Shuhai Zhang

# SELF-ORGANIZING URBAN TRANSFORMATION AND ITS INSTITUTIONAL IMPLICATIONS

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# Self-organizing Urban Transformation and Its Institutional Implications

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This thesis relates to the ever evolving human settlements: urban regions, focusing on the mechanism behind those spontaneous urban transformations and seeking for the effective way of conducting planning and institutional intervention. This research embraces the complexity science by bridging the concept of self-organization and the understanding of urban changes which emerge in a bottom-up and spontaneous manner. We argue that self-organization is one of the fundamental driving forces for urban transformations. Self-organization is regarded as an alternative and innovative perspective which is helpful to cope with new challenges resulted from increasing uncertainties that planners have encountered in recent years.

Three main questions are central to the concern of this thesis: 1) What is the alternative solution for planning in the face of complexity, which is challenging both the technical and communicative rationales? 2) How should we understand and identify self-organization in urban transformation? 3) How can spatial planning, as a manifestation of collective intent, relate to an unintentional self-organizing process?

In order to answer the above questions, three types of cases from Beijing were studied. The first type including two cases is focusing on new urban development in the periphery of built-up area of Beijing urban region; the second type of case is about urban renewal of hutong area in Beijing inner city; and the third type of case is about functional transformation of a peri-urban village. These cases were studied by qualitative methods including desk research of literature reviews and document analysis, field visits, informal talks, questionnaires and semi-structured in-depth interviews. Based on these empirical studies, the main conclusion and contribution of this thesis are summarized into the following four aspects.

First of all, this research made an attempt to go beyond the debate on technical planning and communicative planning, both of which are mainly based on urban reality at certain moment, whether a factual reality (technical rationale) or an agreed reality (communicative rationale). Although both technical and communicative planning approaches work well under certain circumstances, they both show inadequate abilities in explaining the emerging uncertainties of planning issues. Both the technical rationale and communicative rationale emphasize the role of various actors and factors and how these can shape the urban environment, rather than how the urban environment develops in itself. This research concerns the matter of time, through which the planning situations keep changing and put influences on actors within urban system.

Secondly, this research built conceptualized framework of self-organizing processes. A self-organization process is a non-linear transformative process which follows mainly three steps: first symmetry break occurs, increasing tensions and reaching criticality; Second, adjusting behaviours respond to situational changes; And third new, spontaneous patterns will emerge. Such an analytical framework will be tested by empirical evidence from urban transformations in practice. Moreover, this paper examined the applicability of self-organization theories in a wider context by providing illustrations from China.

Thirdly, this research transferred the hard science rooted concept self-organization into social context and related it to urban system and planning. Therefore, this thesis contributes to the understanding of self-organizing process in urban society which is rare and deserves more exploration (Collier, 2003, Portugali, 2012).

Last but not least, this research reconsidered the role of institutions in self-organizing processes. We argue that in the face of complexities, institutional intervention can still find its way to influence on the urban transformations albeit not through a controlling manner. Instead of direct regulation, institutions are actually triggering, constraining and enabling the conditions which allow the happening of self-organizing process. Therefore, institutional settings should be aware of what specific conditions would be changed and get prepared for the consequences resulted from these changed conditions. In comparison to traditional institutions which focus on content and outcome at certain moment, institutional interventions on self-organizing urban changes have significant concerns on the conditions and a dynamic process. On the contrary, self-organizing processes can also lead to institutionalization. From such a perspective, urban transformations are the autonomous outcomes, as well as natural manifestations of interactions between self-organization and institutional intervention.

Deze dissertatie relateert aan de immer veranderende menselijke nederzettingen: urbane regio's, waarin de focus ligt op het mechanisme achter deze spontane stedelijke transformaties en de zoektocht naar een effectieve manier van het bedrijven van planologie en institutionele interventie. Dit onderzoek omarmt de complexiteitswetenschap door een brug te slaan tussen het concept zelforganisatie en het doorgronden van stedelijke veranderingen die op een spontane, bottom-up wijze ontstaan. We stellen dat zelforganisatie één van de fundamentele, drijvende krachten voor stedelijke transformaties is. Zelforganisatie wordt gezien als een alternatief, innovatief perspectief dat kan helpen om te gaan met nieuwe uitdagingen als gevolg van vergrote onzekerheden die planologen recentelijk hebben ondervonden.

Drie hoofdvragen worden in deze dissertatie behandeld: (1) wat is de alternatieve oplossing voor het bedrijven van planologie in het licht van complexiteit, dat zowel de technische als communicatieve rationaliteit betwist?; (2) Hoe moeten we zelforganisatie in echte, stedelijke transformatie begrijpen en identificeren?; en (3) Hoe kan de ruimtelijke ordening, als een manifestatie van collectieve intenties, worden gerelateerd aan een ongepland zelf-organiserend proces?

Om bovenstaande vragen te beantwoorden zijn drie typen casussen uit Beijing bestudeerd. Het eerste type omvat twee cases en focust op nieuw stedelijke ontwikkeling in de periferie van bebouwd gebied van de stedelijke regio in Beijing; het tweede type casus gaat over stedelijke herontwikkeling van een hutong-wijk in de binnenstad van Beijing; en het derde type casus betreft de functionele transformatie van een peri-urbaan dorp. Deze casussen zijn bestudeerd met behulp van kwalitatieve methodes die zowel bureauonderzoek van literatuurbeoordelingen en documentanalyse omvatten, alsmede veldbezoeken, informele gesprekken, enquêtes en semigestructureerde diepte-interviews. Op basis van deze empirische studies zijn de hoofdconclusie en de bijdrage van deze dissertatie samengevat in de volgende vier punten.

Ten eerste poogde dit onderzoek verder te gaan dan het debat rondom technische planologie en communicatieve planologie, die beiden gebaseerd zijn op een stedelijke realiteit op een bepaald moment, ofwel een feitelijke realiteit (technische rationaliteit) danwel een overeengekomen realiteit (communicatieve rationaliteit). Hoewel zowel technische als communicatieve planologische benaderingen goed werken onder bepaalde omstandigheden, laten beide beperkingen zien in het verklaren van planologische kwesties met opkomende onzekerheden. Zowel de technische rationaliteit alsmede de communicatieve

rationaliteit benadrukken de rol van verschillende actoren en factoren en hoe deze de stedelijke omgeving kunnen vormgeven, in plaats van hoe de stedelijke omgeving ontwikkelt uit zichzelf. Dit onderzoek behandelt de kwestie van tijd, waardoor de planologische situaties blijven veranderen en wat actoren binnen stedelijke systemen beïnvloedt.

Ten tweede vormde dit onderzoek een conceptueel raamwerk van een zelforganiserende proces. Een zelf-organiserend proces is een non-lineair, transformatief proces dat hoofdzakelijk drie stappen volgt: ten eerste treedt een symmetriebreuk op, wat resulteert in toenemende spanningen en uiteindelijk een kritiek punt bereikt; ten tweede reageren aangepaste gedragingen op situationele veranderingen (die zullen plaatsvinden – de derde stap); en ten derde zullen spontane patronen optreden. Een dergelijk analytisch raamwerk zal worden getest door empirisch bewijs van stedelijke transformaties in de praktijk. Bovendien onderzoekt deze dissertatie de toepasbaarheid van zelforganisatie-theorieën in een wijdere context door voorbeelden uit China te tonen.

Ten derde vertaalde dit onderzoek het concept van zelforganisatie, dat geworteld is in de natuurwetenschappen, naar een sociale context en relateert dit aan stedelijke systemen en planologie. Deze dissertatie draagt daarom bij aan het begrip van zelforganiserende processen in stedelijke maatschappijen, wat zeldzaam is en wat meer uitleg verlangt (Collier, 2003; Portugali, 2012).

Tenslotte heroverwoog dit onderzoek de rol van instituties in zelforganiserende processen. We stellen dat in het licht van complexiteit institutionele interventie nog steeds transformaties kan beïnvloeden, maar niet op een gecontroleerde manier. In plaats van directe regulering creëren instituties juist triggerende, belemmerende en stimulerende condities die een zelf-organiserend proces toestaan. Institutionele kaders moeten zich daarom bewust zijn van welke specifieke condities zullen veranderen en moeten zich voorbereiden op de consequenties die uit deze veranderende condities voortvloeien. In vergelijking met traditionele instituties die focussen op de inhoud en het resultaat op een specifiek moment, besteden institutionele interventies gerelateerd aan zelforganiserende stedelijke veranderingen significant aandacht aan de condities en een dynamisch proces. Integendeel, zelforganiserende processen kunnen ook leiden tot institutionalisering. Vanuit een dergelijk perspectief zijn stedelijke transformaties zowel de autonome resultaten, alsmede natuurlijke manifestaties van interacties tussen zelforganisatie en institutionele interventie.

SELF-ORGANIZING URBAN TRANSFORMATION AND ITS INSTITUTIONAL IMPLICATIONS[1]

# 1

# INTRODUCTION

1 This thesis has received funding from the European Union Seventh Framework Programme ([FP7/2007-2013] [FP7/2007-2011]) under grant agreement n° 295045, PEOPLE MARIE CURIE ACTIONS: PUMAH (Planning, Urban Management and Heritage) Project (FP7-PEOPLE-2011-IRSES).

## 1.1 THE DYNAMIC URBAN SYSTEM IN NEED OF ALTERNATIVE THINKING AND PLANNING

### 1.1.1 MAIN CONCERNS OF THIS THESIS

This thesis is concerned with the dynamic urban transformations occurring around us, exploring the mechanism behind these transformations and seeking better interventions from a planning and institutional perspective. This topic is not new but has progressed in parallel with the evolution of cities and our knowledge of urban systems. This research considers cities to be complex adaptive systems and argues that self-organization is a fundamental mechanism underlying various urban transformations, in particular those which include spontaneous and unexpected change. In addition, it is argued that the role of institutions and planning also needs to be reconsidered in the face of a dynamic and uncertain urban environment. The three main reasons for the necessity and importance of this research topic are addressed in turn below.

