pressures, similar to the linear and hierarchical model of urban development in the late XIX century. In other systems, changes can represent a so called critical transition, a mostly irreversible systemic shift from one stable state to another. Systems capable of these abrupt transitions are called "bi-stable", because they can exhibit two or more configurations, and when one configuration is established it becomes difficult to change. The logic of bi-stable systems and critical transitions can be applied and tested widely, from political science to cities:

- *In the case of this study I consider the system of the city of Moscow and Shenzhen as a complex system and the neoliberal regime of urbanization as a critical transition from the socialist state urbanism to the market capitalist urbanization.*

There are two major features are crucial for the overall response of the system to changes (Fig. 2.1) (Scheffer et al., 2012). Heterogeneity of the system's components and the degree of their connectivity affect the stability of the system and its behavior under the pressure of a major change.

TWO MAJOR FEATURES ARE CRUCIAL FOR THE RESPONSE OF COMPLEX SYSTEMS:

#1 Heterogeneity of the components of the city systems

- SOCIAL (income diversity)
- ECONOMIC (jobs diversity)
- MORPHOLOGICAL (diversity of the units)
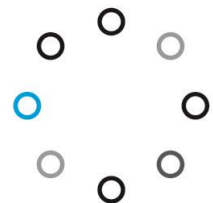
#2 Connectivity of the components of the city systems

- SOCIAL (population density)
- ECONOMIC (employment density)
- MORPHOLOGICAL (built-up density)
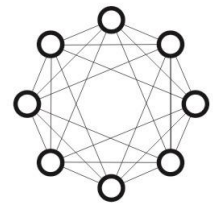
Figure 2.1 *Conceptual representation of the attributes of the system, which are mainly responsible for the systems reaction and behavior under the changing conditions and perturbations*

Highly heterogeneous system with modular character of the relationship between components tends to experience systemic resilience and adaptability to changes (Fig. 2.2). Responses in these systems are gradual and negative outcomes are easier to reverse. Under the rapidly changing conditions some modules shift to the alternative stable state while the others, balancing the systemic change, transition gradually module by module, rather than the domino effect of a system where all components are closely connected and less diverse. Therefore some heterogeneous systems experience a high adaptive capacity and a so called systemic resilience - the ability of systems to absorb external pressures, adapt, and resist transitions to self-reinforcing unproductive states.

Figure 2.2 *Conceptual representation of the behavior of a highly heterogeneous system under the stress of changing conditions (Scheffer et al., 2001; 2012)*

In terms of the systems of cities and neoliberal transition that they encounter during capitalist restructuring, we can observe an interesting analogy with the processes that occur in complex systems. In the process of the China's early neoliberal urbanization we can recognize the behavior of a gradual transition and systemic resilience due to the released potential and the emergence of extremely heterogeneous and modular socio-spatial and economic system. Due to the underlying conditions of socio-spatial and economic system, but also because of cultural values and unknown motivational forces of that Chinese government that created the policy of gradual neoliberal change (which I will discuss in the next part of this chapter).

Originally, even though China adopted the strategy of socialist development from the USSR, they didn't accumulate as much state owned commodities (enterprises) as did the USSR. By 1978 when Den Xiaoping launches the first privatization program China possessed 71% of *agricultural* (FRBSF Economic Letter) state enterprises due to the non-complete form of industrialization and Mao's anti-urbanism (belief that urbanization is an enemy of proper socialism). This condition allowed China to restructure its economy to the capitalist state gradually through the strategy of disarticulation (redistribution) and generation of a complex multi-level system of transitioned and transitioning modules time at a time (Fig. 2.3).

- *"The initial phases of Deng's reforms involved maintaining state control of the economy while simultaneously allowing market elements to develop in agriculture and retail distribution. It also included preserving central-planning in major industries while allowing smaller enterprises to openly sell anything produced beyond state-imposed targets"* (Henderson et al., 2013).

The gradual transition in the case of China is the process where some sections of the national economy are successively separated from the core of the planned economy while new development programs are initiated without any linkage to the planned core. "The disconnected and new segments of the economy are then allowed to grow in response to market forces, while the relative importance of the planned component of the economy declines progressively until the economy eventually "grows out of the plan"" (Naughton, 1995).

This complex management of different layers or modules of economy to restructure a layer at a time allowed the system to transition gradually. Gradualism of neoliberal transition in China resulted in a release of a wide variety of socio-spatial scenarios and morphological typologies, which combined together to create an extremely heterogeneous socio-spatial system, analyzed in further details further in this chapter (Henderson et al., 2013; Huang, 2012; Ma, 2002; Weiss, 1999).

Figure 2.3 *Neoliberal transitional policy implemented by China's government and representation of correspondent to it urban response in the settlement typology*

On the contrary, *homogeneous system* with high connectivity of systemic components tends to react to changing conditions or perturbations with domino-effect-like abrupt transitions and shifts. In these cases while encountering the major change or disturbance a system exhibits so called local resilience (Fig. 2.4). This means that the complex systems bounces back after some minor shocks creating the appearance of a highly resilient system. This "bouncing back" behavior shows resistance to change until the threshold is crossed (the price for land as an example of a threshold in the process of gentrification, etc.). After the threshold is crossed, highly connected systemic components transition one after another into the alternative stable state (market capitalism and socialism as an example of two alternative states) therefore exhibiting an abrupt transition.
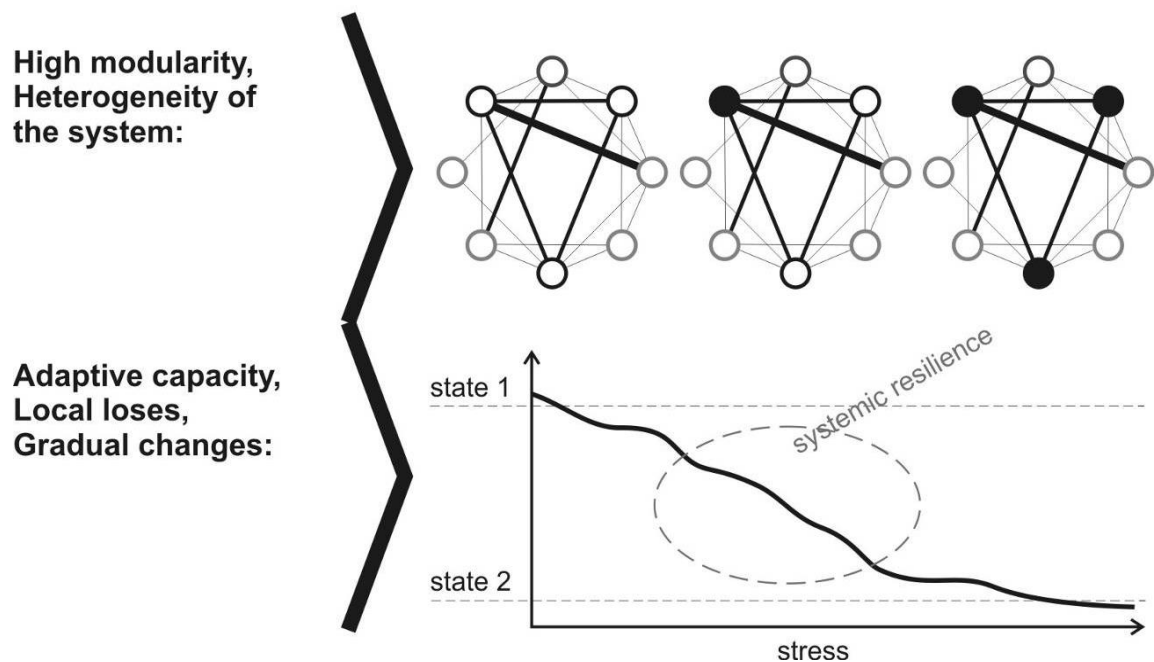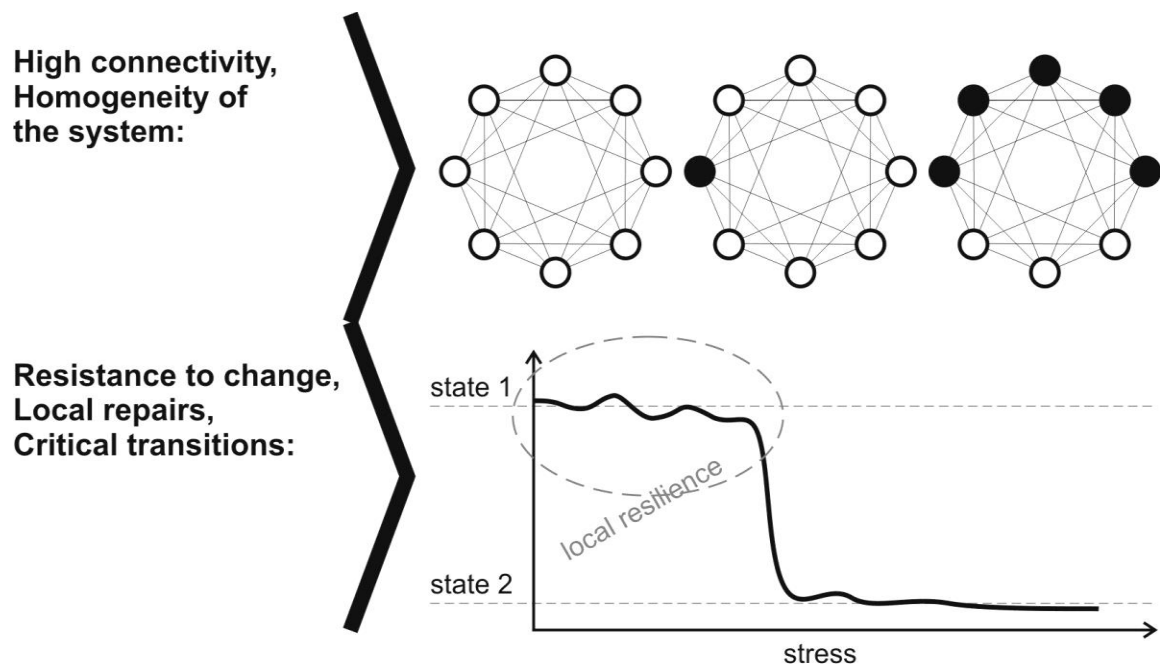

Figure 2.4 *Conceptual representation of the behavior of a highly homogeneous system under the stress of changing conditions (Scheffer et al., 2001; 2012)*

Cities that are characterized with high homogeneity of their components and low modularity tend to change abruptly in the response to critical changes and transition to an unproductive state that is difficult to reverse. This systemic behavior occurs in the rapid neoliberal transition in Russia (former USSR in the 1990s). The shock therapy, as studied by many, was probably the only way to restructure the almost fully industrialized economy with 85% of non-agricultural state enterprises and more than 2 million separate commodities to privatize (FRBSF Economic Letter) (Fig. 2.5). "Big bang" transition and the program of mass

privatization might led the socio-spatial and economic systems of Russian cities to stagnancy. The results of Russian reform have led to worsening shortages, decline in output, increases in income inequality, and an increase in corruption.

- *"During the end of the Soviet Union, Gorbachev tried to push through gradual reforms. Unfortunately, the Soviet Economy was already too diseased to be fixed. When the Soviet government collapsed, the new regime had to decide whether to continue gradual reforms by maintaining state control over a large portion of the economy or whether to follow the advice of Western economists and undertake radical reform. The regime chose the latter option, first undergoing rapid liberalization of prices and then privatization of most of the economy"* (Pivovarov, 2003).