### 1.1.2 THE EVOLVING URBAN SYSTEM REQUIRES AN ALTERNATIVE PLANNING PERSPECTIVE

An ever evolving urban system continuously acquires (or loses), transforms and upgrades (or degrades) its functions and structures, which provides rich empirical data for the creation of new knowledge and perspectives. This knowledge and new perspectives contribute to a better understanding of cities and support the role of urban planning in relation to complex planning issues. In predominantly agricultural eras, the urban system was a simple combination of market facilities for trade and a defensive system of city walls. Direct physical intervention could be effective in creating and managing this function. Industrialization has greatly expanded the size of cities and the variety of urban functions, entailing cities with an efficient production system, and a considerable number of workers and consumers. The changing structures and the increasing uncertainties in urban society today demand more systemic thinking and sophisticated intervention packages.

Since the early 1980s, information technology has greatly improved the speed and efficiency of information exchange, empowering individuals to receive and also deliver information at the neighbourhood, city, regional, national and international levels. This fundamental change has enhanced interactions between individuals and organizations within and beyond urban systems,

leading to a network mode of urban society (Castells, 2010; Hajer & Wagenaar, 2003). Such a society manifests emerging characteristics, highlights interactions between individuals and increases social-spatial networks and dynamics within the urban system (Newman, Barabasi and Watts, 2006; Healey, 2006; Buckley, 2008). These new characteristics of the urban system are challenging the conventional wisdom of planners and demanding additional ideas to improve positively oriented planning and governance. More recently, the planning debate has discussed how to embrace more post-structural planning approaches as a necessary supplement to current theory and practice (Byrne, 2003; Boelens & De Roo, 2014).

The theoretical shift in relation to urban systems, moving from a Cartesian-Newtonian mechanism to the complex sciences – from system equilibrium to a complex adaptive system – also requires alternative thinking from the planning perspective (Allen, 1997; Batty, 2008a). The Cartesian-Newtonian worldview is characterized by mechanistic determinism, dualism and reductionism, and as the most profound paradigm in modern science it has been influential in planning and policymaking (Wallerstein, 1991). Newton's view of absolute space-time provided the framework for a fixed, predictable and rigidly law-abiding reality (Rynasiewicz, 2004). In Newton's universe, matter can ultimately be reduced to individual particles and various forces through which these particles interact. The movement of these basic particles is governed by the deterministic laws of nature (Heylighen et al., 2006).

The Newtonian paradigm provided support for urban planning and the development of the built environment. For example, various types and a large number of new urban facilities have been built based on a demand-supply model and aided calculations. The infrastructure of cities, such as streets, buildings and metro, is well organized on a blueprint, which benefits from analytical simplicity and positive modelling techniques. However, in recent decades the Newtonian worldview has been increasingly questioned. In theory, small changes in operating conditions can also lead to large disruptions in performance, or even disorder and chaos; similar causes can have different effects and different causes can have similar effects (Prigogine & Stengers, 1984; Waldrop, 1992). Gradually, there is a loss of normalities and generalities, while there is increasing confrontation with non-linearity, regressions, variability, circular causalities and the emergence of new forms. Increasing evidence from planning practices that does not align with the Newtonian paradigm has further stimulated interest in alternatives. For example, a municipality-wide traffic jam

may result from a small accident at the conjunction of a ring road; or housing prices keep increasing despite the implementation of a series of institutional regulations aiming to stabilize prices.

In summary, both the theoretical debate and planning practices have highlighted that urban transformation may be creative, based on a circular causality, non-linear and spontaneous. These new properties of urban transformation – which are not well explained by conventional knowledge – have prompted planners to seek alternative models. Among the many research streams, theories of complex adaptive systems have manifested an ability to deal with complex issues but are still underdeveloped with regard to urban issues (Portugali, 2012). As Weaver pointed out that organized complexity was becoming the cutting edge of science because most problems belong to organized complexity when controlled conditions or assumptions were destructed (Weaver, 1948). New thinking and approaches that recognize the urban system as an interconnected whole, within which the components and their interrelationships are in a constant state of discontinuous change, are needed.

### 1.1.3 SELF-ORGANIZATION AS A POPULAR BUT CONFUSING CONCEPT REQUIRES IN-DEPTH RESEARCH

Among the theories of complex adaptive systems, the notion of self-organization is fundamental and popular. 'Self-organization' refers to a process out of which new structures and functions can be created as emergent consequences of interactions between systemic constituents within the physical or social environment (Heylighen, 2008). Self-organization has gained attention in a wide range of disciplines in the past decades and quite recently has led planners to explore this non-linear concept in relation to the dynamics and uncertainties of planning (De Roo & Silva, 2010; Rauws & De Roo, 2011; Boonstra & Boelens, 2011; De Roo et al., 2012; Meerkerk et al., 2013; Zhang et al., 2015). The increasing popularity of self-organization has stimulated rich debate and discussion in the domain of planning. However, the increasing diversity and variety in the understanding and interpretation of the concept of self-organization is also causing problems. Implicit, over exaggerated or loose ways of using the concept might cause misunderstanding in the planning debate and consequently hinder the adoption and integration of the concept into planning theories. For example, not every bottom-up transformative process can be considered to be self-organization; not all efforts by the 'self' will lead

to spontaneous pattern formation; and not every self-organization process will lead to order in the social sense. At the same time, empirical studies on self-organization within urban planning and practice have been to a large extent inadequate. As Portugali has pointed out, 'planning and urban design ... have hardly as yet been examined from the perspectives of complexity and self-organization' (Portugali, 2012, p. 2). Therefore, it is necessary to conduct research to clarify and explore issues relating to the origin of self-organization, what it means, how it can be identified in urban development, and what the relationship between self-organization and institutions might look like.

### 1.1.4 CHINA IS UNDERGOING TRANSFORMATION WHICH REQUIRES A BETTER EXPLANATION AND BETTER INTERVENTIONS

China has gone through the most intensive urban transformation and dramatic economic development in the past three decades (Zhu, 2004; Yin, Bertolini & Duan, 2015). The content, process, situation, mechanism and consequences of Chinese urbanization are all popular and interesting academic research topics (Friedman, 2005; Abramson, 2006). In practice, there is an enormous amount of planning being undertaken, which provides a wonderful stage for planners to apply their expertise. Theories and practices have confronted changing institutional settings with respect to property ownership, top-down regulations and technical planning, which all guaranteed the provision of urban land and the result of intensive economic activity. On the one hand, the dynamics in Chinese urban development have provided rich empirical evidence to support the exploration of self-organizing processes. On the other hand, the conventional planning tools have gradually revealed themselves to be insufficient for understanding, explaining and dealing with these emerging urban transformations (Liu et al., 2010) that were arising from a new situation. This insufficiency is mainly related to the following aspects.

Firstly, growing linkages between local activities and global influences heightened dynamics in urban transformation. Chinese society used to be a hierarchical system (Farh et al., 1997; Stockman, 2000). Take investment for example. Previously, foreign investment would first be applied to the CBD areas of megacities such as Beijing, Shanghai and Guangzhou, then investment from megacities would go to middle-sized cities and from middle-sized cities to small cities and towns. More recently, such a hierarchical linear connection has been gradually changing. Locals are gradually coming into direct contact with global investors and cooperating directly with international enterprises. For example, this occurred when McDonalds opened a new shop next to a traditional Chinese

courtyard (*Siheyuan*); and when Adidas set up its factory in a small Chinese town it employed half of the local residents. These changes indicate a network-style of interaction in urban economic activities, which has replaced the hierarchical structure, and this fundamentally influences the mechanisms behind urban transformation.

Secondly, there has been a shift in the State's development strategy, from centralization to a more decentralized pattern, which provides more freedom for bottom-up initiatives (Breslin, 2000; Lin et al., 2014). The centralized or polarized strategy was very effective in boosting the Chinese economy in the initial period of reform in the 1980s. This was due to its efficiency in gathering resources, the organization of production and the scale of the economy (Lin et al., 2003). However, the drawbacks of this policy soon started to become apparent. For example, the polarized policy aggravated regional disparity (Li & Haynes, 2011). In 2003, the highest GDP per person in Chinese cities was about 15 times that of the lowest. Regional disparity has threatened sustainable development, causing problems such as massive migration to megacities, safety issues, congestion and environmental issues. Another negative consequence of the polarized policy is that bottom-up innovation is restrained by top-down regulation. Small private companies are at a disadvantage in the competition with state-owned enterprises. As a response to negative consequences resulting from the polarized policy, the State's development strategy was reoriented to encourage the decentralized distribution of public investment aiming to trigger bottom-up innovation. This new development strategy aimed to shift the economy from one driven by state investment to a consumption-driven economy, and to stimulate regional cooperation and integration. All of these new changes loosened regulations and provided more freedom for bottom-up initiatives.

Thirdly, as mentioned in the previous section, information technology has fundamentally changed the way individuals communicate, in China, as elsewhere. Information and knowledge are widely and efficiently distributed throughout urban society. Thus, the process of planning and policymaking becomes more transparent to individuals. People are informed, the processes are explained and they are involved in these processes. With abundant online information, individuals can analyse the potential effects of situational changes and take action or respond quickly, which can significantly influence urban development. For example, the implementation of a new policy constraining car use (e.g. prohibition on use during a specific period or at a certain place) will lead individuals to look for alternative modes of transport, which collectively may lead to a spontaneous new pattern of transportation. Such a change requires

a corresponding adjustment in understanding and intervention in the urban system.

On the basis of the above we can see that there is both a theoretical and practical need to explore alternative ways of thinking about current urban transformation and planning. In the face of complexity and uncertainties, the improvement of governance and planning needs non-linear thinking – outside the conventional box. The exploration of such an alternative perspective is the main concern of this thesis, which explores a new domain of knowledge: complex adaptive systems and self-organization.

## 1.2 THEORETICAL CORE: COMPLEX ADAPTIVE SYSTEMS, SELF-ORGANIZATION, URBAN LAND USE AND SPATIAL PLANNING

This section will elaborate the theoretical foundation of this thesis, which primarily concerns self-organization and spatial planning. We regard the urban system as a complex adaptive system, which we will consider before introducing the concept of self-organization, understood as a mechanism that allows such an urban system to acquire a new pattern. The concept of self-organization will also be related to transformations in urban land use. Therefore, theories of complex adaptive systems, self-organization, urban land use and spatial planning will be discussed respectively.