RUSSIA "RAPID NEOLIBERAL TRANSITION"

85% of non-ag state enterprises
>2mln of state commodities
FRBSF Economic Letter

MASS Privatization Crisis

- All potentials were exhausted
- Planning was ignored

Slow growth
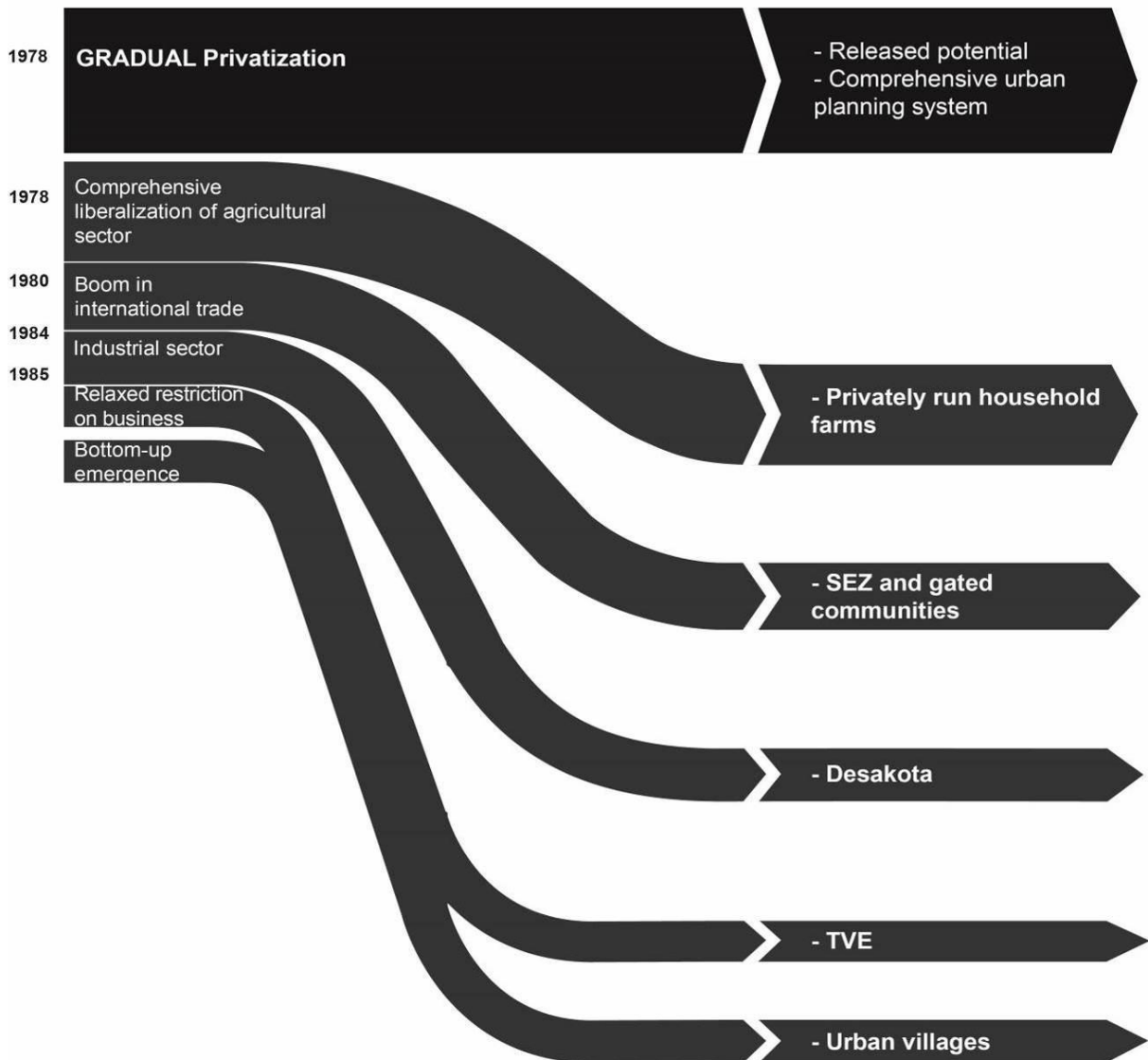
- Leftover typology of residential construction
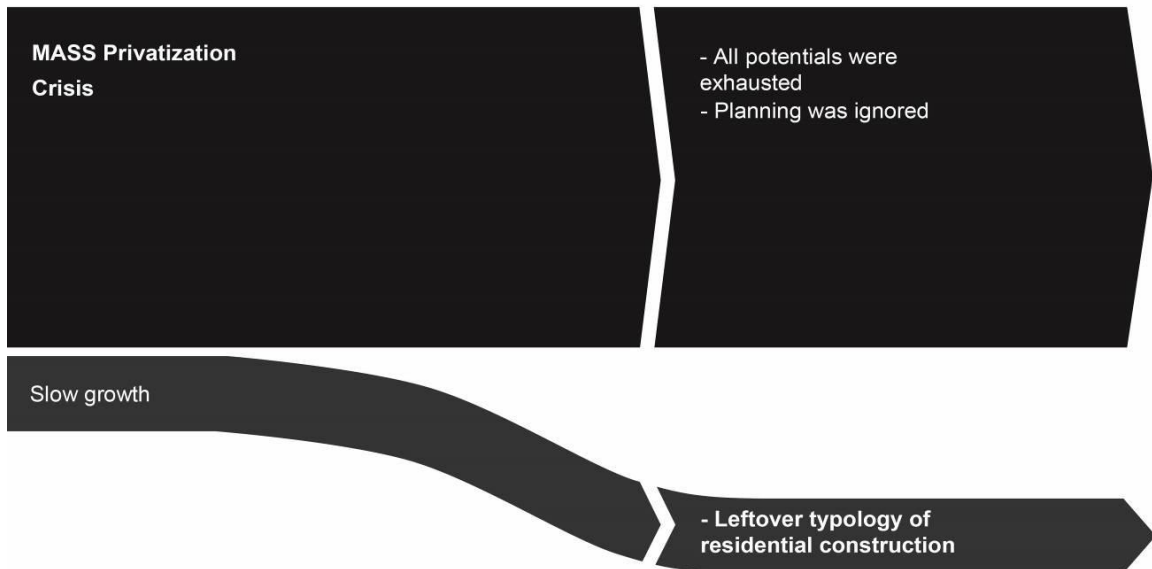
Figure 2.5 *Neoliberal transitional policy implemented by Russia's government and representation of correspondent to it urban response in the settlement typology*

The real GDP of Russia contracted over 35% during the first years of reform from 1989 to 1993; from 1993 until 1997 the GDP decreased at a more gradual rate (OECD 29). Russia's standard of living has also fallen during the transition years. In terms of the socio-spatial systems development, the crisis led to reduced construction rates, low population mobility, stalled urban growth and a lack of appreciation for urban planning as a tool for generating a more productive and livable environment. In terms of urban morphology the post-socialist crisis resulted in policies promoting homogeneous patterns of urban dynamics, low density and poorly planned settlement typology.

- *In sharp contrast to the improving living standards in China, the Russian people have faced deteriorating qualities of life with a lower life expectancy, a phasing out of housing subsidies, and a marked decrease in consumption (OECD 236).*

The policy differences in how China and Russia approached the neoliberalization process explain a lot of why China has been more successful. However, I believe that the position of complexity theory on the heterogeneity and modularity of systems helps to enrich our perspective on socio-spatial and economic neoliberal restructuring. It also leads to how we can study neoliberalization from an urban studies perspective and use this to perspective to make recommendations of how we can help neoliberalizing cities be successful and how to "fix" cities that have already gone through neoliberalization and remain unproductive.

It is very challenging to test and apply this theory, but doing so it can open new insights on the architecture of urban fragility under the pressure of critical neoliberal restructuring and other outside pressures. The rest of this study quantifies attributes of the socio-spatial system of Moscow and Shenzhen in order to connect the morphological pattern with the response of cities to neoliberal urbanization. The questions I test is whether the heterogeneity and modularity of the underlying socio-spatial pattern influences the ability of the system to transition to the neoliberal state in a productive way.

Local scale socio-spatial dynamics: research question and design of a study

To measure the diversity of the components of settlement typologies prior, during, and after neoliberal change requires comprehensive quantitative analytic tools and methods. Using publicly available OSM Street data and historical satellite images from Moscow and Shenzhen I

determine the temporal changes in typology of settlement units, changes in their population and built up densities, urban area and major economic driving force. Combining this information in this part of analysis, I evaluate the heterogeneity of components of the settlement typologies over time.

For population data I use publicly available census results from 1939, 59, 69, 79, 89, 2002, 2010 – for Moscow, and the newer census data for Shenzhen from 2003 to now. For area and built-up density measurements I use GIS tools and the maps that I generated by using historical satellite images and other historical information on the master plans of Moscow and Shenzhen and their territorial and administrative divisions. Census data for Russia was taken from the publicly available database of the Institute of Demography, National Research University Higher School of Economics; Census data for Shenzhen was partially found in the peer-reviewed papers (Chang, Li, Wang, Wu, & Xie, 2012; Gong, Chen, & Yu, 2011; Hao, Geertman, Hooimeijer, & Sliuzas, 2013; Shen, 2008) and a publicly available database of China's Statistical Year Book for the Sichuan region; satellite images over time for both cities were downloaded from the Landsat 7 USGS database.

To measure the attributes of a particular settlement typology and its temporal changes I take a sample of three settlement units per certain settlement typology that was developing during the different periods of time. For example, for the analysis of the typology of a "City block" ("Kvartal" in Russian) that was built in the 1920s-30s under the development of Russian avant-garde style in architecture and with the growth of industrial labor force population, I take three samples of the units that represent the characteristics of this typology. I then measure their population and built-up density in comparison to the other units of latter typologies (in other words, comparing city blocks in one decade to those in previous decades). Eventually I have the sample size of about 20 typological units for Moscow and 25 for Shenzhen, which I can use to conceptualize the socio-spatial trends during the neoliberal transition in Russia and China.

Heterogeneity of the settlement typology's components in Moscow and Shenzhen: data analysis

Urban planners take into consideration many different settlement typologies when studying the processes of urban transformation. For the purpose of this research the choice of the settlement typology has been made with the accent on valuable interactions between *rural* and *urban*, which represents a reaction of urban environment to complex processes of contemporary urbanization (Fig. 2.6).

THE SCALE OF THE STUDY AND THE CHOICE OF THE SETTLEMENT TYPOLOGY:

| RURAL settlement typology | PERIURBAN settlement typology | URBAN settlement typology |

REGIONAL SCALE — By location; By transport accessibility / By the pattern of urban growth

CITY SCALE — By the characteristics of morphological form and its socio-spatial indicators (built-up density, population density)

BUILDING SCALE — By a height of the building; By the architectural style and details / By the amount of residents

Figure 2.6 *Explanatory diagram of the choice of the settlement typology as a case study for analysis. Due to the importance of the connections in-between urban and rural I make an emphasis on studying the urban-rural settlement typologies on the scale of the city*

Studying the typology of rural, urban, and rural-urban settlements allows us to generate a picture of the otherwise invisible and fragile network of different connections in-between these spaces that play an important role in the development of the cities. First I provide a short study of temporal changes in the main typology of urban-rural settlements in Moscow from the 1920s and Shenzhen from the 50s to now. (Every studied typology is represented on the following pages

with a short description, periods of its development, and a master plan of one sample unit for a visual representation (Series of figures 2.7, 2.8. 2.9, 2.10)) .

Figure 2.7 *Typology of urban-rural settlements in Moscow*

**1917-20s
COLLECTIVE
FARMS (KOLHOZ)**

Socialized farm sector which emerged in Soviet agriculture. A form of settlement unit which is based on the principles of collective economy.

**1920-30s
SETTLEMENT FOR
LABOR FORCE
(RABOCHIY POSELOK)**

Urban type settlement localities created during the Soviet era. Residents are mostly involved in industry and partially in agriculture.

Poselok Beskudnokivo
1930

0.1km   0.5km   1km   1.5km

0.1km   0.5km   1km   1.5km
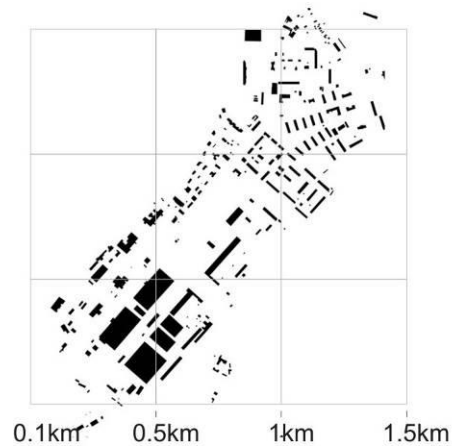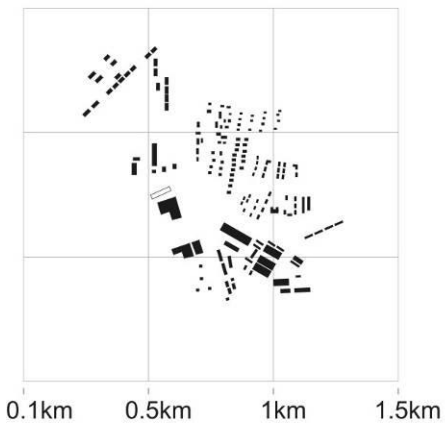
1920-30s
CITY BLOCK
(KVARTAL)

Usually centrally located urban settlement unit with distinctive principles of urban development, such as high density, 4-5 story high buildings, support of the street grid.

1950-70s
MICROREGION
(MICRORAYON)

A large-scale residential complex which was the primary structural element of the residential area construction in the Soviet Union and in some post-Soviet states.

Budenovsky gorodok city block
1927-1929

0.1km   0.5km   1km   1.5km

Pokrovskoe-Steshnevo microrayon
1950

0.1km   0.5km   1km   1.5km
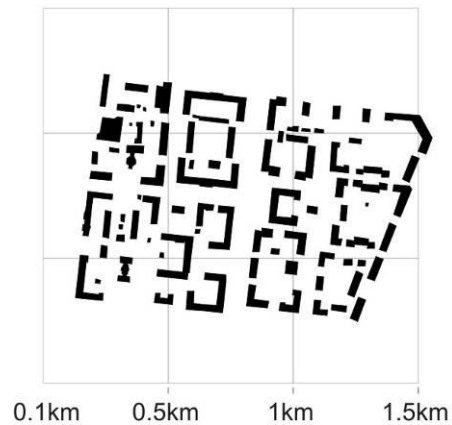
90-today
MICROREGION
(MICRORAYON)

Severnoe Chertanovo microrayon
1972

0.1km   0.5km   1km   1.5km
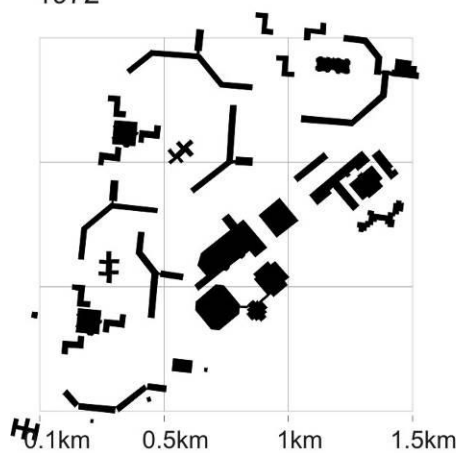
Figure 2.8 *Typology of urban-rural settlements in Shenzhen*

1950s
SOCIALIST BLOCK
(DANWEI WORK UNIT)

Self-sufficient urban work-unit created during Socialist era. Urban structure was borrowed from the USSR and created for promotion of collective style of living.