### 1.2.1 COMPLEX ADAPTIVE SYSTEMS

An urban system is a typical complex adaptive system, composed of a very large number of components which, as elements of the system, interact in an iterative and recursive manner. In a complex adaptive system, the whole is more than the sum of its parts and much can emerge from little (Holland, 1992). It is impossible to separate the behaviour of individual elements from their context in order to simplify a problem. The complex adaptive system is *complex* in the sense that the sub-systems and individuals are such that their influence on the system cannot be evaluated in concrete terms. The complex adaptive system is *adaptive* because it is able to respond, adjust and absorb changes in the environment. Due to these characteristics, complex adaptive systems are able to adapt to major contextual changes and create new patterns spontaneously out of an apparently chaotic environment. The ability to adapt to environmental change and to create new patterns is the result of the interactive

networks of agents and the various flows they create (money, resources, information) (Innes & Booher, 2010). These flows support individuals to adjust through actions that respond to environmental change.

We live in a world full of such complex adaptive systems, from a cell composed of a large number of interacting molecules to the brain operating as the entire complex of neurons, to the market composed of merchants and customers, to the city composed of individuals (Innes & Booher, 2002). Complex adaptive systems and the mechanism of pattern formation have been recognized and studied in a wide range of academic domains (Fleming & Sorenson, 2001; Ellis & Larsen-Freeman, 2009; Romero & Ruiz, 2013). Aggregations of molecules can form laser lights, flow patterns in fluids, crystals and cloud formations, without a prescription or instructions given beforehand. The Bénard phenomenon is one example: when a liquid in a round vessel is heated from below, at a certain moment, molecules of the liquid which at first moved randomly will exhibit a coherent macro-movement made up of hexagonal cells or parallel rolls (Benard, 1901). Using the analogy of a sand pile, Bak and Chen (1991) demonstrated what they called 'self-organizing criticality', where adding another grain of sand to the pile at some indeterminate point causes an avalanche and the formation of a new pattern without external intervention (Bak & Chen, 1991; Portugali, 2000).

Examples outside physics are also widespread. For example, the human brain is composed of billions of cells which, by virtue of their coordination, give rise to how we think, act, decide, remember, perceive, learn and develop. This is a genetic process of non-linear self-organization (Kelso, 1995). In cities, we might understand the unplanned, spontaneous growth of informal settlements to be the result of the collective effort of individuals and individual organizations. The mechanism behind the pattern formation in complex adaptive systems through bottom-up interaction is called 'self-organization' (Vesterby, 2008; Portugali, 2011).

### 1.2.2 THE EVOLUTION OF SELF-ORGANIZATION

According to the Longman Dictionary, 'organization' is defined as the arrangement or planning of parts so as to form an effective whole. Correspondingly, the literal meaning of 'self-organization' is an arrangement made by the components of the system themselves. However, when used specifically as the mechanism by which a complex adaptive system creates order out of chaos, the meaning of self-organization goes beyond such a literal interpretation. In this case, 'self-organization' refers to a non-linear process within which new structures, patterns or organizations emerge spontaneously as a result of

interactions between elements, parts, agents or actors that are not externally controlled, coordinated or regulated (Nicolis & Prigogine, 1977; Bonabeau et al., 1997; Bak, 1999; Heylighen, 2008). A review of the concept of self-organization below will indicate its key properties and clarify where this thesis stands theoretically.

### *(1) Self-organization within the natural sciences*

Self-organization is a well-known, important term and a general methodology which originated from the 'hard' sciences. Self-organization has been applied in a wide range of academic domains and theories, such as cybernetics (Ashby, 1947; Foerster, 1984), dissipative structures (Prigogine, 1978), synergetics (Haken, 1980), fractals (Mandelbrot, 1983), biology (Maturana, 1980; Kauffman, 1993, 1995), chemistry (Lehn, 1990), computer modelling (Langton, 1997) and self-organized criticality (Bak, 1996).

The concept of self-organization was first introduced by W. Ross Ashby (1947) in his works on cybernetics. According to Ashby, the principle of self-organization assumes that a deterministic dynamic system will automatically evolve towards a state of equilibrium. This idea was further developed by Foerster in the 1960s, who formulated the principle of 'order from noise' and developed what is called second-order cybernetics. This approach asserted that the investigator is part of the cybernetic system, emphasizing the importance of self-referentiality, self-organizing and the subject-object problem, among other things. Investigators of a system can never see how it works by standing outside it because the investigators are always engaged cybernetically with the system that is being observed. While cybernetics has since had a strong effect on systems thinking that is closely related to planning theory, at the time, the increasingly popular concept of self-organization did not receive much attention in planning theory, if any at all.

'Self-organization', as a word and a concept, was used mostly within the realm of general systems theory in the 1960s, and did not gain broad attention until the late 1970s through the work of Prigogine and Nicolis (1977) in the fields of physics and chemistry, who introduced the idea of dissipative structures and systems. They argued that the concept of self-organization entailed the notion of an irreversible 'Becoming', replacing Newton's static framework of 'Being' (Prigogine et al., 1977). In comparison to traditional theories of thermodynamics, Prigogine's dissipative structures theory explained how, within an open system, energy, matter and information can be exchanged with the outside of the system, triggering the system itself to change. Through dissipative mechanisms

a system receives energy, matter and information as input. This allows systemic parts to take action from within, changing and adapting to the outside world. This theory was also applied in urban studies, for example in the reinterpretation of central place theory through dynamic models (Allen & Sanglier, 1979; Chen & Zhou, 2006), where the formation and disappearance of urban centres is taken to be the spontaneous result of the collective actions of migrants and employers.

Prigogine's work initiated a new era of scientific research focusing on non-linearity, of which Hermann Haken's (1983) theory of synergetics is the most profound representative. While Prigogine emphasized external interactions, Haken's synergetics explained interactions within the system. At the system level, energy, matter and information is absorbed, used, transformed and passed on, resulting in both stable phases and dynamic transition phases. Haken's theory contributes to the grasping of complexity through the notions of systemic symmetry and symmetry breaking (Helbing & Vicsek, 1999; Hartman, 2000). In biology, the discussion of 'autopoiesis' by the Chilean biologists Humberto Maturana and Fransisco Varela (1974) also contributed to research on self-organization. Maturana and Varela's model of autopoiesis explains how subsystems are capable of reproducing and maintaining themselves. While these subsystems are considered to function more or less autonomously, they are 'structurally coupled' with their contextual environment. Through this bottom-up process, the system holds the subsystems together. A living system can self-reproduce and maintain its essential form. In addition to the above, self-organization has also been applied in the study of fractal geometry (Mandelbort, 1983); urban research, such as work on infrastructure systems and urban networks by Batty and Longley (1994); fractal theories and self-organized criticality (Bak, 1996); rich modelling research in chemistry (Lehn, 1990); physics (Wolfram, 1984, 2002; Manneville, 1990); computer and system science (Bonabeau et al., 1999); and of course in urban planning (White & Engelen, 1993; Batty, 2007, De Roo, 2010).

### *(2) Self-organization within the social sciences*

While it is apparent that the notion of self-organization has flourished within physics, chemistry, biology and the hard sciences generally, it is not the only root of this concept. Economics, sociology and even urban studies have also contributed to the study of self-organization.

Adam Smith's idea of the 'invisible hand' already informed an autonomous self-organizing mechanism within economic systems in 1776, although in an implicit manner. It came with the idea of an interaction process entailing coordination

as an unintended side effect in the pursuit of self-interest (Witt, 1997). Krugman (1996) illustrated the economic consequences of self-organization, arguing that: 'Self-organisation is something we observe and try to understand, not necessarily something we want' (Krugman 1996: p. 5-6). Economics is about what individuals do, and individuals are self-interested; moreover, the societal impact of these individuals (the parts) might be disappointing and might even contribute to a crisis, such as the global credit crisis of 2008. Thus, in response to an increasing interest in self-organization, Krugman reminds us that self-organization does not necessarily entail a positive outcome. This is crucial when considering the transfer of self-organization from the hard sciences to the social sciences.

Self-organization has also received broad attention in sociology (Luhmann, 1982; Byrne, 1998; Fuchs, 2003). Luhmann (1982) applied the concept of autopoiesis in the social domain, regarding society as a self-referential system, the basic element of which is human communication (Fuchs, 2003). Luhmann emphasized that communication among individuals is most important for the formation of social structures, arguing that it is through the permanent production or reproduction of communication that social systems are well maintained and reproduced (Luhmann, 1988). Such a view of self-organization denies that spontaneous results arise from independent individual behaviours, which is an important type of self-organization (Fuchs, 2003).

Luhmann's ideas on social self-organization were later developed and improved by Giddens in his work on structuration and agency theory, although the term 'self-organization' was not used explicitly in his work. According to Giddens (1981), the human being is neither a determined object nor an unambiguously free subject: 'All human action is carried on by knowledgeable agents who both construct the social world through their action, but yet whose action is also conditioned and constrained by the very world of their creation' (Giddens, 1981, p. 54). Giddens argued for a dialectical relationship between self-organization and institutional rules based on social structures and actions, with this relationship being a heuristic for the study of the relationship between individual actions and institutions, planning and policies.

### *(3) Response to complexity in the urban and regional domains*

Planning has its own history of response to the notions of systemic complexity and self-organization. In the 1960s, Jacobs implicitly expressed a non-linear notion of autonomous urban evolution and cities as organic wholes.

She asserted that something had gone wrong in the way we understand cities, which led us to make inappropriate interventions justified by planning. She proposed that a city should be viewed as a problem in organized complexity. Such complexity can lead to aggregate patterns, created by heterogeneous and coherent local interactions (Jacobs, 2010). Therefore, a relational and non-linear perspective is proposed. Similar to Jacob's ideas, Christopher Alexander also pointed out that bottom-up evolution is a key part of urban change. One of the earliest planners to discuss uncertainty in planning issues and the way we should deal with it is Karen Christensen (1985), although the method that is used is very much linear. Christensen classified planning problems into two dimensions: whether the planning goal is agreed upon or not, and whether the technology (means) is known or unknown.