1950s
PEOPLE'S COMMUNE

A combinations of smaller farms collectives which consists of about 5000 to 20000 households created for promotion of collective work.

Former danwei unit,
socialist urban block

0.1km   0.5km   1km   1.5km

Rural settlement with agricultural fields, former peoples commune

0.1km   0.5km   1km   1.5km
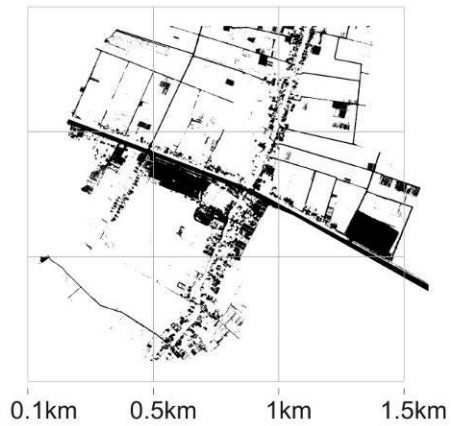
1980s
DESAKOTA

Unique mixture of rural and urban patterns of development emerged as a result of bottom-up rural urbanization during liberalization of industrial sector in 1978.

Desakota land use pattern,
Shenzhen

0.1km   0.5km   1km   1.5km
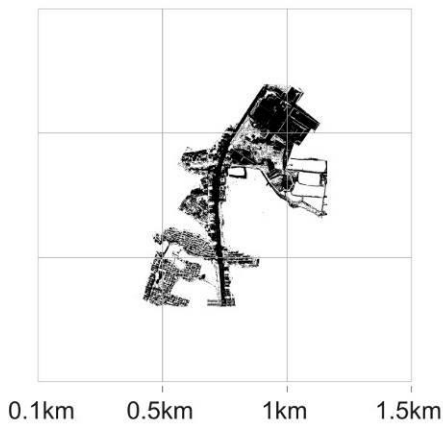
1980s
URBAN VILLAGE

Unique phenomenon emerged during rapid urbanization in Chinese major cities. Extremely dense patterns are surrounded by high-rise mega-blocks and are located in the center and outskirts of the cities.

Urban village,
Shenzhen
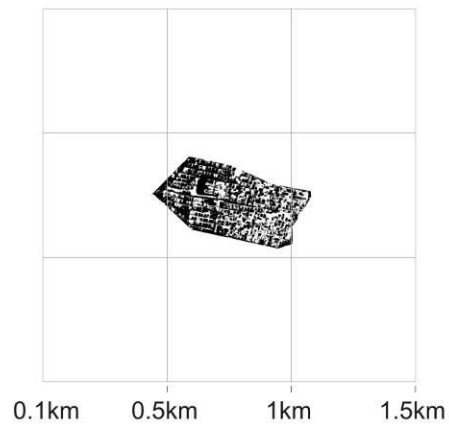
0.1km   0.5km   1km   1.5km

**1980s
TOWNSHIP VILLAGE
ENTERPRISE**

Former people's communes. Urban-rural patterns with the population involved in industry and lately - in market.

Township Village Enterprise, Shenzhen
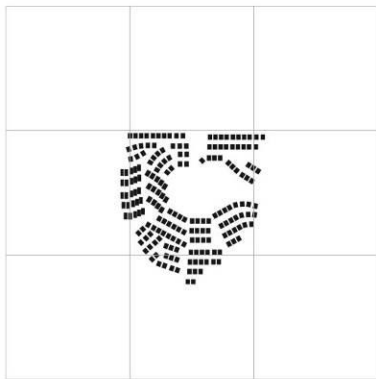
0.1km   0.5km   1km   1.5km
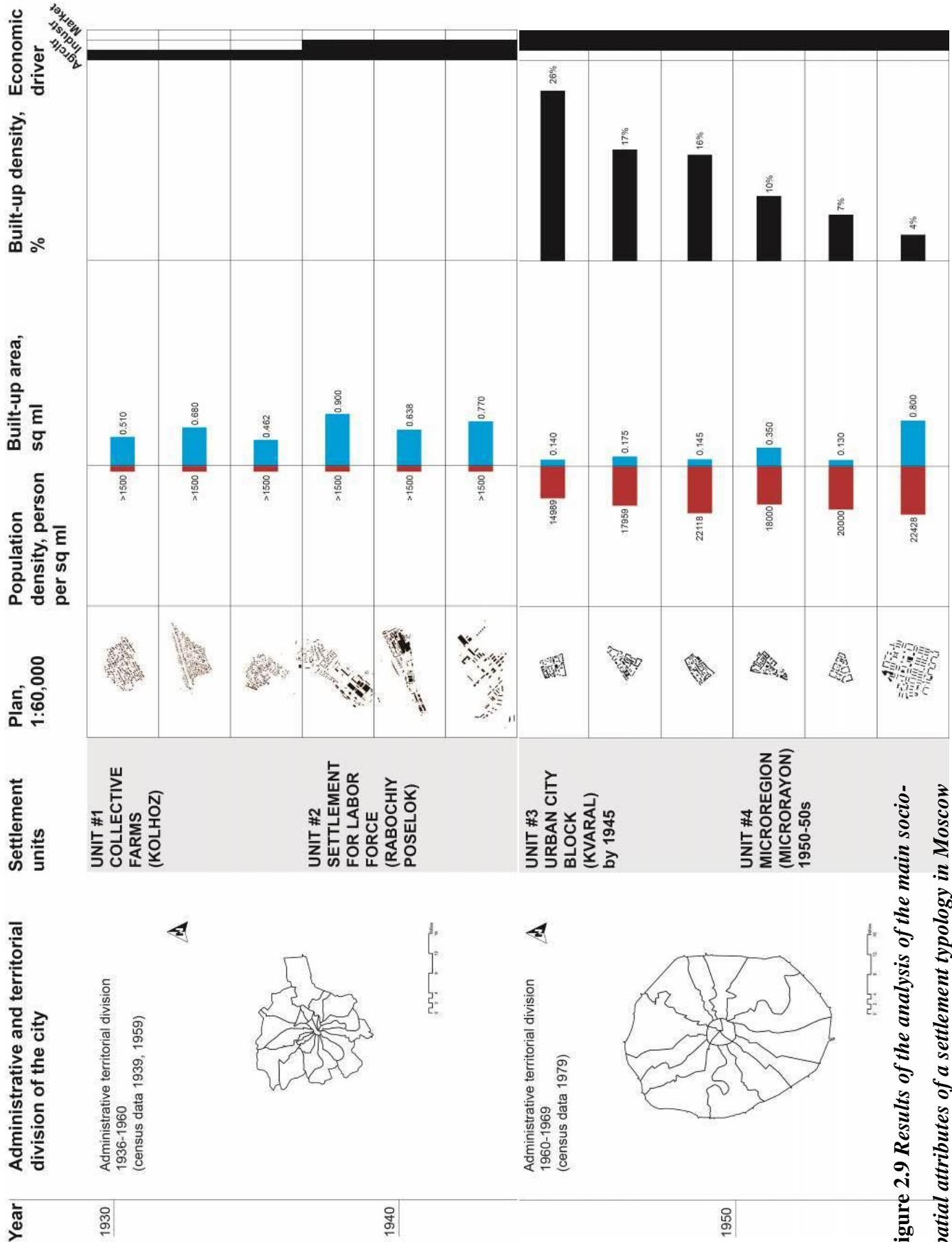
Figure 2.9 *Results of the analysis of the main socio-spatial attributes of a settlement typology in Moscow*

Year	Administrative and territorial division of the city	Settlement units	Plan, 1:60,000	Population density, person per sq ml	Built-up area, sq ml	Built-up density, %	Economic driver
1930	Administrative territorial division 1936-1960 (census data 1939, 1959)	UNIT #1 COLLECTIVE FARMS (KOLHOZ)		>1500	0.510		Agricult / Indust / Market
				>1500	0.680		
				>1500	0.462		
1940		UNIT #2 SETTLEMENT FOR LABOR FORCE (RABOCHIY POSELOK)		>1500	0.900		
				>1500	0.638		
				>1500	0.770		
	Administrative territorial division 1960-1969 (census data 1979)	UNIT #3 URBAN CITY BLOCK (KVARAL) by 1945		14989	0.140	26%	
				17959	0.175	17%	
				22118	0.145	16%	
1950		UNIT #4 MICROREGION (MICRORAYON) 1950-50s		18000	0.350	10%	
				20000	0.130	7%	
				22428	0.800	4%	

UNIT #5
MICROREGION (MICRORAYON)
1970s

32010 | 1.200 | 6%
18443 | 2.310 | 6%
40000 | 1.930 | 6%

Administrative territorial division
1969-1991
(census data 1989)

1990

UNIT #1
MICROREGION (MICRORAYON)

24848 | 3.000 | 3%
31100 | 1.000 | 11%
40000 | 0.800 | 7%

Administrative territorial division
1991-2011
(census data 2002, 2010)

2010

30

Figure 2.10 *Results of the analysis of the main socio-spatial attributes of a settlement typology in Shenzhen*

UNIT #3
DESAKOTA

>7770	>7770	>7770	>1200	>1200	>1200
0.173	0.215	0.520	0.300	0.214	0.100

UNIT #4
TOWNSHIP
VILLAGE
ENTERPRISE
(TVE)

Second Master Plan 1996
population by 1990 - 1,214,800

UNIT #5
URBAN
VILLAGES

>7000	>7000	>7000
0.072	0.086	0.042
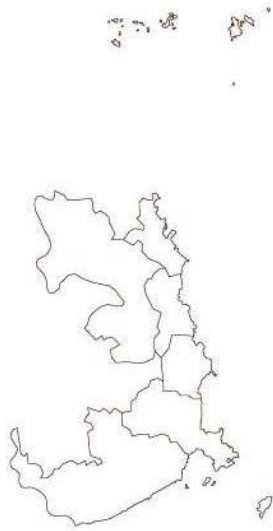
Third Master Plan 2005
population by 2005 - 8,277,500

There are several distinct trends in settlement typology and the attributes of its components over time in China and Russia.

First, in Moscow we can clearly recognize the long term footprint of the State's pressure on the entire urban system. Russia and especially its capital Moscow went through the two dramatic and distinctively different changes under the socialist and later the neoliberal critical restructuring. Even though there is no straight forward connection between the soviet reforms and the results of neoliberalization of the last 20 years, I argue that the socio-spatial pattern of most Russian cities lost its heterogeneity and modularity due to the mass replication of state-built residential units using a very small number of building and settlement topologies. Part of the reasons that Russia adopted this typology during early Socialist period is that urbanization was a byproduct of an extremely rapid industrialization. Prior to launching the industrialization program in the 20s the environment of the Russian cities was mostly rural with a concentration in agricultural economy:

- *The rapid growth and concentration of the urban population in scattered centers across a vast national territory, coupled with the formation of a considerable network of urban settlements after 1917, ran considerably ahead of adaptation among recent village inhabitants to the urban way of life and their assimilation of the urban culture, of a new system of values. The growth of towns was not adequately backed up either by economic opportunities or by the social priorities of the state (Pivovarov, 2003).*

From the perspective of urban morphology, the socio-spatial system of Moscow in the 20-30s was relatively diverse and heterogeneous. Different types of settlement components and economic uses coexisted together, represented in the typology of collective farms (kolkhoz), peri-urban – labor force settlements (Rabochiy poselok) and urban – city blocks (kvartal). These three settlement kinds created a heterogeneous network of different socio-spatial connections, which interacted with close neighbors and partially helped the economic system to adapt to minor shocks and to grow at a fast pace.

The first wave of population movement into the industrial sectors and city centers resulted in the urgent need for central planning and the emergence of the two powerful residential mass-construction programs developed by the State. By the 70-80s the whole country was built-up with standardized and prefabricated residential neighborhoods and the new

settlement typology of "Microrayon" emerged, substituting the diversity of urban-rural and in-between spaces with low-density, homogeneous patterns of urban growth (Fig. 2.11).
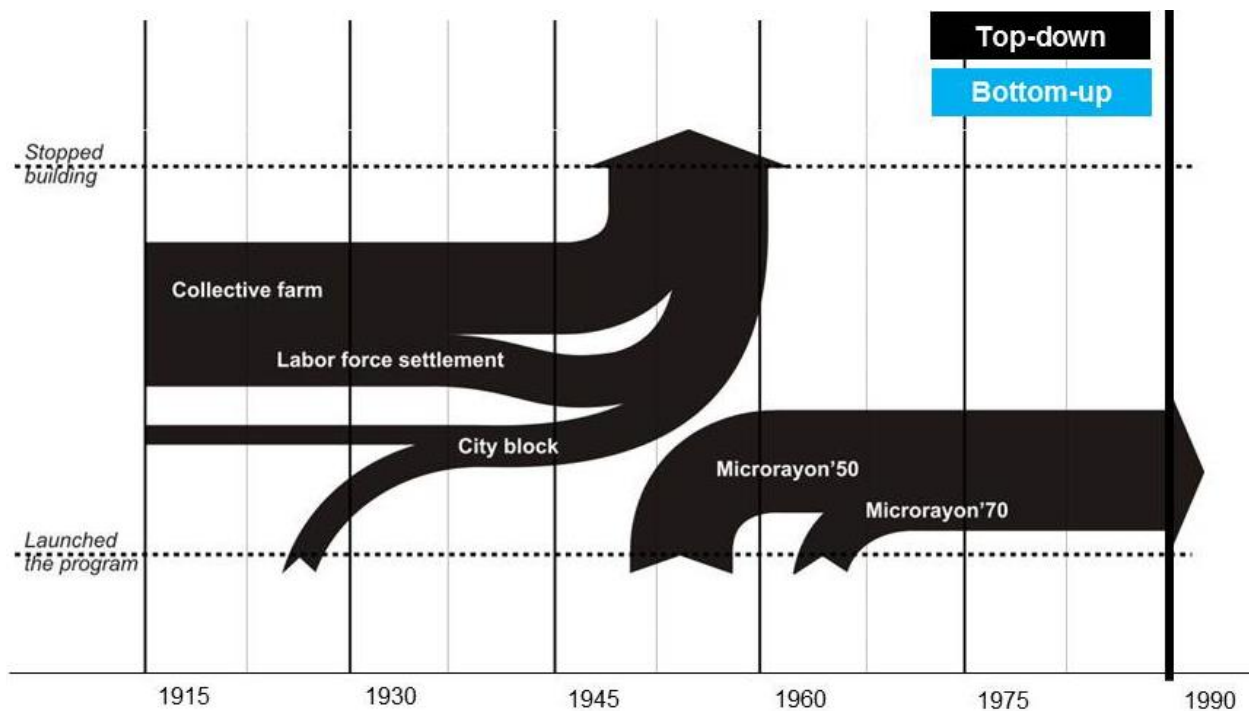
Figure 2.11 *General description of the process of settlement typology formation in Moscow*

These diagrams show the shift from socio-spatial diversity of the 20-30s with complex relationships in-between urban and rural, to the low-density and homogeneous settlement type that is still replicated in contemporary urban expansion in Russia. Microrayon, a pattern of urban growth is an object of many studies around the world and compared to the low density and low diversity suburban growth in the US. Even though the population density of microrayons is relatively high due to the height of the buildings (mostly 12-22 story buildings) the built-up density is noticeably low (from 4 to 10%), with a large percentage of surrounding "lawns" that are not used by most residents and end up being dead unusable space.

If generalizing, the analyses of Russian urbanization show that by 1990 (when neoliberalization began) the urban environment had become very low diversity in the form of a limited number of different component types. Even each city usually only had one or two different industries. For example, the industry in my home city was almost all steel production. Most of the area was oriented towards middle class citizens involved in the industrial sector, in

34

an attempt to achieve high efficiency in production. Therefore most of the city was locked into a single space-economy relationship that creates homogeneity on all levels of socio-spatial and economic development (Fig. 2.12). The pattern of homogeneity of all the components became stronger after Russian neoliberalization. Microrayons remained the primary building typology, the amount of residential development has decreased, and simple space-economy scenario has also been maintained.
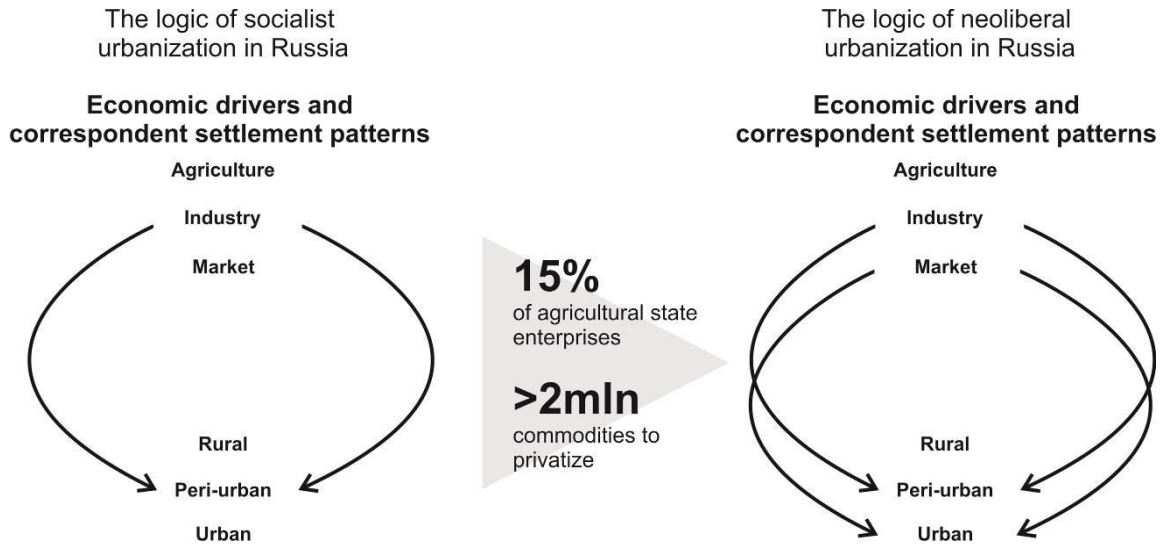
Figure 2.12 *General description of changes in the space-economy scenario, shown as connections between a major economic driver and correspondent to it settlement type in Moscow, Russia*

Summarizing these trends I refer to the first chapter and redefine the process of capitalist urbanization once more by using these analyzed above examples. The modern process of urbanization, as analyzed by many, lead to the continuous reproduction of space in the race for capital accumulation (Angel, Sheppard, & Civco, 2005; Bergmann & Sheppard, 2009; Leitner, Sheppard, & Sziarto, 2008). Considering continuous reproduction of space the scholars mostly refer to the ability of government to achieve the most efficient and beneficial outcomes in terms of capital accumulation patterns of socio-spatial development. The later 50-70s typology of urban settlement types in Russia can serve a perfect example for this logic.

These patterns of suburban, non-productive, and homogeneous growth is a cause for current social and economic problems, but also, from the view complexity theory, these patterns

have a tendency to lead the system into crisis in reaction to changing conditions and
perturbations.

To summarize the pattern of small-scale diversity in Russian urban planning, Russia tried
to manage the urban growth and generate new kinds of settlement typologies during
neoliberalization, however, the urban development prior to confronting neoliberal restructuring
had already depleted the potential of the Russian cities by suppressing them under the 70 years of
central planning and continuous reproduction of cheap, cost-efficient, and prefabricated urban
environments that served a low diversity of industrial activities.
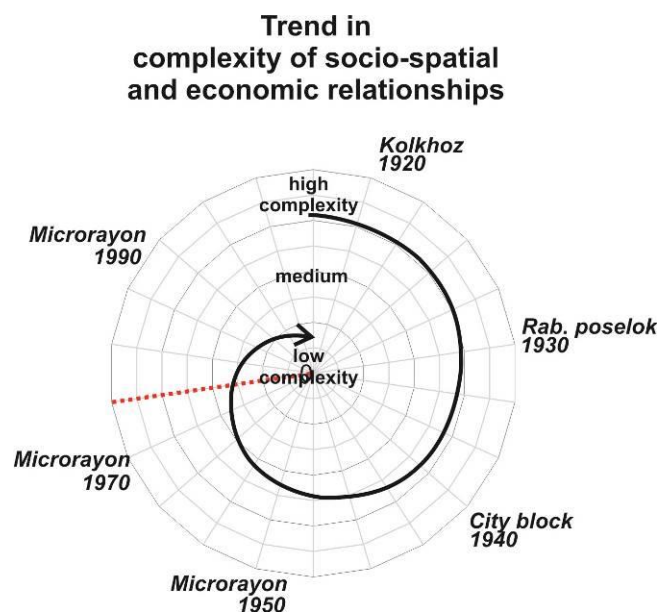
Figure 2.13 *Conceptualization of the trends in socio-spatial and economic changes in
Moscow during the process of neoliberalization*

This socio-spatial homogeneity partially played a role in the failure of neoliberal
transition in Russia in the 90s, which included major declines in GDP, social instability, and low
volumes of residential construction. During this time, there was an ignorance of how urban
planning could be a tool for economic problem solving. Even though, speaking realistically, the
resulting transitional outcome appeared to be the best scenario possible under the conditions of a
real socialism (Pivovarov, 2003), the urban environment was, is, and will remain stagnant if the
same pattern is recreated (Fig. 2.14). This hypothesis is based on the comparison with urban
topology in China.
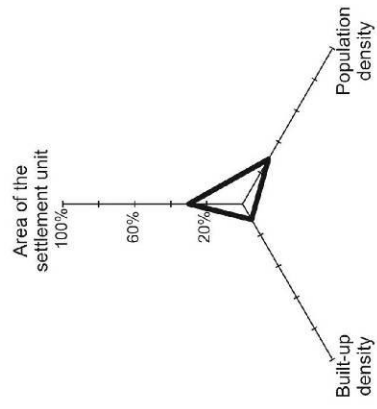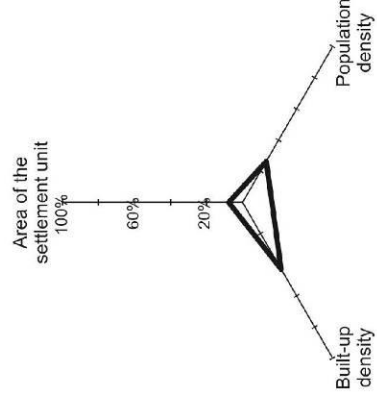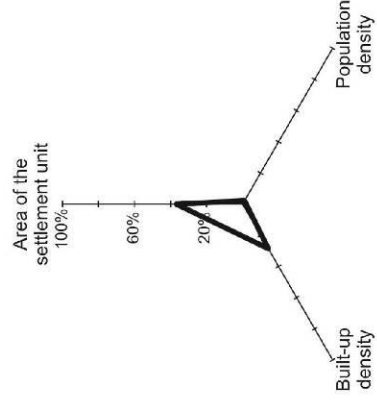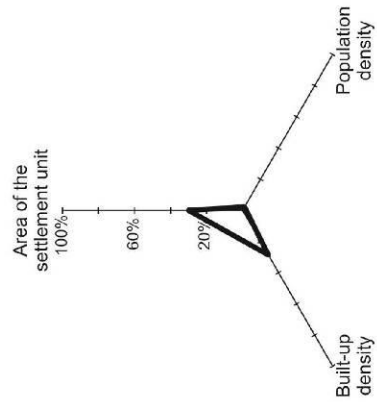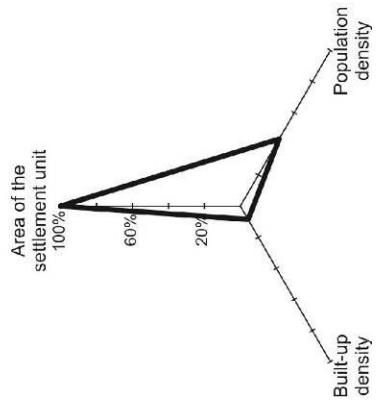
Figure 2.14 *General attributes of each urban-rural settlement typology that was built-up as a reaction to certain socio-economic situation at a time. For Moscow, 1920-2011*

China, similar to Russia, underwent two dramatic urban transformations in the half century from 1950 to neoliberalization: first, through a slow urbanization process controlled by Mao in the 50s, and second, moving away from socialist ideologies to neoliberal position of Den Xiaoping on urban planning and socio-spatial development in the early 80s. The example of extremely heterogeneous and complex patterns of neoliberal urbanization in China differs substantially from the conditions of transitional outcomes in Russia.

- *"Among the many facets of urban transformation since 1978 (in China) are a more heterogeneous urban population, rural-urban migration, spatial reorganization through urban land-use change, new housing development, globalization, suburbanization, polycentric restructuring of urban form, and changes in the spatial/administrative systems of cities" (Ma, 2002).*

In the context of this analysis I make an emphasis on the conditions of the socio-spatial morphology prior confronting the neoliberal change and the results after it. In comparison to Russia, socialist urbanization in China didn't lead to the exhausted potentials of socio-spatial environment. In terms of the settlement typology, Mao's anti-urbanism resulted in creation of a powerful unit of socialist landscape and a new socio-spatial structure – "danwei work unit". The danwei was the only structural and typological component that was created during the socialist urbanization in China. This settlement typology was injected into the rural socio-spatial landscape and doing so - created a unique dual character of emergent urban patterns.