More recently, self-organization has been increasingly accepted by planners and geographers, who are enriching the theoretical debate (e.g. Boonstra & Boelens, 2011; Portugali, 2000, 2011; Rauws & De Roo, 2011; Zhang et al., 2012). This research can also be linked to some extent to the research from various hard science disciplines mentioned in previous sections. For example, influential research on self-organization and cities by Portugali, with his concept of 'dual complexity' and 'cognitive cities', directly engages with synergetic theories, as well as brain and nerve research in biology.

### *(4) Summary: reflection on the concept of self-organization*

Based on the above, it is apparent that self-organization is a concept and a general metaphor which has been broadly used in various scientific domains. In general, self-organization designates a mechanism that allows complex adaptive systems to achieve order out of chaos through the interactions of system components. Self-organization is a spontaneously evolving process, giving rise to new structures, patterns or functions as a result of interactions between system components which are not externally controlled, coordinated or regulated (Portugali, 2012). However, this meaning of self-organization is too abstract and does not become concrete and instructive for practice until it is related to the analytical subject. For example, self-organization appears as the dissipation of heat in dissipative theory; the theory of synergetics interprets self-organization as a mechanism of laser light formation resulting from the coherent movement of molecules; in biology, the details of coordinated human movement are seen to arise from the synergetic assembly of muscle collectives (Kelso & Tuller, 1984); autopoiesis interprets the self-organizing process as the self-production of a subsystem in order to maintain the functioning of the

system. In summary, the abstract concept of self-organization has to be related to an analytical subject to acquire a specific meaning. This thesis relates self-organization to transformations in urban land use, exploring how macro land use transformations (physical and functional) relate to micro or individual activities within the urban system.

We should also keep in mind that since the meaning of self-organization as a concept originated from the natural sciences it might change slightly when it is employed in the social context. The elements of social systems – human beings – in comparison to particles (atoms, molecules, electrons, etc.) in natural systems, are more complex, in the sense that human beings are capable of transforming, reducing, elaborating, storing, recovering and utilizing information from outside the system. In social systems, individuals can be reflective and make adjustments with greater freedom and thus generate more possibilities. The thesis will also consider these differences in complexity when transferring self-organization into the social domain, examining what Portugali (2000) calls 'dual complexity'.

### 1.2.3 CONNECTING THE CONCEPT OF SELF-ORGANIZATION TO URBAN LAND USE

Urban land use constitutes one of the most widespread forms of human engagement with the environment (Harvey & Josey, 2004). The current state of urban land use, as well as changes to this, offers a comprehensive reflection of social and economic activities and institutional interventions into the urban system. Urban land use is not only a local environmental issue, but also has an effect on global climate change, ecosystem cycles, biodiversity and environmental pollution (Kalnay & Cai, 2003; Foley et al., 2005), all of which are closely connected with the sustainability and livability of human societies. Therefore, urban land use change has been an important issue in both academic research and policymaking: on the one hand, there is much scientific debate on urban sprawl, the notion of the compact city and optimal urban size; on the other hand, in practice, we find urban land development projects with public investment, and policies such as urban growth boundaries.

While urban land makes up only a small share of all land use types, it is the most active, dynamic and influential. Globally, urban land accounts for around 3 percent of the terrestrial surface, but produces 78 percent of carbon emissions and accounts for 60 percent of all residential water use, while 76 percent of all wood used for industrial purposes has been attributed to cities (Brown, 2001).

Urban land expansion leads to increasing motorized transport, air, water and noise pollution, energy consumption, a loss of agricultural land and a reduction in biological diversity (Randolph, 2008; He et al., 2011). Therefore, intervention is needed to control the speed and space of urban land use change and its negative consequences.

However, the demand for urban land continues to grow rapidly, due, for example, to the increasing numbers of urban residents, a demand for new and larger houses, industry, services and public facilities. The world has been in a rapid process of urbanization and this will continue in the near future. In 2007, the world's urban population surpassed the rural population and the United Nations expects that the world's urban population will have increased by 72 percent by 2050, from 3.6 billion in 2011 to 6.3 billion in 2050 (The United Nations, 2011). In China, the most populated country in the world, the percentage of the urban population exceeded 50 percent in 2011 (Chinese Statistical Bureau, 2012) and it is expected to reach 70 percent by 2030.

Based on the above, we can assume that urban land use change is inevitable and that it will be rather difficult to control this process due to the strong bottom-up demand. At the same time, there is an urgent need to reduce the negative consequences that accompany rapid urban land growth and, thus, planning and regulations are still required. The question thus becomes: What is the mechanism behind urban land transformation? How can self-organization be linked to such transformation, and correspondingly what is the best solution for planning and governance in a dynamic period of rapid change?

### 1.2.4 SELF-ORGANIZATION PROVIDES AN OPTION FOR THE EVOLUTION OF PLANNING THEORY

The evolutionary path of planning theory reflects a continual process of looking for answers to the key question: 'What is the best way to intervene in urban change?'. The answer has been enriched, revised and reconsidered from time to time as the idea of what a city is and how it operates changes. Some of these ideas brought about paradigm shifts in planning theories.

Cities used to be taken as a combination of buildings designed by architects and engineers. Before the 1960s, planners intervened through the direct design of urban elements such as buildings, roads, parks, etc. Cities were regarded as a blank canvas on which the most wonderful landscapes could be painted. Later on, planners started to realize that cities are not static entities but rational,

systematic wholes. In what came to be called 'rational theory', planning was then undertaken on the basis of a series of scientific analyses which aimed to find the best solution. As a systematic whole, the general functions and structures of a city were considered to be more than the sum of its parts. Cities were to be treated in terms of finding equilibrium and optimization. Corresponding to this view, planning theories moved from a design approach to a technical rationale and, in turn, to a communicative rationale. How did this come about? Critics of rational theory increased sharply following a period of decentralization and changes in the structure of governance, with the view of cities changing slightly from the notion of a rational system to the city as a constructive whole made up of stakeholders. Decisions on urban development were thus to be communicatively determined by the stakeholders.

The communicative planning approach has dominated planning theory since the 1990s, but cannot solve all the planning issues, in particular the increasing uncertainties appearing in planning over the past decade. These uncertainties have triggered debate on how cities operate and thus how cities can be managed. Innovative theories and alternative perspectives are needed to cope with this new challenge to planning. In this context, complexity theory, in particular self-organization theory, has found its way into urban and regional studies and has demonstrated its ability to offer new interpretations and approaches to complex planning issues. Self-organization, with its concern for the temporal dimension, the non-linearity of change and the dynamic conditions within which change occurs, provides an option for the further evolution of planning theory.

Research featuring the dynamic modelling of cities, such as the cellular automata model, the agent-based model and the neuronal network model, have prospered in complexity research on cities. While this has attracted broad interest in the potential of non-linear mechanisms to govern cities, it has also raised criticisms. For example, it has been argued that micro-level dynamics and qualitative information are poorly represented, that parameters can often be too aggregated and that emergent global outcomes may not always be easily anticipated (Gilbert & Troitzsch, 2005). As these multidisciplinary theories are grounded in the hard sciences, the application of self-organization to urban development and planning still needs a considerable amount of research, in particular regarding the social aspects.

## 1.3 RESEARCH OBJECTIVE AND MAIN QUESTIONS

The research objective of this thesis is to explore and reveal the mechanism behind urban transformation in which emergent urban change occurs in a spontaneous way. Moreover, we will reflect on and clarify the role of planning in the process of self-organizing urban transformation. In order to achieve the aim of the research, the following sub-questions will be answered: 1) What is the alternative solution for planning in the face of complexity, which is challenging both the technical and communicative rationales? 2) How should we understand and identify self-organization in real urban transformation? 3) How can spatial planning, as a manifestation of collective intent, relate to an unintentional self-organizing process?

In answering these questions, this thesis provides an innovative contribution to the field of planning. Firstly, this research goes beyond the debate between technical and communicative planning, both of which are mainly based on the assumption that at any given moment it is possible to identify a fixed urban reality, whether a factual reality (technical rationale) or an agreed reality (communicative rationale). Of course, both methods work well under certain circumstances, but both seem to be inadequate in the face of increasing uncertainties. This research takes into account the temporal dimension in which planning occurs – a context in continual flux which influences actors within the urban system.

Secondly, this research builds a conceptual understanding of the self-organizing process in the context of the theoretical debate in planning. A self-organizing process is a non-linear transformative process which follows three main steps: first, there is a break in symmetry, with increasing tensions, approaching criticality; second, adjustments in behaviour respond to situational change; and, third, new, spontaneous patterns emerge. Such an analytical framework will be tested using empirical evidence from urban transformation in practice. Moreover, this thesis will examine the applicability of self-organization theories in a wider context by providing illustrations from China.

Thirdly, this research transfers the concept of self-organization from the hard sciences into the social context and relates it to urban systems and planning, which is an unusual approach which deserves more exploration (Collier, 2003; Portugali, 2012).

Last but not least, this research is distinguished from the work of those who conceive of self-organization in a radical and revolutionary way. We do not wish to overemphasize or deny the role of either self-organization or institutional intervention in urban transformation. Instead, this research argues that urban transformation is the autonomous outcome, as well as a natural manifestation of, interactions between self-organization and institutional intervention. At the same time, traditional institutional intervention can still have a role in the transformation of urban areas, albeit through a different mechanism. Thus, this thesis reveals the bridge between the unintended process of self-organization and spatial planning, which intentionally intervenes in space and place with the intention of supporting societal wellbeing.

## 1.4 RESEARCH STRATEGY

### 1.4.1 RESEARCH FRAMEWORK

#### *(1) Ground of self-organization in urban transformation*

In this thesis, self-organization in urban land use transformation is understood as a process of spontaneous adaptation of a complex urban system to form a macro-level land use pattern (or function) due to the unintended, independent actions of individuals on the micro-level. In the light of theories of self-organization and complex adaptive systems, we build a theoretical framework to analyse and test self-organization in urban land use transformation.

Haken's theories of synergetics reveal the fundamental role of self-organization within the dynamic process of systemic mismatch and systemic order formation. According to Haken, a system is self-organizing if it acquires a spatial, temporal or functional structure without specific interference from the outside (Haken, 2006, p. 11). The system as a whole is composed of many subsystems. The subsystems may be atoms, molecules, cells, animals, or human individuals in the case of an urban system. Under certain conditions, these subsystems perform a well-organized collective motion or function (Haken, 2004, p. 24). When the situation changes, the system is able to transform itself into another state, with new functions or structures acquired through the mechanism of self-organization.

Based on this knowledge from synergetic theories, a new framework of urban transformation can be built from the perspective of self-organization (as shown in Figure 1.1). An urban region can be seen as a typical synergetic system (Haken, 1983), which means that the urban system operates on the edge of instability and achieves order through self-organization, which will lead to the emergence of new structures or functions. The appropriate state (structure or function) is achieved by maintaining flux of energy and matter through the system. State A can be well maintained in dynamic equilibrium until the moment when the conditions (energy, resources, institutions, etc.) which supported this equilibrium change through a trigger event. Such an urban transformation event can take various forms, on different spatial levels: a shrinkage or boost in the economy, a natural disaster such as a flood or earthquake, a change in state policy, and even the implementation of spatial planning on the macro level, or hygiene deterioration, or the aging of a community on the micro level. The trigger event will create instability in the urban system, causing a symmetry break. Such a conditional change becomes the initial phase of the urban transition. Increasing tension resulting from the symmetry break, if not fixed by planning or the market, will push the system to criticality and trigger adjustments by the individual parts of the system.

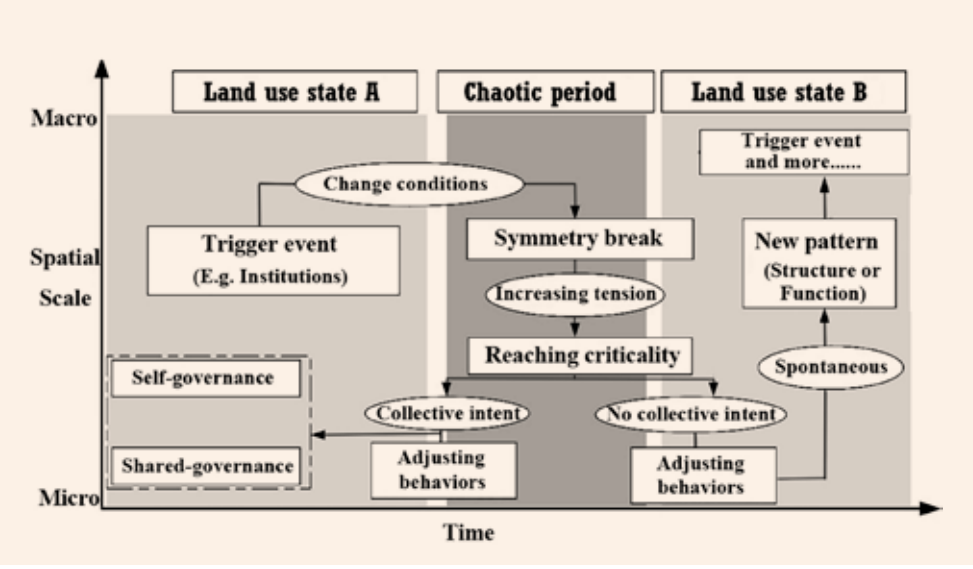


Figure 1.1

A self-organization framework of urban land transformation

These individual adjustments, as responses to the situational change that aim to improve individual welfare, are characteristically independent of each other and are not intentional. In the beginning, the individual adjustment might exhibit a distinct pattern, with various possibilities arising that might even contradict each other. On the system level, a chaotic period will be visible, or a period of non-identity. Nevertheless, at a certain moment these seemingly heterogeneous individual adjustments will spontaneously perform as a collective activity. Once the collective activity begins, the transformation process is irreversible, which will ultimately lead to a spontaneous pattern: an emergent State B. The unexpected spontaneous outcome, in turn, might bring environmental changes to the initial conditions and cause a new symmetry break. In such continuous interactions, the urban system is able to evolve and upgrade itself.

It must be emphasized once again that the individual adjustments are independent of each other. Individual actions are not intentional in any form. In a self-organizing process, it is of key importance to distinguish self-organization from other, similar bottom-up processes, such as self-governance and shared governance. In a process of self-governance, there is a collective intent which instructs individual actions. This collective intent is achieved by interaction, discussion and negotiation among individuals within the system. In a process of shared governance, there is also a collective intent instructing individual actions. However, the collective intent is not only created by individuals within the system, but also by external authorities.

### *(2) Relation of institutions and planning to self-organization*

Policymakers and planners have developed various forms of institutions (regulations, spatial policies, planning, etc.) to intervene in urban development, with the aim of creating the desired urban environment. As a collective manifestation of 'intent' in relation to urban land use change, planning will inevitably be confronted with self-organization, or the 'spontaneous' transformation of urban land use. What is the relationship between planning and self-organization? Here, we use two analytical figures to elaborate.

The first figure represents how institutions work when we take cities to be linear systems made up of causal relationships, a model which has been predominant in the planning field. In this case, the task of planners is to identify the underlying causal relationships and the input-output principles, on the basis of which the institutional intervention can be conducted in a scientific way. The changes achieved after the institutional input are considered to be the

institutional effects, while the changes that are not achieved, in addition to the unexpected changes, are ascribed to residuals which can be partially ignored and/or partially resolved by the improvement of institutions (see Figure 1.2).

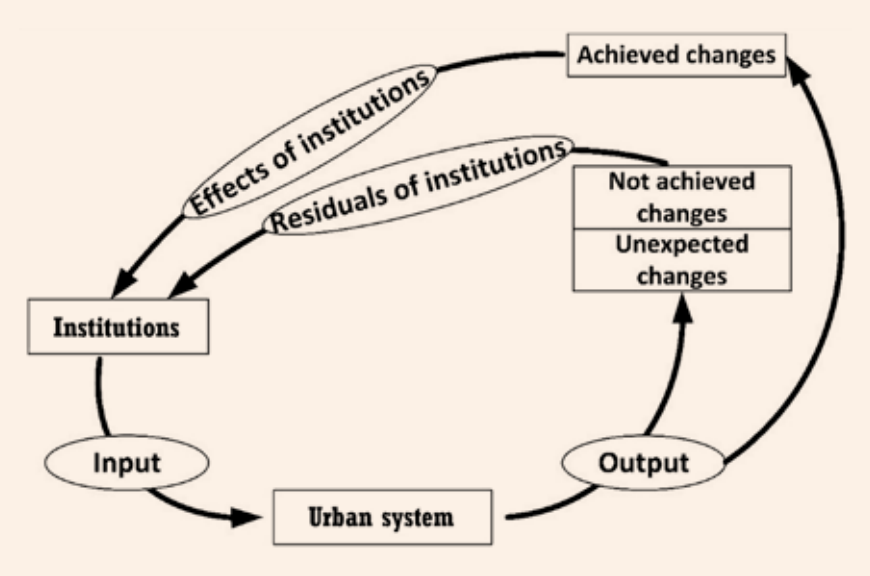


Figure 1.2
Linear thinking on the mechanism of institutions in relation to the urban system

In contrast, Figure 1.3 represents the role of institutional intervention in the urban system when we also take into account the self-organizing mechanism. According to this framework, institutional input into the system actually triggers a conditional change, which will cause a symmetry break, manifest as a mismatch between function and structure, or between reality and expectation. Due to the conditional change, individuals within the system who are influenced by system conditions will adjust their strategies and activities in order to adapt to the new situation, to find the best fit to the mismatch, or the best response to the symmetry break. In the beginning, the individual activities might appear chaotic. However, gradually, through communication and interaction, individual activities become collective. The collective activities are irreversible and ultimately result in a spontaneous outcome that has two main aspects. On the one hand, changes are achieved by the institutions as expected, but as the result of a different mechanism that is not in line with the institutions. On the other hand, there are spontaneous changes that were not expected by the institutions at all. Both the spontaneous mechanism and the spontaneous changes

will stimulate reflection and revision by the institutions. Therefore, rather than a linear input-output relationship, a circular relationship is built. This framework demonstrates the interdependence of institutions and self-organization.

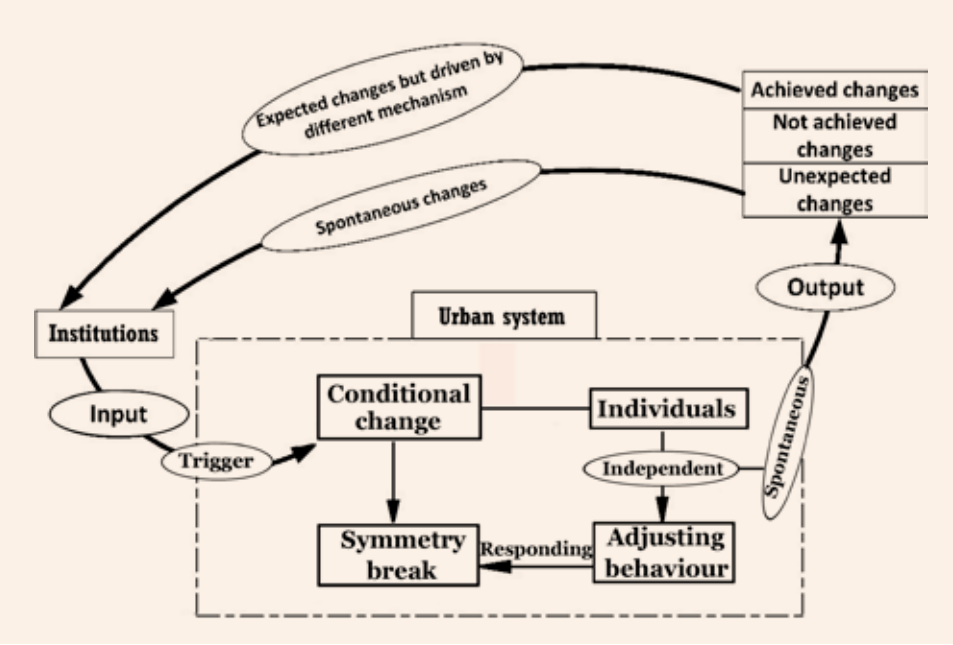


Figure 1.3

Non-linear perspective on the mechanism of institutions in relation to the urban system

This research framework emphasizes the situational nature of urban development within a complex adaptive urban system. Self-organization plays the role of the driver of change and transformation: 'In certain situations external forces acting on the system do not determine or cause its behaviour, but instead trigger an internal and independent process by which the system spontaneously self-organizes itself' (Portugali, 2011, p. 54). Urban development, therefore, is a dynamic evolutionary process, accompanying the emergence and decay of systemic mismatches, bottom-up activities and top-down institutions and planning. Through feedback and feed-forward loops, these elements form a circular causality, or co-evolutionary path.