- *Danwei have been the basic spatial and social cells of Chinese cities under socialism each with a clearly defined spatial boundary, marked most frequently by a wall or fence with one or more gates. For factories and universities, the territory of a danwei is generally separated into workspace and residential space. In the prereform era, people of such danwei lived together in apartment buildings where social interaction was intense, social cohesiveness strong, and social inequality less pronounced than in the presocialist and postsocialist periods (Ma, 2002).*

These rural areas were called "people's communes" created a second distinctive type of the settlement typology in China that is rural, based on agricultural production and collectivist social organization. Danwei work units in combination with these people's communes and restrictions on urban-rural population mobility created a system with a unique duality of the

socio-spatial pattern that consisted of a combination of dense urban and completely rural patterns of growth (Fig. 2.15) (Huang, 2012; Liu & Wu, 2006; Ma, 2002; Wang & Yao, 2003).

Figure 2.15 *Representation of a "Chinese unit", Wang, 2013. Research project at AA School of Architecture, London*

China confronted the neoliberal transition in 1978 with contrasting combination of two distinctively different socio-spatial system of rural and urban, which partially gave a release of new potentials and emergence of the wide range of new settlement typologies. Confronting neoliberal restructuring an already heterogeneous urban pattern became even more heterogeneous, creating very unique forms of urbanization. Many scholar refer to this unique character of the emergent urbanization as "bottom-up urbanization" (Gee, 2010; Huang, Lu, & Sellers, 2007; Huang, 2012; Xie, Batty, & Zhao, 2007). The character of neoliberal outcomes in China differs from others, partially due to the gradual transitional policy chosen by the government or due to the released potential of the "preserved" urban environment during the socialist period the socio-spatial system.

First, the former collectivist farms turned into the privately run ones through softening of the restrictions on business and gradual liberalization of agriculture during the first privatization program launched by Den Xiaoping in the 1978. Privately run farms became a flourishing settlement typology under the capitalist economy (to be particular - capitalist agriculture with unique Chinese characteristics) and ordinary farmers were able to open up their local markets and create a higher profit for their own families. The other type of rural settlement typology that emerged during neoliberalization was Township Village Enterprise (TVE). Transformed partially from the people's communes, these types of settlements were more urban than rural, but still rural in comparison to the UN definition of urban (UN World Urbanization prospect, 2011). Serving the role of a connector between rural and urban, TVEs helped to raise rural income, absorb rural surplus labor and encourage competition in Chinese economy (Huang, 2012).

- *The value-added produced by these rural businesses increased from 6 percent of GDP in 1978 to 26 percent of GDP in 1996 (Naughton, 2007). In the 1980s, these rural businesses were the only source of competition to the incumbent state-owned enterprises at a time when foreign firms were still restricted and urban private firms were small. They undermined the monopoly of state-owned enterprises in both product markets and factor markets (in labor and capital). They played "a catalytic role" in China's economic transformation (Naughton, 2007).*

Even though Township Village Enterprises were owned by the local governments rather than by the private enterprises, they represent an incredibly efficient economic system, a paradox that is being studies by many scholars (Economies, 1995; Huang, 2012; Monkkonen, Wong, & Begley, 2012). Privately run farms and TVEs combined together created a basis for rural economy development under the regime of market capitalism, contributing to China's rapid economic growth (Fig. 2.16, 2.17).

Terry Mc Gee, the urban geographer from the University of British Columbia argues that the uniqueness of capitalist urbanization in China should be found not only in the development of privately run rural businesses, but in the natural bottom-up emergence of a unique form of suburban growth and a complex systemic phenomena, which he calls "desakota". Desakota are in the hinterlands of Asian cities, and morphologically characterized as highly productive, densely populated areas with distinctively strong economy and mobility of population. These

areas have tight connections to central cities, forming massive regional systems similar to an extended metropolis.
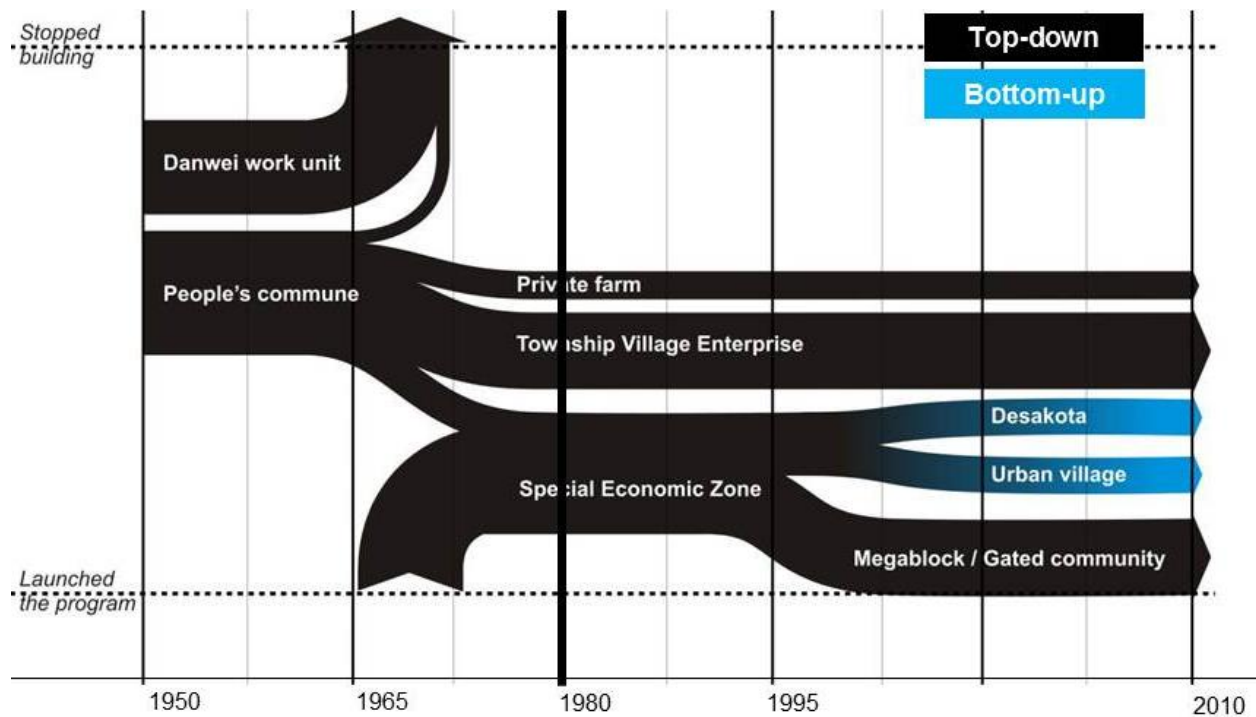
Figure 2.16 *General description of the process of settlement typology formation in Shenzhen*
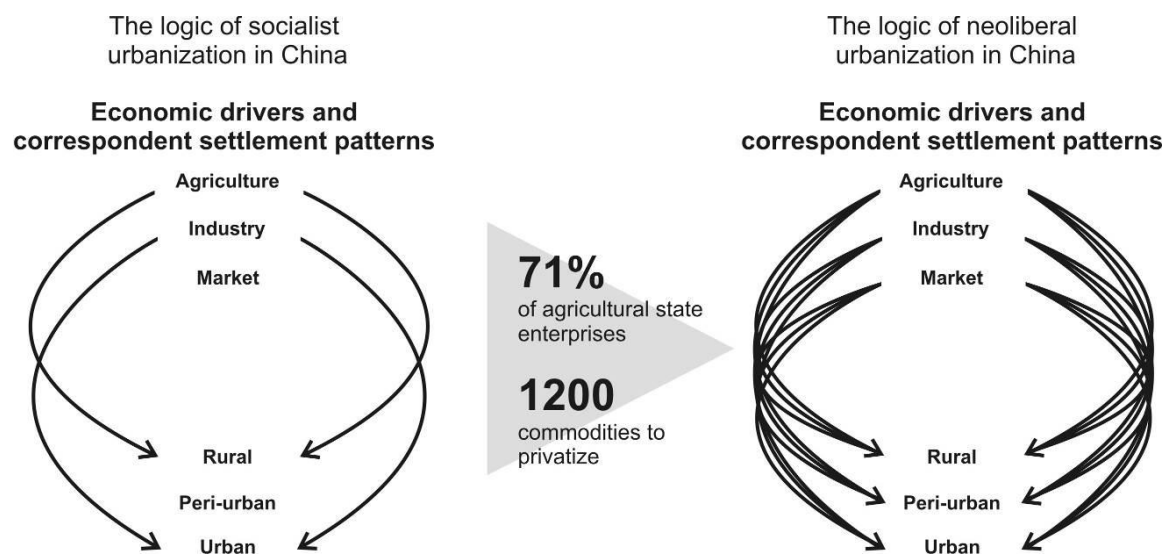
Figure 2.17 *General description of changes in the space-economy scenario, shown as connections between a major economic driver and correspondent to it settlement type*
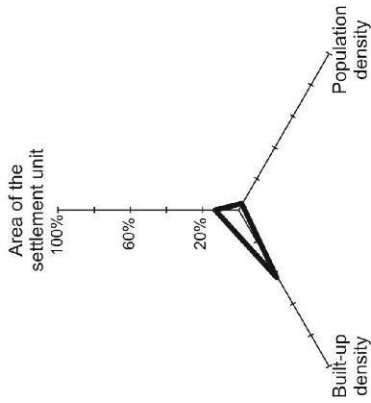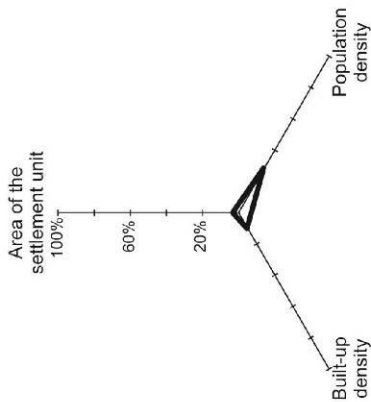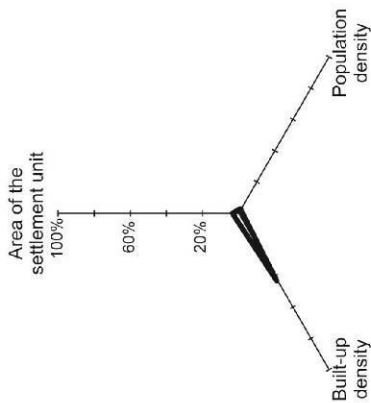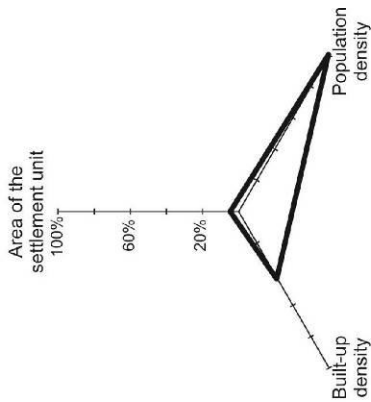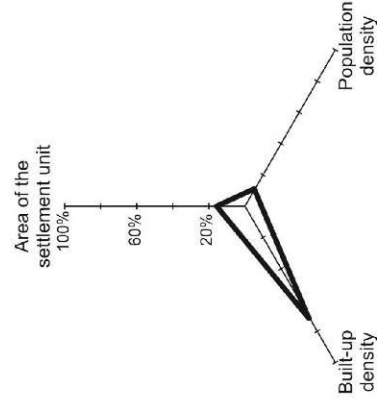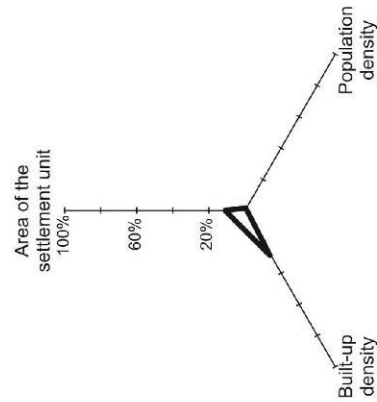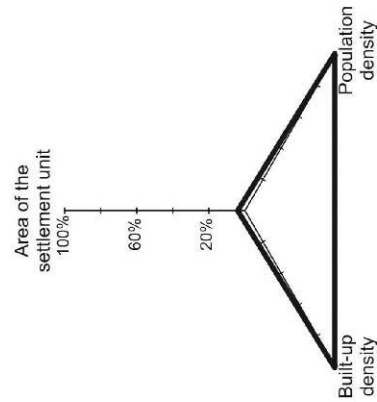
Figure 2.18 *General attributes of each urban-rural settlement typology that was built-up as a reaction to certain socio-economic situation at a time. For Shenzhen, 1950-2011*

- *These zones are characterized by high population densities, rapid growth of non-agricultural activities, labor mobility, occupational fluidity, and intense mixture of land with agriculture, cottage industries, industrial estates, suburban developments and other uses (Gee, 2010).*

The growth of desakota was possible due to the perception of these zones as "invisible" or "grey", from the view point of state authorities. From a demographic point of view these areas are highly dense with high fluidity and mobility of population mostly involved in small businesses, local industries and cultivation of rice. As studied by many, desakota is a main component of a bottom-up emergent socio-spatial structure in comparison to planned and top-down organized TVEs and privately run farms (Guldin, 1996; Mcgee, 2009; Moench & Gyawali, 2008; Xie et al., 2007).