### 1.4.2 RESEARCH METHODS

The argument of this thesis is supported by three case studies from Beijing. The first case study focuses on new urban development at the periphery of the built-up area of the Beijing urban region; the second case study concerns urban renewal of a *hutong* area in Beijing's inner city; and the third case study looks at the functional transformations of a peri-urban village.

This thesis adopted a qualitative research approach to the collection of data. This includes: desk research performing literature reviews and document analysis to acquire historical data about developments and information related to policy, institutions and planning; field visits and informal discussions to verify information from desk research and gain an understanding of the case study area; and questionnaires and semi-structured in-depth interviews to collect objective facts and subjective opinions of the relevant actors. Detailed information on research methods and research techniques will be explained in the respective chapters on each case study.

## 1.5 RESEARCH ORGANIZATION

This thesis is organized into six chapters, as shown in Figure 1.4. Chapters Two to Five explore answers to the three main research questions.

Chapter Two will begin with a critical review of planning through a comparison of the evolution of planning within two different contexts: China and Europe. Spatial planning is one of the most prominent institutional interventions in urban development, which reflects the current understanding of cities and urban regions. A comparison of the two trajectories in planning reveals that inadequate attention is being paid to the dynamics and uncertainties of any urban system. Here, it is argued that spatial planning entails a learning process – about the current situation and the context of a society, and the continuous adjustment to it. Instead of pursuing an atemporal perfect planning approach, the key is to understand the mechanism that lies behind the complex urban transformations, which, in turn, will determine what kind of planning is appropriate. Therefore, from Chapter Three to Chapter Five, we explore the mechanism behind various urban transformations through empirical studies.

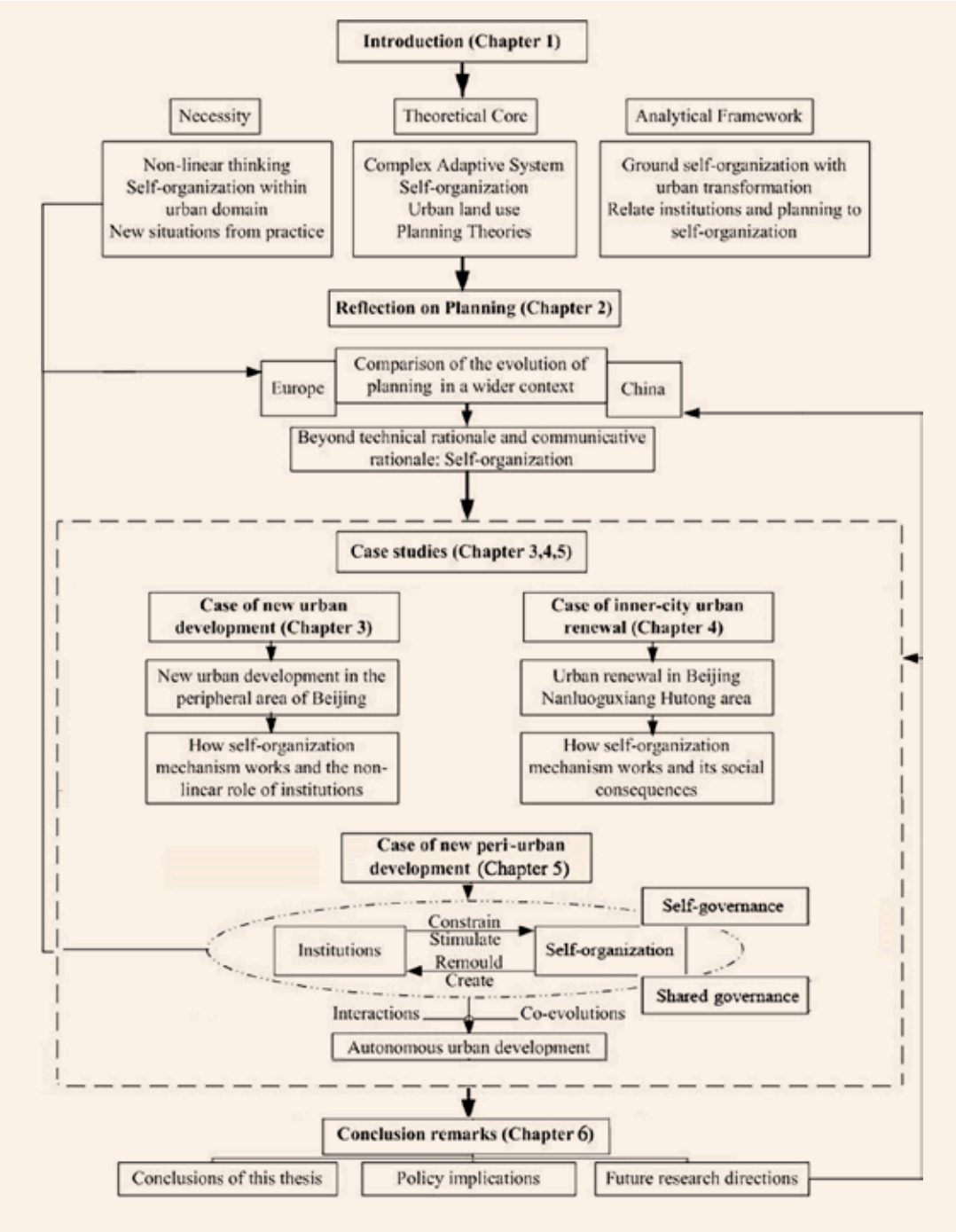


Figure 1.4

The organization of research in this thesis

Chapter Three argues that the mechanisms behind urban land use patterns are the consequence of an interdependence between self-organization and institutional actions. The chapter is based on an empirical study of two land development cases in the Beijing urban region. The study found that in both cases of urban land transformation self-organizing processes occurred, triggering symmetry breaks, unintended collective behaviour and spontaneous patterns, while still being institutionally framed. The interdependence of self-organization and institutional rules builds on a framework of circular causality at different spatial levels. This study tested whether self-organization is a driver for autonomous urban change and non-linear transformation.

In Chapter Four, we further confirm the role of self-organization in urban transformation, providing evidence from Nanluoguxiang, an urban redevelopment case, at the neighbourhood level. In addition, this chapter argues that self-organizing transformation, as a property of complex adaptive systems used to acquire order, can also lead to 'chaos' when judging by social standards. Therefore, planning is still required to complement the self-organization of urban development if we are to ensure that societal needs are taken into account.

Chapter Five deals with the question of the relevance of self-organizing processes in relation to top-down institutional regulations. This chapter explores the relationship between formal institutions and self-organizing urban transformations by discussing two primary questions. Firstly, in what way do institutions constrain urban self-organization? Secondly, to what extent can institutions also stimulate, facilitate and make use of the processes of urban self-organization? This chapter also focuses on the world in between top-down planning and self-organization, by looking at the positions of shared governance and self-governance. Empirically supported by a case study of Gaobeidian in the Beijing peri-urban region, it is concluded that the interrelationship between self-organization and institutions is, in general, symbiotic, and self-organizing urban transformation is the autonomous outcome of the interaction between self-organization and institutions.

Chapter Six presents the conclusions with respect to the research as a whole, beginning with a brief summary of the findings in the previous chapters. In addition, this chapter also provides recommendations for planning and policymaking, as well as indicating future directions for research in relation to the role of self-organization and institutions in the transformation of urban systems.

# 2

# CHINA: WHAT ABOUT THE URBAN REVOLUTION? [2]

## Rapid Transformations in Chinese Planning and its Links with a Slowly Emerging European Planning Theory

2 This chapter has been published as Zhang Shuhai, Gert de Roo & Lu Bin, 2012. China: What about the Urban Revolution? Rapid Transformations in Chinese Planning and its Links with a Slowly Emerging European Planning Theory, European Planning Studies, 20(12): 1997–2011.

**Shuhai Zhang, Gert de Roo, Bin Lu**

**ABSTRACT:** This new global financial crisis has required us to recognize how closely and deeply different regions and countries around the world are connected and how they interact with each other. In this interconnected context, planning theory and experiences also become fluid rather than being confined within certain boundaries. This paper explores the links between Chinese planning and European (or "Western"-oriented) spatial planning by critically analysing the development of Chinese planning. In China, modern European planning theories have been under discussion and partly in practice for years. Indeed, they have been playing an important role over the past 30 years in, for example, urban growth management, land-use regulation and environmental protection, and also in helping achieve sustainable development. However, the evolution of Chinese planning, now in a highly dynamic phase, has distinguished itself from that of European planning by adopting a highly rational, coordinated and top-down approach. This paper argues that there are several reasons for this. However, beyond this mere observation, there are a wide range of possibilities to be considered and reflected on with respect to these two different trajectories of planning development, which could enhance planning theory and practice. In other words, there are lessons to be learnt in comparing contemporary Chinese and European planning.

## 2.1 INTRODUCTION

China has experienced rapid development over the last 30 years (Fan, 2008; Song & Ding, 2007; World Bank, 2008). During this period, spatial planning has been accorded a lot of attention by both the government and the academic world. The significance of spatial planning is strongly emphasized across the nation, from the developed eastern coastal area to the less developed Western interior (Wen, 2010). The planning discipline has delivered efficient tools for solving various wide-ranging problems that have come about during the process of urbanization.

In this paper, planning refers to “urban planning” as it used to be called or “urban and rural planning” as it has been referred to since the promulgation of the new “Urban and Rural Planning Act” in 2007 (Ministry of Housing and Urban-Rural Construction, 2007; Tang, 2004), which comes under the ambit of the Ministry of Housing and Urban-Rural Construction. Either way, it can be regarded as the counterpart of European “spatial planning” in China. According to the “Urban and Rural Planning Act”, Chinese urban and rural planning entails a statutory blueprint and guidance for comprehensive urban construction and regional development, usually for the coming 20 years. There are usually three spatial orientations and six spatial levels, as in the present planning system, each of which is well embedded in its respective political structural layer (Figure 2.1).