The system of peri-urban and rural spaces creates a strong metropolitan network that was partially planned from the top-down (TVEs and privately run farms) and that partially emerged from the bottom-up (desakota). This complex character can be observed not only in the peri-urban areas of newly emerged South East Asian metropolis, but also in the urban core of the Chinese cities with the development of the first Special Economic Zone in the 1982.

Special Economic Zones were the first areas that are more free market oriented. The first and the most successful SEZ was established at the Shenzhen region in 1982 and caused the rapid urban growth from a small village to a city with population of 10 million in 20 years (Huang, 2012). The rapid development of SEZ caused the emergence of a new urban settlement typology called "mega-block" and "gated communities". Also, the rapid pace of urban development under neoliberal transition created a situation where the former villages were not wiped out under the pressure of urban expansion like in Russia, but they stayed in urban cores as extremely dense urban-rural areas and a source of social housing for the vast amount of rural migrants into the SEZ. In China, the combination of upper class *gated communities*, high rise urban *mega-blocks* and dense and compact *urban villages* created extremely dynamics and complex socio-spatial network (Fig. 2.18) with diversity of settlement components (Fig. 2.20), which in connections to privately run farms, TVEs and suburban desakota formed the newly emerged Asian Metropolis.

The idea of Asian dispersed metropolis, described first by Gakkai in 1960 is fascinating (Fig. 2.19). Due to maximum spatial interaction between central cities, suburbs, exurbs, satellite towns and desakota hinterlands this settlement type is not a system of core cities joined into a massive operational entity but a system of sub centers and in-between areas tying core cities into a regional entity, in other words "a metropolis with-out a core" (Guldin, 1996; Mcgee, 2009; Moench & Gyawali, 2008).

Figure 2.19 *Two models of urban agglomerations. Megalopolis of Gottmann, 1961 and Dispersed Metropolis by Gakkai, 1960*
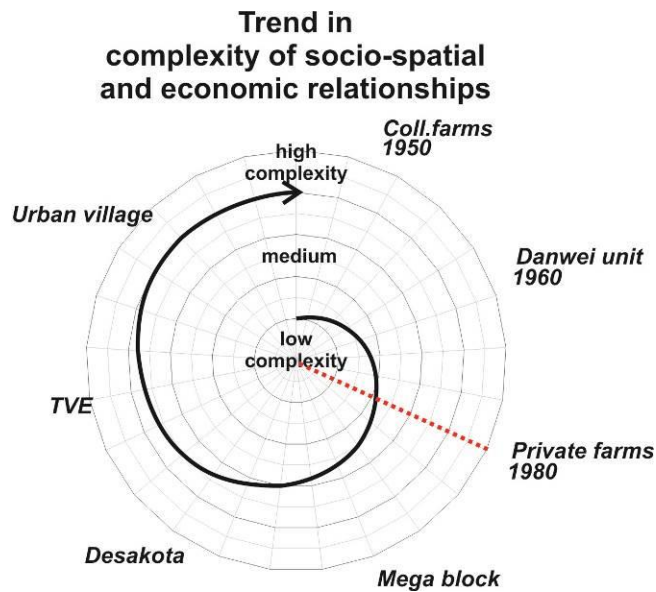
Figure 2.20 *Conceptualization of the trends in socio-spatial and economic changes in Shenzhen during the process of neoliberalization*

Chapter 3 - LARGE SCALE SOCIO-SPATIAL DYNAMICS UNDER THE CRITICAL NEOLIBERAL TRANSITION

Large scale socio-spatial dynamics: research question and design of the study

The aspect of multi-scalar heterogeneity and in particular large-scale modularity of the system is rarely explored in the field of urban studies, despite the wide consideration of the general role of heterogeneity in system's behavior.

- *In the case of cities, heterogeneity of settlement typology and its components plays a crucial role in urban system's functioning, but the model of urban development (in other words the pattern of spatial distribution of the components in the territory) can unintentionally promote homogeneity across the component's links and therefore decrease modularity of the system.*

Modularity refers to when the network has closely connected sub-networks called modules. Each module is composed of a group of components that interact primarily between each other, but do not interact much with components outside of their module. In urban environments modularity can lead to greater productivity and resilience because a highly modular system tends to move shocks and changes from module to module at a time therefore allowing system to transition gradually and with minimum loses.

The question I raise in this chapter is how does the local scale heterogeneity and diversity of the settlement typology influence the large-scale socio-spatial modularity of the urban pattern? Also, how does the pattern of urban development and a model of spatial distribution of the systems components affect the general modularity of the socio-spatial system?

To infer large-scale heterogeneity and modularity of a system I analyze transformations of the urban development models in Moscow and Shenzhen, and the changes in the spatial distribution of settlement components in the territory of the cities. By describing the trend of spatial dynamics we can recognize what tactics of urban development led to beneficial and

negative social and economic outcomes. This information can help to generate new models for future redevelopment.

There are many methods to study the patterns of spatial distribution of the components in the system and to organize this spatial data in order to observe major trends from it. For example, the method of the spatial autocorrelation allows us to measure quantitatively and accurately the dependency and connectivity in-between the spatial components of a system. Due to limited data, I aim to study modularity of the socio-spatial system through generating the maps that represent spatial distribution of settlement components (units) in the territory. First of I build a map for every settlement typology every 2 years for Shenzhen and 7-10 years in Moscow. Then I connect settlement components according to the character and degree of the connections in-between them. There are many types of connections we can trace in-between the components of the socio-spatial system, including:

- Social connections (residential to schools, hospitals, grocery stores)
- Economic (residential to jobs)
- Demand/supply (production to the distribution centers)

By connecting the settlement units in-between each other we can create a valuable network of systemic relationship, which gives us a chance to measure modularity of the system. For this analysis I use GIS mapping methods, and ArcView for 3d data visualization.

The data I used are the typologies of settlement units generated in Chapter 2 and measured attributes and information of their spatial locations through satellite images derived from Landsat USGS database. Landsat are available every 7-10 years for Moscow and density maps found in peer-reviewed papers for every 5 years for Shenzhen (Chang et al., 2012; Hao et al., 2013; Shen, 2008). For the map of spatial distribution of the settlement components I use publicly available OsmStreet data (© OpenStreetMap contributors) and technical resources of GIS spatial modelling.

Patterns of urban development and modularity of the socio-spatial system in Moscow and Shenzhen: data analysis

Even though diversity of the components (analyzed in the previous chapter) is a valuable attribute of any system, the pattern of city development or the structural organization of these components plays a crucial role in the system's behavior under changing conditions and shifts. If generalizing, we can consider two the most distinguished and most used models of urban development that can play crucial role in promoting or diminishing the degree of modularity of the system.

First, a "mono-centric" model of urban development, if not managed to promote diversity of modules usually creates a pattern of concentric rings that are connected only to the one center therefore generating a non-modular system with homogeneous connections of the components to the central core.

Early urban development of Moscow was based on mono-centric development and was built upon the XIX century experimental ideas in Western urbanism. The pattern of centralized urban development first of all aimed to address the problems of rapidly industrializing cities in the second half of the XIX century. The first major urban planning project to be implemented was developed for reconstruction of Paris by Baron Haussmann in 1853 (Fig. 3.1). Rapidly growing cities in the XIX century confronted many problems with pollution, contamination of drinking water, unorganized traffic and other extremes of the poor quality of life (Merlin, 1996).

The "recipe of Haussmann's renovation of Paris" first was implemented for reconstruction of the Moscow's master plan in 1935 (Fig. 3.2). The radical methods of standardization and transformation by cutting huge boulevards through the city fabric helped to deal with the problems of urban agglomeration, but also generated new problems in the long run.
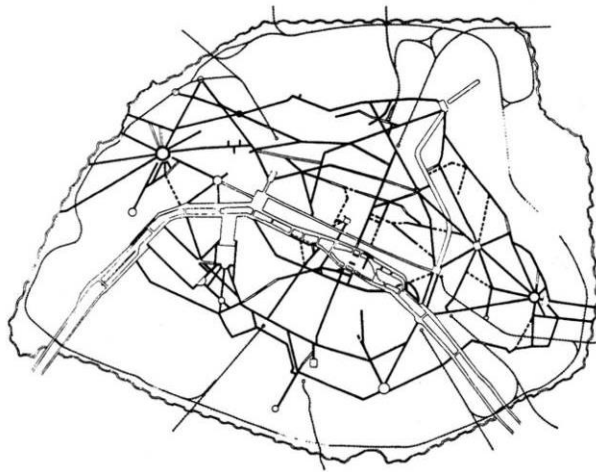
Figure 3.1 *The model of reconstruction of Paris by Baron Haussmann in 1853*

Figure 3.2 *Sakulin's model and the first master plan of Moscow, 1935*

Around at the same time (1898) the model of a garden city created by Ebenezer Howard appeared in the practice of urban planning (Meijers, 2007). Howard's ideas were implemented not only in the further developmental plans of Moscow, but across many Soviet cities. The later plan of a "New Moscow" created by Boris Sakulin represents the city as a gigantic agglomeration established using the principles of a hierarchical concentric urban development (Grigoryevich, 2009). This model was a foundation for the Moscow's city plan during yearly socialist period.

From the perspective of complexity theory, Sakulin's model of urban development could be considered as a highly heterogeneous, despite of the fact that heterogeneity was developed from the top-down using the principles of hierarchical distribution of the components. Moreover, this master plan of Moscow has provided prerequisites for future modular development of the socio-spatial system. The nodes (agricultural, industrial and market oriented) and connections in-between them (demand, supply) envisaged high systemic modularity.

Modular but concentric urban development worked on the short term until the capacity of the system to support diversity was exhausted with the launch of mass residential production program of the 50s and the 70s across the USSR. These programs promoted homogeneity of components across the settlement typology and turned the multi-modular pattern of urban

development into one highly connected module, focused on the city core, with the goal to achieve simplicity and therefore efficiency. The urban plan grew out of its proposed model prior to confronting neoliberal restructuring and achieved the current state in low modularity and homogeneity of its socio-spatial system.

The second model of urban development that is considered as "polycentric" or "linear" differs from the one of Moscow distinctively. Even though Shenzhen went through two similar to Moscow kinds of economic restructuring (Socialist in 1950s and neoliberal in 1980s), it achieved extreme heterogeneity of the settlement typology and, moreover, high modularity of its socio-spatial system.

As an apogee of Mao Zedong's socialist governing, the condition of the socio-spatial system prior confronting neoliberalization achieved the process of so called "destruction for construction" (Koolhaas, 2001). In other words, during socialism in China millions of people were sent to the countryside to work in agriculture thereby ignoring the process of urbanization. Pure industrialization without urbanization resulted in the model of decentralized urban development or de-urbanization, slowing population concentration in urban areas. The new strategies and models of urban development were not tested yet during Mao's politics of anti-urbanism. From the perspective of complexity theory we can observe that even though the socio-spatial pattern was only relatively complex and diverse during late socialist period in China, the urban-rural dichotomy, which was reinforced by Mao's politics, encouraged high modality of the system prior confronting neoliberalization.

Under the neoliberal pressures and Den Xiaoping's shifts from the ideology of socialism to "capitalism with Chinese characteristics" (Henderson, Appelbaum, & Ho, 2013), a new concept of the city development emerged in 1978.

First of all, the new city shifted from the idea of planning for standard masses to the "consumption of a place in a continuum by variation" (Koolhaas, 2001). The model of city planning was continuously readjusted in accordance with a change and was guided according to short term targets. In comparison to Moscow's mono-centric urban development implementing the experience of the Western models of urban expansion by hierarchy, Shenzhen used "chaos as a measure of their achievements in urban development" for the first time in the history of urbanism (Koolhaas, 2001). Opening of markets during neoliberalization turned farmers into real

estate developers and gave a birth to Chinese suburbia, complex poly-modal mixtures of urban and rural, industry, agriculture and market. Nodes of mixed "urban and rural" appeared with rapid urban expansion because state authorities considered them as a grey area that they would not control.