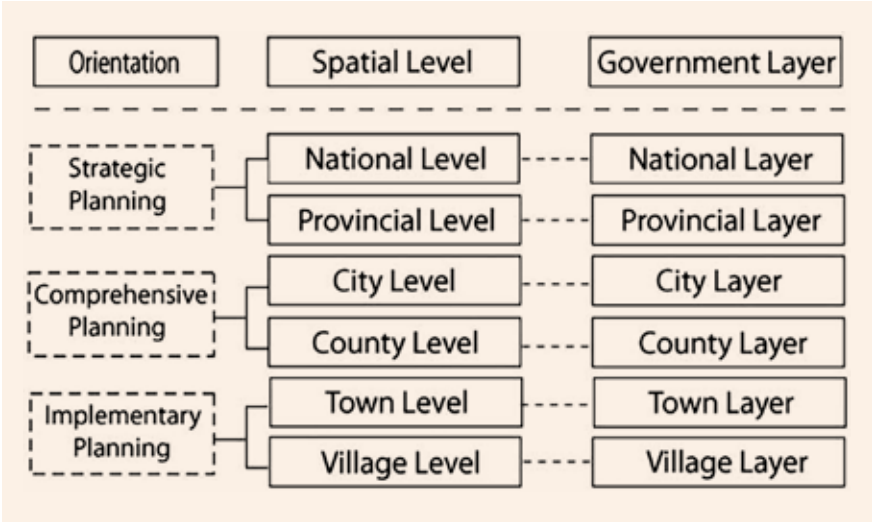


Figure 2.1

Spatial levels of urban and rural planning in China and their corresponding institutional layers

The debate about “whether there is Chinese modern planning theory” remains contentious (Zhang & Richard, 2009). Nonetheless, planners in China have paid a great deal of attention to learning from European (or “Western”-oriented) planning theory and experience, such as retail analysis, transportation analysis and residential area allocation, which are mainly systemic rational approaches (Cao & Gu, 2005; Wei et al., 2005; Yang, 2000).At the same time, the uniqueness of Chinese urban development, with its large population, high density and

amazing speed, will definitely provide valuable experiences for improving the applicability and adaptability of European planning theory. Consider Beijing as an example. The population growth in Beijing each year since 2005 has been over half a million and urban construction land covered over 3300 km2 in 2008. The accelerating motorization has exhibited a net growth of about 1900 cars every day over the last 5 years (Beijing Municipal Bureau of Statistics, 2008, 2009). Unfortunately, this speed has brought not only rapid economic growth, but also serious urban problems such as a shortage of employment, very high housing prices, serious traffic congestion and environmental degradation. Moreover, the interaction between and co-evolution of these issues make them harder to solve by planning.

The experience of such dynamic rapid planning should at least act to shake up the current European debate on planning theory, in which various ideas and thoughts about how planning should act and how planning theory should develop are hardly in agreement at present (Falleth et al., 2010; Friedmann, 1998; Graham & Healey, 1999; Marshall, 2007).

To clarify the characteristics and challenges of Chinese planning, this paper first explains how it evolved—mainly over the past 60 years—of which the latter 30 years, the years after the "Reform and Opening" policy, are of particular interest. It then charts how European planning influenced and interacted with this process and why Chinese planning practices have been dominated by highly rational, organizational and top-down approaches. We consider the underlying situation of the rapidly expanding dynamic environment in which planning issues arise and the growing number of planning problems which remain unanswered in China. This development requires us to reconsider the different planning proposals coming from Europe. In contrast to Chinese planning, European planning has experienced a transition from rational approaches to communicative ones, not without serious critics from within the European context. Aside from this, we have to determine how to deal with the dynamic complex planning context in China. This paper reflects on the possible advantages of communicative planning for China and about the lessons to be learnt from the dynamic Chinese planning, which could readily contribute to the European planning debate.

## 2.2 THE RISES AND FALLS OF PLANNING IN CHINA: HOW IT HAS BEEN INFLUENCED BY EUROPEAN PLANNING

We have to admit at the outset that it is impossible to divide planning accurately into different periods, owing to its continuous and interwoven processes of change. Nevertheless, we will mark the development of Chinese planning subjectively with some crucial milestones to identify how Chinese planning has evolved alongside the transitional socioeconomic context.

### 2.2.1 BEFORE 1949: PHYSICAL PLANNING INFLUENCED BY BOTH CHINESE CULTURE AND EUROPEAN UTOPIAN PLANNING THEORY

Although the existence of modern planning theory in China remains unclear, valuable thought on the planning of physical construction layouts has existed since very early times. For instance, a classic Chinese text called "Zhouli", from as early as 900 BC (Dong, 2004), contains a complete description of zoning, the spatial relationship between royal city, inner city and outer city and the relationship between the various functional sectors, such as government and market. The Forbidden City of Beijing is a perfect example of this thinking.

Another famous planning concept from ancient China is "The geomantic omen doctrine". The literal meaning of "geomantic omen" in Chinese is "wind and water", which actually refers to the relative position of the human in the environment. It was broadly intended to achieve a harmonious relationship between people and nature (Hu, 2009; Wang, 2004; Yu, 2005). For instance, according to this doctrine, a perfect location for either a town or an individual house lies with its back to a mountain and facing water, which not only would ensure a pleasant relationship with nature but was also thought to bring people good luck. The location is also functionally reasonable. High land such as a mountain can protect residential areas from uncomfortable climatic conditions such as hurricanes, while water, as a fundamental requirement for life, should be reachable. Both of the above elements are crucial for agriculture.

Immediately after the 1920s, there was a famous municipal reform movement in China. European utopian planning theory (Burtenshaw, 1985), along with

some thoughts from the “City Beautiful Movement”, became the theoretical foundation and reference for this period. Ideas about planning such as the “garden city” (Howard, 1898) and the theory of organic decentralization (Saarinen, 1942) were imported to be used as ideal models for optimizing the urban living environment. There are two major reasons for an interest in this “Western style” of planning during this period. The first reason is that after the end of feudalism and the Qing dynasty, the capital was provided with a new institutional framework in 1910, which allowed strong improvements in spatial planning. And this was very much necessary, as the rapid growth of industry in big cities such as Shanghai requested a solution to deal with issues including site selecting and industrial waste pollution (Tan, 2005; Zhang, 2006a, 2006b). Central government at that time had a good relationship with both Europe and the US. Therefore, European planning ideas were well received and left their influence on Chinese planning. For example, in the municipal plan of Shanghai conducted from 1927 onwards, professionals from Europe and the US were invited by Chiang Kai-shek’s government. Within and around Shanghai’s Central Business District (CBD) area, 10 concentric zones were pinpointed in the plan, including high-quality residential area, commercial area, middle-quality area and industrial sites (Tan, 2005), reflecting an attempt of adapting Howard’s garden city model.

The second reason for appreciating European planning ideas at that time relates to a European colonial attitude to directly influence the planning of cities in those parts of the world where the European countries have an interest in. For example, the city of Qingdao was occupied by Germans for almost 20 years since the late nineteenth century. The planning and construction made in this period were a prototype for later planning work, which is featured by, for example, meticulously designed buildings located and positioned in a highly ordered way. Also a differentiated road system with small-secondary and high-density routes can be seen (Shi, 1981).

In general, various social, institutional and political conditions at that time provided conditions for being susceptible to utopian planning ideas from Europe. As the main planning focus at that time was on physical design and the “elegance” of the urban environment, these ideas have had an impact on Chinese engineers and designers.

### 2.2.2 1949–1980S: SOCIALISM IN PHYSICAL AND FUNCTIONAL PLANNING: PARTING COMPANY WITH EUROPEAN PLANNING

#### *(1) General attitude of Western spatial planning: a technical rationale*

In the first few years after the foundation of the People's Republic of China, the country had a pressing need for key national projects and holistic urban constructions. In retrospect spatial planning during that time followed a Western attitude to planning, which was the technical rational approach. This was very much in line with the social and economical desires in those days. Due to the serious destruction caused by the Second World War and the Chinese Civil War, planning during this period was driven by the demand for industrial development within a planned economy. The socialist ideal at that time, to consider the city to be a place for economic production and industrial development, was not different from Western beliefs (Huang, 2006; Zhao, 1984). To a large extent, planning for residential units, roads and green land was affiliated with industrial allocation. This reduced urban planning, its attention to the urban structure and its spatial organization into a technical process (Huang, 2006; Zhao, 1984).

During this period, China promulgated its first 5-year plan (1953–1958) for the national economy and social development. Urban planning was regarded as a concretion and reflection of this 5-year planning process, whose main task was to guide or "plan" the national and regional economy (Yuan & Liu, 2009). Spatial planning practices boomed during this decade, characterized by their functional characteristics. The most important planning practice was the national project "key cities planning", in which 156 national industrial programmes were designated for delivery in "key cities". In addition to the planning of these "key cities", a total of more than 150 cities compiled their own urban planning schemes. Almost the only issues of importance in these planning schemes were the building of basic urban facilities such as residential houses, factories and transportation lines to support rapid economic growth. As a new socialist country, China was at odds with Western capitalist countries. Therefore, both the will and the opportunity to learn about the planning theories and opinions from Western European countries were in short supply. Instead, planning experts from the Soviet Union, who were considered to be socialist brothers and allies of China, were invited to help by delivering planning theories and experiences of planning practices from a socialist context (Xie & Costa, 1991, 1993).Most of these experts were professionals in economic geography

and urban design. Accordingly, planning during these times was characterized by a rational analysis of how the urban economy works and how to exhibit a grand-scale social order through block and building design. Thus, planning in this period was very functional and technical, underpinned by the confidence to create a new world by changing the physical environment. To some extent, the confidence and passion were largely inspired by the outcomes of the Chinese Civil War and the war against the Japanese. In any case, planning during this period contributed greatly to the post-war economic recovery and urban construction.