An alternative (antipode) for the crowded Western metropolis was a "linear" model of urban development (spatial distribution of the settlement components in a straight line (Fig. 3.4)), adopted by Shenzhen and moreover since the late XIX century associated with the socialist ideas. The idea of a linear city had arrived in China in the 1950s and was first implemented only for the development of Shenzhen in 1980s (Fig. 3.3). The linear development of Shenzhen during the first (1982) and the second (1984) master plan was a main instrument for organizing a flow of capital for successful functioning of relatively "capitalist" economy. A task of neoliberal urban development of Shenzhen was to connect the nodes of existing development into complex network of linear corridors, which played the role of major production and communication lines. "Enforced from top-down" and "emergent from bottom-up" linear structure of urban development played an important role in systems modular development in the long run. Using modernist strategies of zoning the planners subdivided the city into self-sufficient and independent blocks, therefore increasing modularity.
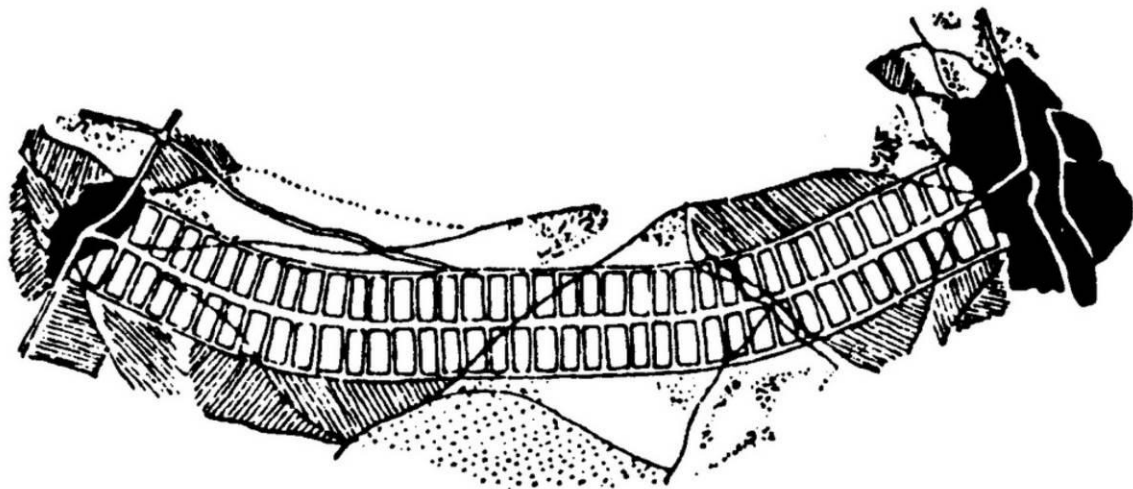
Figure 3.4 *A Spanish linear city as illustrated in El Lissitzky's Russland, 1930*
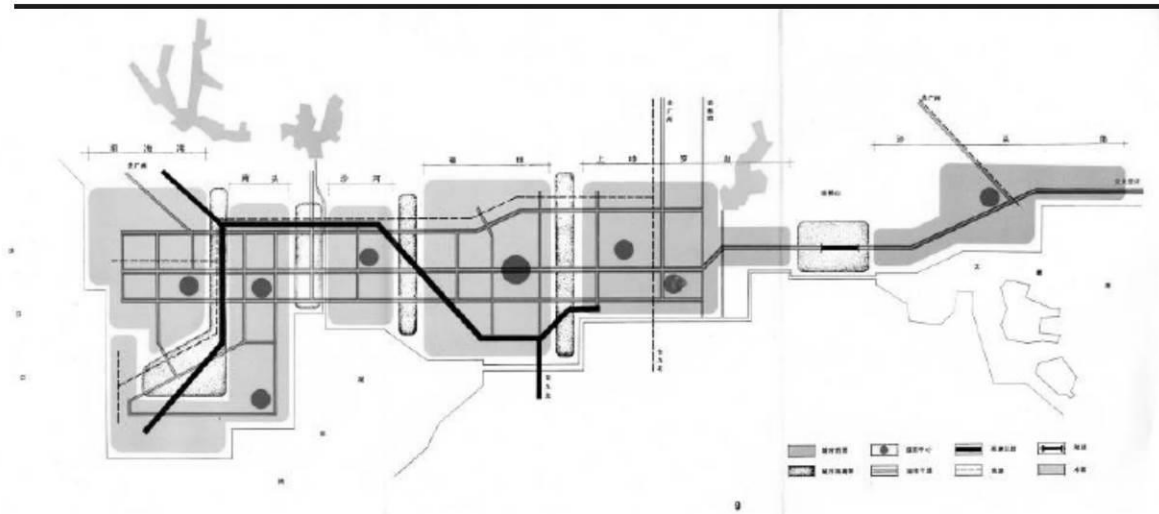
Figure 3.3 *First master plan of Shenzhen in 1986*

- *Doing so, "the system achieved a greater flexibility and adaptability to changes by controlling the urban growth partially from top down and switching the flow of governmental funding and attention from one node to another" (Huang, 2012).*

The increased modularity of the system was represented as a complex multilevel network of different links in-between the components such as: residence – factory – residence – factory; farming – market – farming – market (Fig. 3.5) (Koolhaas, 2001).
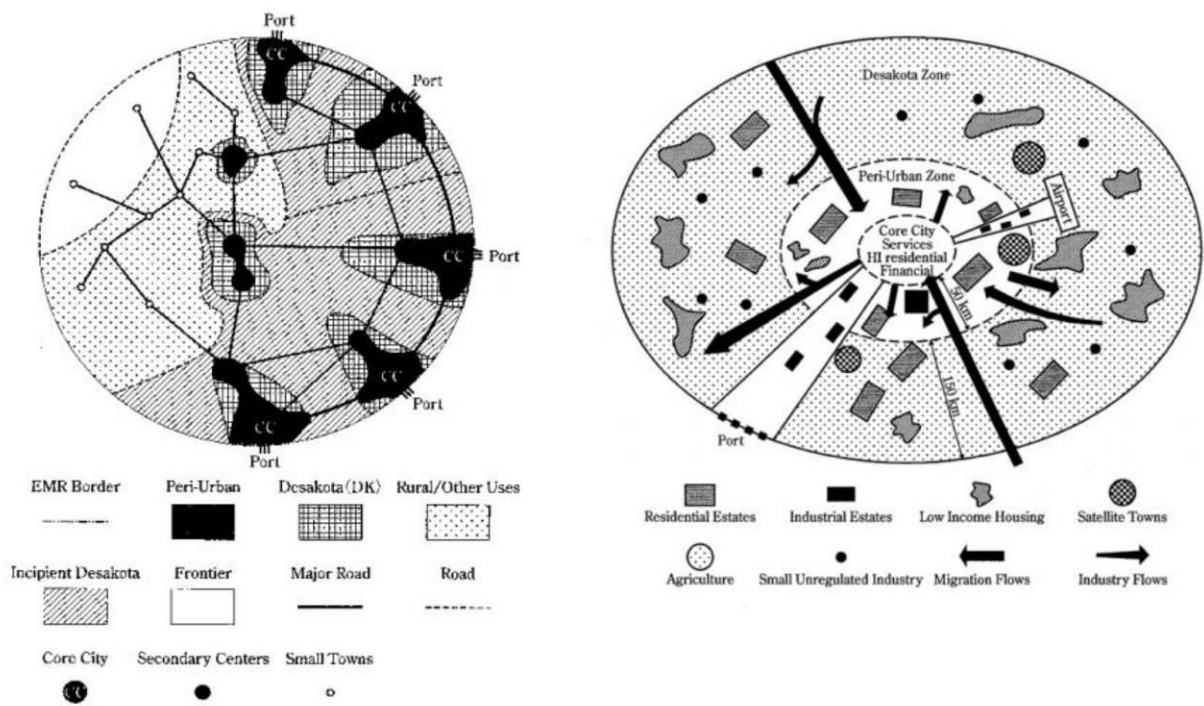
Figure 3.5 *Different conceptual models that represent the logic of China's urbanization process and emergent pattern, Mc Gee, 1996*

Mono-centric and polycentric patterns of urban growth represent distinctively different approaches to urban development. In the long run these models can either promote successful and productive urban system or stagnant and mono-modular urban development. Sometimes due to emergent bottom-up activities the system tends to "grow over" its planned model and these circumstances can lead to unpredictable kinds of urban dynamics. For a better understanding of urban dynamics it is also important to analyze the patterns of urban development using a real data. In the following figures I analyze patterns of population distribution in the socio-spatial system of Moscow and Shenzhen among with creating maps of spatial distribution of the settlement components in the territory of the cities.

First, analyzing the maps of Moscow we can recognize the trend of continuous homogenization of urban environment by mono-centric distribution of settlement components in the city (Fig. 3.6). With each settlement typology, created at a time, Moscow was growing ring by ring. Newer and newer settlement typologies were built-up further and further from the city center.

Legend:

- 3,526 - 4,000
- 4,000 - 4,750
- 4,750 - 5,500
- 5,500 - 6,250
- 6,250 - 7,000
- 7,000 - 7,750
- 7,750 - 8,500
- 8,500 - 9,250
- 9,250 - 10,000
- 10,000 - 10,750
- 10,750 - 11,500
- 11,500 - 12,250

Highest peak in
12250 persons/sq ml

Lowest peak in
3526 persons/sq ml

1959

1968

1986

2004

Figure 3.6 *3d map of Moscow's population densities distribution across the territory of the city. Made by using census data and different GIS and ArcScene tools and resources*

Legend:
- 1,343
- 4,000. - 7,000
- 7,000. - 10,000
- 10,000 - 13,000
- 13,000 - 16,000
- 16,000 - 19,000
- 19,000 - 22,000
- 22,000 - 25,000
- 25,000 - 28,000
- 28,000 - 31,000
- 31,000 - 34,000
- 34,000 - 37,000

Highest peak in
37000 persons/sq ml

Lowest peak in
1343 persons/sq ml

1990

2006

2011

Figure 3.7 *3d map of Shenzhen's population densities distribution across the territory of the city. Made by using census data and different GIS and ArcScene tools and resources*

If we consider the cycles of socio-spatial development, we can assume the following logic: *1. Urban expansion - 2. Replacement of the underlying pattern with the new one - 1. Urban expansion (Pivovarov, 2003).*

By promoting diversity through concentrating on bottom-up activities and individuals, the Russian government could create a modular and complex system based on the monocentric pattern of urban development like did Seoul or Paris and London. But the potential of the system to generate diversity was already exhausted under the "actually existing regime of socialism."

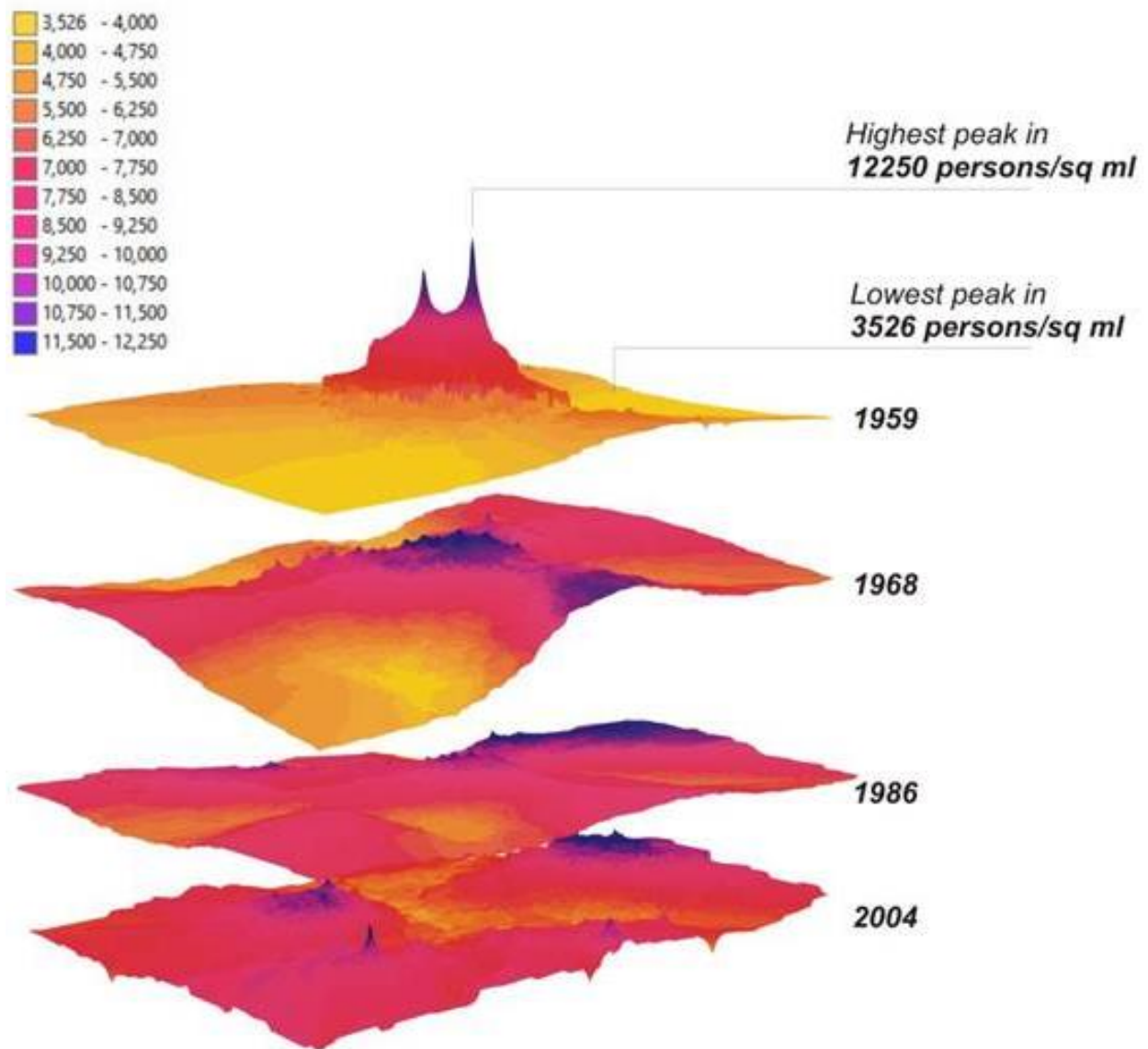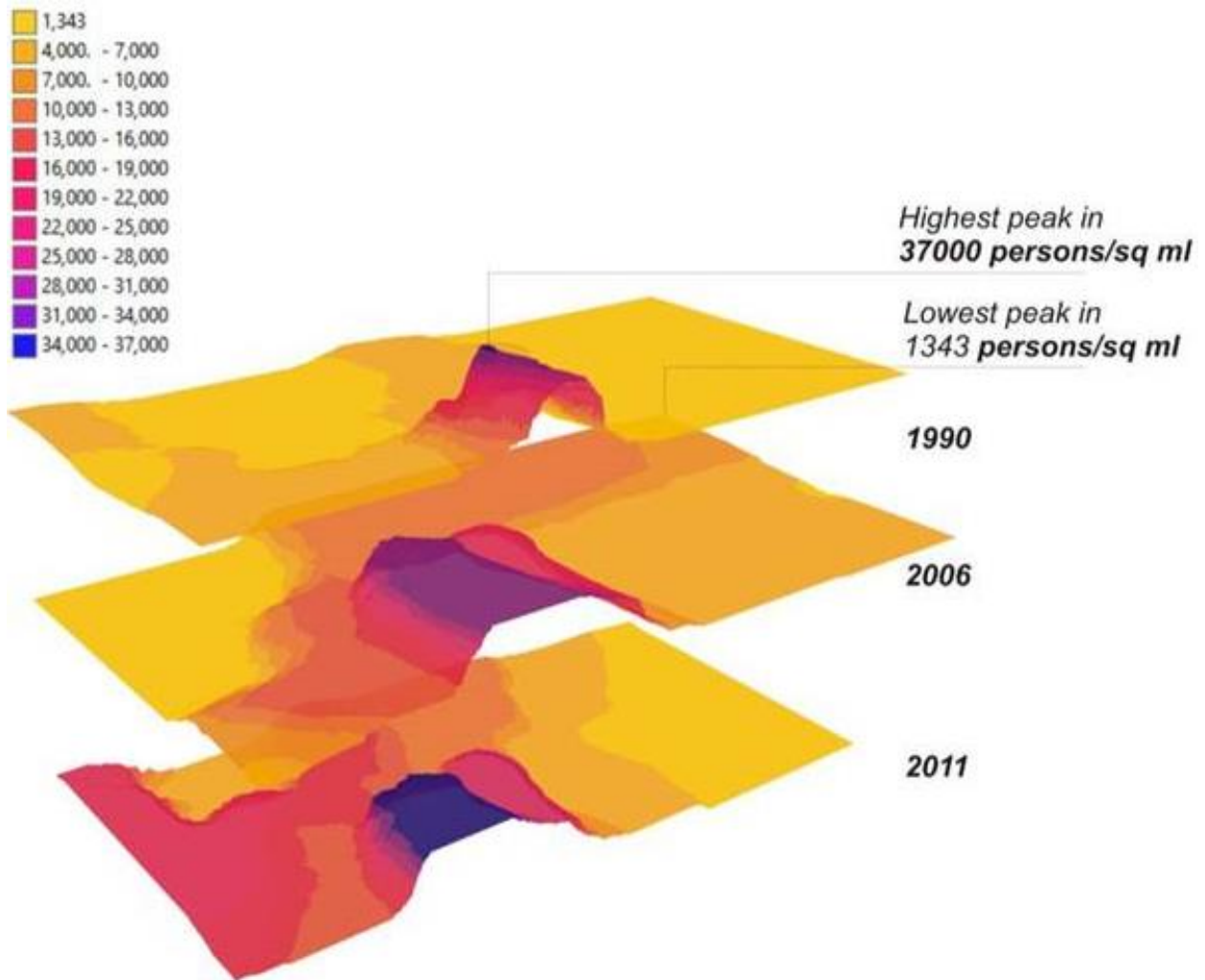*Second, Shenzhen's* patterns of spatial and population distribution, we observe a distinctively different story. During neoliberalization the population achieved high levels of mobility into and from urban areas, generating a chaotic bottom-up pattern. Diverse nodes were emerging without any structural organization as we can see on the maps (Fig. 3.7). Heterogeneity of the settlement components was partially created by citizens and partially controlled by government.

China's metropolis in general follows the unique pattern of urban growth, which can be explained through the logic of developmental cycles:

1. Intensification (growth of built-up area) – 2. Densification (increase in the height of the buildings) – 3. Urban expansion of not intensified areas – 1. Intensification (Hao et al., 2013).

In summary, two different patterns of urban dynamics reflect two important aspects of urban development of Moscow and Shenzhen.

First of all, these patterns correspond to the initial conditions of settlement typologies. Diverse or homogeneous, conditions of settlement typologies played a crucial role in the patterns of urban dynamics and future tendencies of cities development.

Second of, the patterns of urban dynamics of Moscow and Shenzhen were also partially influenced by the master plans that were implemented by the both governments.

- *As a result of this analysis I argue that all these aspects of urban development should be taken into consideration when planning to create the system which is heterogeneous on the multiple levels and scales, with the aim to increase its resilience and adaptability of changing conditions and pressures like neoliberalization.*

Chapter 4 - CONCLUSIONS, FUTURE DEVELOPMENT AND RECOMMENDATIONS

Discourse on complexity of urban systems prior confronting capitalist socio-spatial restructuring

Homogeneous and low-density patterns of urban expansion not only cause major environmental and socio-spatial problems, but also negatively affect the urban system's ability to adapt to changing conditions. During global capitalist urban restructuring, the qualities of urban resilience and adaptability to critical changes are essential.

The modern process of urbanization drastically reflects current socio-economic events, resulting in the emergence of unpredictable and novel kinds of urban dynamics and morphologies that create a major challenge for planners and state authorities. The process of urbanization is not anymore the simple "movement of people from rural to urban areas with population growth equating to urban migration" (UN World Urbanization Prospect, 2011), which possibly could be well managed by conventional Western policies of the late XIX century.

- *The modern process of urbanization is a byproduct of the global market capitalization and neoliberalization of economy, which encourages socio-spatial polarization, gentrification and accumulation of capital through space (Chapter 1.1) (Bergmann & Sheppard, 2009; Brenner & Schmid, 2014; Brenner, 1998; Merrifield, 2011; Weber & Puissant, 2003).*

It is important to reconsider the current processes of urban changes and generate an analytical framework for its analysis and evaluation. This question creates a big challenge for modern planners and socio-spatial theorists.

Through this work I made an attempt to participate in the global discourse on the consequences of the modern processes of urbanization by studying the patterns of urban dynamics that emerged under neoliberal changes. With this goal I analyzed two processes of urban transformations that happened under the conditions of neoliberalization in China and

Russia. Taking Moscow and Shenzhen as case studies I determined the reasons for distinctively different morphological outcomes after neoliberal transitions (Chapter 1.3, 1.4).

Even though the patterns of urbanization and results of neoliberal transition in China can be considered as extremely dynamic and diverse, they have been more successful than the ones in Russia. I argue that the unique experiences of Chinese and Russian neoliberal urbanization need to be conceptualized through their critical and theoretical reevaluation and comparison, with the aim to determine causes of different urban outcomes and use these outcomes to improve strategies for redevelopment of homogeneous patterns of urban growth. The same pressures and dynamics are emerging in the countries that are just now facing neoliberalization (Chapter 1.6).

In this research I conducted two conceptual analyses (Chapter 1.4, 1.5). First, I analyzed the fine scale transformations of the settlement typologies that usually reflect the reaction of socio-spatial system to socio-economic situations and changes. Second, I evaluated the spatial patterns of distribution of these settlement components in the territory of the cities with the aim to measure modularity of the urban systems prior confronting major neoliberal change.

Analyzing fine scale transformations of the settlement typologies I determined that the diversity of the components plays crucial role in the behavior of socio-spatial system under changing social and economic conditions (Chapter 2.1, 2.2, 2.3). After 70 years of socialism in Russia, the settlement typology was simplified and reproduced in order to achieve high efficiency through minimization of costs and resources, but not in the long run. This strategy, after the period of neoliberalization, resulted in low density, homogeneous and non-productive patterns of urban growth, which we are still experiencing right now. China, in comparison, managed diversity of underlying socio-spatial pattern prior confronting the neoliberal restructuring, resulting in the opening of a wide range of new types of settlement components and urban-rural morphologies. Analyzing settlement typologies is necessary because they constitute a major core of urban planning and can promote or diminish diversity of urban pattern as well as can the model of spatial distribution of the settlement components in the territory of the city.

Even though the diversity of the settlement components is an important factor, the model of urban development unintentionally can organize this diversity into the pattern that is homogeneous in terms of the connections in-between the components, or from the perspective of

complexity theory – exhibits low modularity of the system (Chapter 2.1, 3.1, 3.2). Urban systems with low diversity of inter components links tend to react poorly to unpredictable changes. Or as in the example of China's urbanization – highly modular system adapt to changing conditions slowly module by module at a time. Encouraged by government through the polycentric master planning and partially emerged from the bottom-up highly complex socio-spatial system created a rich network of different connections in between different modules. Whereas, the model of Moscow's mono-centric urban development that was adopted from the West and a current low diversity of the settlement components has promoted low modularity of the socio-spatial system in the long run. This quality of the urban system resulted in still lasting homogeneity and stagnancy of the patterns of urban growth on the periphery in Moscow and many other post-soviet cities.

In terms of the contribution in the field of critical urban studies, this analysis, first of all, creates an attempt to bridge two different systems of knowledge under the question of current urban transformations. Perspectives of Critical urban theory and Complexity theory enrich and reinforce each other in the way that is essential for more theoretical reconceptualization of modern processes of urbanization (Chapter 1.2). These two perspectives on critical transitions help to build a comprehensive theoretical framework for studying urban transformations under the regime of neoliberal restructuring.

Second of all, this research expanded the frame for comparing the reasons for divergence in transitional outcomes in Russia and China from the sociological and economic perspective into the more morphological type of analysis (Chapter 1.4). The emphasis on geographical understanding of the territories of neoliberal urbanization opens up the potential to determine possible underlying reasons for low density and homogeneous patterns of urban growth. Moreover there are valuable lessons we can adopt from the both examples of neoliberal restructuring and their corresponding patterns of urban dynamics.

Eventually, I hope this research, through its theoretical and conceptual contribution, will help to prove the importance of long term socio-spatial resilience and adaptability as crucial attributes of any urban system that are especially valuable when encountering major changes. In the time of globalization and capitalization of society it is hard to predict and overcome such consequences of capitalist urbanization as gentrification and social polarization that can partially

account for homogeneous suburban expansion. I believe that heterogeneous, modular and therefore resilient urban systems will promote democratic urbanization from the bottom-up and will stimulate unguided emergence of a wide range settlement components, which, if managed to promote diversity, will lead our cities to long term prosperity.

Future implementation and development of the study

This research was the attempt to apply theory and known conceptual frameworks for critical evaluation of the unique urbanization experiences and approaches to urban planning in the time of global neoliberalization. Current urbanization process requires fundamental reconceptualization, which, in my view, can be managed through a tight collaboration of academics and socio-spatial theorists with state authorities and policy makers.

If we consider the example of neoliberal urbanization process in Russia, with the goal to monitor resilience and heterogeneity of its socio-spatial pattern we need more fundamental changes than just the redevelopment of the approaches to urban planning, we need a proper restructuring of the state-economy system. Top-down planning strategies are necessary only in the case if they promote and encourage bottom-up socio-spatial activities and morphological emergence. The situation in China is drastically different from the one in Russia, considering its enormous variety of bottom-up structures and the emergence of non-planned socio-spatial territories. Thus, the problem in this case is that the emergent urban structures are still considered as "grey" areas in the point of view of China's state authorities, which can cause a lack of governmental support, management and, therefore, possible vanishing of these unique patterns in the near future.

- *The fragile architecture of urban systems and the tactics of their management, in my view, is hidden in the challenging ability of top-down authorities to promote bottom-up and democratic socio-spatial emergences and simultaneously be able to indirectly control and support their development in the long run. In these cases both examples of neoliberal urbanization in Russia and China failed to succeed.*

By comparing these two unique examples of urbanization and experiences of neoliberal urban restructuring I argue that we need to encourage urban planners and state authorities to

open their mind up to a more experimental and theoretical understanding of ongoing urban transformations. Doing so we can get a step closer to understanding that the fragility of our urban environment is in its unique capacity to reflect socio-economic changes and shifts resulting in the emergence of non-planned urban dynamics and bottom-up morphologies that can create a core for more responsible and democratic model of urban planning.

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