### *(2) Planning declined because of domestic socioeconomic turbulence: the vacuum period for all foreign planning ideas*

Planning was more or less out of the picture due to the nation's suffering from both economic disaster and social turbulence. From the late 1950s to the early 1960s, China suffered a serious famine resulting from the Great Leap Forward in which industry was over-emphasized to the detriment of agriculture (Li & Yang, 2005). Moreover, before the young nation could emerge from this disaster, another political catastrophe called the Cultural Revolution caused it even more serious harm (Akira, 1978). This was nothing less than a political movement in which people were instructed to express a fanatical critique of capitalism, to declare war against all capitalists and to be suspicious of everyone and everything. In this period of upheaval and suffering, city growth declined and urban planning ceased or even regressed. For instance, the city was designated a socialist industrial centre and commercial facilities were removed, industrial and residential space was allocated without any guidance or rationale and many planning institutions and organizations were disbanded during this Chinese dark age. Planners, like many other intellectuals, were sent to the countryside or were forcibly transferred to do other manual work. Many planning documents and information were discarded or lost. Western planning concepts, which were regarded as one form of capitalist thought, were totally prohibited in China. Perhaps surprisingly, even the planning principles of the Soviet Union were criticized due to the deterioration of the Sino–Soviet relationship. Therefore, this can be regarded as a vacuum period for all foreign planning ideas. In general, the turbulence during this period not only negatively influenced regular development but also seriously damaged Chinese planning.

### 2.2.3 1980S–2000: TECHNICAL-RATIONAL PLANNING: MAJOR INFLUENCES FROM EUROPEAN PLANNING

Two years after the Cultural Revolution, China welcomed a policy of reform and opening up, in which the Chinese Communist Party adjusted its central tasks with respect to economic development, following Deng Xiaoping's philosophy that growth was of overriding importance (Wu & Zhang, 2007). From then onwards, the nation was on its way towards a stable market economy. In contrast to the 1950s, learning lessons from and making reference to successful experiences from developed countries were encouraged during this period being in support of efficient socioeconomic development. Theories, technologies and skills from developed countries, such as those from Europe, were broadly embedded in many fields, and planning was no exception.

With the development of large-scale urban development programmes, the importance of spatial planning was again recognized. Basically, planning research and practices boomed since the early 1980s. European rational planning theories and practices were gradually introduced and left their influence on Chinese planning (Guo, 1989; Liu, 1994; Peng, 1994; Zhang, 1983; Zhao, 1983).

The precise content of what was actually drawn from European planning, however, was quite selective, focusing on rational approaches and systemic concepts such as industrial allocation, urban residential development and planning training. Rational planning concepts of the city, for instance, that which treated the city as a predictable linear system, and ideas such as rational analysis, structural control and systemic strategy were greatly admired (McLoughlin, 1969), as was the notion that in planning, a series of models should be built to conduct systematic analysis and control (Taylor, 1999). It was broadly accepted that planning was an approach that would yield the best results (Faludi, 1973). In addition to theory, selective learning from and the import of European planning experience also occurred, ranging from planning methods such as zoning, spatial regulation, green-space protection and land-use classification to planning cases such as the London metropolitan area, the Paris metropole and the Randstad (Hall,1992; Salet et al., 2003). The above can also be seen in the rules and laws of the Chinese planning system. Planning content, procedures and approaches were expressed by planning laws, ordinances and rules, which detailed rational analysis procedures and methods. According to the "Urban and Rural Planning Act", the objective of planning activity was to be clearly determined and aimed at predicting and determining the size of urban

population and its implications for employment, construction land and various infrastructure, as well as the spatial location of urban expansion, ecological buffer zones, green space and so forth.

In this context, most cities in China during this period laid down their spatial planning acts and had them enacted through the People's congress. In fact, many of these cities were adopting spatial planning for the first time, ending an era of unplanned urban development, project construction, etc. (Liu, 2009). In addition, a relatively complete top-down and economically oriented master plan system was formed during this period – as mentioned in the introduction – which targeted the spatial demand associated with economic development on various scales. Unfortunately, planning over these 20 years was highly economically oriented to the detriment of urban social issues such as how to reduce regionalinequality.

### 2.2.4 AFTER 2000: THE RISE OF COMPLICATED PLANNING ISSUES AND THEIR AFFILIATION WITH COMMUNICATIVE APPROACHES FROM EUROPE

The image of Chinese planning, however, has been gradually evolving since 2000, especially over the last 5 years, which are characterized by an unprecedented dynamic, interconnected and uncertain planning environment. Past policy, which exclusively focused on the economy, has aggravated social problems such as regional disparity, which are now too serious to be neglected in planning (Wu, 2002). In addition, more actors have become involved in spatial planning on account of this greater social demand for it. Initially, dozens of other forms of planning emerged for certain specific goals, such as planning for economic development, planning for forest preservation, planning for tourism, planning for education facilities and so on, whose aims had to be coordinated with spatial planning (Cai et al., 2009).

This situation has actually revealed the benefits of competition across horizontal departments. In addition, citizens are increasingly demanding to be involved in the processes of planning and decision-making (Johnson, 2010). This suggests a move towards a communicative kind of planning. However, rapid urbanization, immense flows of migration, huge investments in property development and infrastructure are such that within Chinese planning, dynamics is the factor that has become most manifest. While there might be an emerging desire to embrace and benefit from the communicative experiences of European planning, a fundamental shift to communicative approaches is currently impossible.

By and large, this is due to the speed of development that Chinese planning processes have to cope with, which above all means that there is no time to reflect on what is precisely going on and to think through how to respond. "Go with the flow" is the current approach. As a consequence, the technical–rational attitude prevails in Chinese planning. Before elaborating on the dynamics of contemporary planning in China, we will first consider this attitude in coping with its dynamic environment.

## 2.3 REASONS FOR DIVERGENCES IN CHINESE PLANNING

Looking at the development of Chinese planning over the last 60 years, we can arguably state that the evolution of planning in China has been closely related to Chinese transitional economic and social developments, as well as to the top-down nature of the Chinese institutional environment. No doubt European planning theories and practices have influenced Chinese planning over the last 30 years, as there is an awareness about planning being approached in Europe, their evolving path and the constraints and possibilities related to them. Nevertheless, plenty of planning practices in China today are still characterized by highly technical–rational approaches in a highly coordinated and top-down system. Concerns about institutional arrangements for collaboration or system design for intersubjective discourse, which are highly admired in the European planning world, are replaced in Chinese planning by technical criteria, acts and technical–rational rules. Clearly, this is in contrast to the communicative transformation in European planning, and we question why it has remained like this in China. Several reasons, including the following, can be discerned.

### 2.3.1 PRAGMATIC THOUGHTS IN PLANNING

Generally, pragmatic thinking has played a prominent role in Chinese planning, which strongly directs the planning focus towards solving practical issues by scientific means. The reasons for this, however, have varied over time.

The first period of pragmatic behaviour in Chinese planning can be observed in the socialist planning of the 1950s. At that time, demand for reconstruction following the war was urgent. Correspondingly, planning was required to have definite objectives, focusing on the construction of industrial facilities, which was recognized as an efficient method for emerging from poverty. The generation of a visible, perfect material world was what had to be achieved through planning. In addition to its functional aspect, this socialist planning was also

characterized by an emphasis on symbolic formalization, including the favouring of formalistic street patterns and grand designs for public buildings and monuments built around huge public squares (Schinz, 1989). This was regarded as demonstrating the purity and majesty of socialism, creating a new form and a new pattern for cities and developing a strong community spirit within urban sub-communities (Fisher, 1962). Dominated by this ideology, planning favoured landscapes that could be rapidly created, such as rectangular city layouts, chess-board street systems, monumental or symbolic city centres, enclosed yard-style construction units (a new version of the traditional "Siheyuan") and standardized buildings, all of which were common in the newly built-up areas throughout the country (Xie & Costa, 1993).

From the 1980s onwards, a more pragmatic approach was emphasized, following DengXiaoping's famous remark "Development is the first principle". Since then, planning objectives have been strongly economically oriented against a GDP priority background. Accordingly, rational planning approaches have proved efficient in supporting this type of development. Recently, the demand for basic urban construction has not been as great as formerly, but the speed of urban growth still requires fast planning decision-making. For instance, to confront the sharp decline in farmland, planning resolutions fix construction limits by district on the basis of the results of systemic analysis and index calculation. Obviously, this pragmatic approach is very efficient in rapid decision-making, but possibly at the price of negative impacts in the more comprehensive long term.

### 2.3.2 INFLUENCE OF THE CHINESE SINGLE-PARTY GOVERNMENT SYSTEM

Another reason for the difference between Chinese and European planning is the Chinese single-party government system in which planning is embedded. For a city government, planning is regarded not only as a kind of intervention in social development but also as a major task delivered by a higher level government, which is in charge of the evaluation, promotion and appointment of officials from a lower level government. To some extent, this is why Chinese planning did not transform its rational approaches into communicative approaches, as that had happened in Europe. In general, state power is quite centralized in this context. Although it has gradually decentralized since 1994 through fiscal reform, the civil political framework is still under construction and the participation of multiple actors in social decision-making processes is far from being achieved (Zhan, 2009). With regard to planning, there is still no effective institutional arrangement for participation

in planning practice. There is a lack of information and efficient means by which common people and groups can become involved in the planning decision-making process. In general, citizens have little access to information and their capacity to contribute to planning processes is low. Spatial planning is in that respect as secretive as that in the former Soviet Union (Knieling & Othengrafen, 2009). Therefore, the participation and benefit balance is absent from present planning and decision-making. On the other hand, to many local governments, urban planning is an opportunity to exaggerate the importance of urban development by predicting a very large population, which can help in securing more fiscal resources from the province. All in all, the government is very dominant and active in public administration and is given priority in public affairs by law (Barbieri et al., 2010), including in planning and decision-making. This has contributed greatly to a highly organization-based and top-down planning system in China.

### 2.3.3 TRADITIONAL VALUES AND PHILOSOPHY

The main traditional Chinese philosophy, which still influences people's thinking, can be divided into three branches: Confucianism, Taoism and Buddhism. In brief, Confucianism and Buddhism strongly focus on the relationship between people, especially the relationship between common people and authorities (He et al., 1991). For instance, Confucius's main doctrine is "Ren", literally meaning "two people together", which expresses the idea that people should appreciate one another. With respect to social structure, it contains the idea that hierarchy does and should exist within social structures and that common people have to commit to authorities because this will positively contribute to the formation of a stable society. In return, the national authorities have the responsibility for improving the living conditions of the common people. In addition, both Confucius and the Buddha advocated that personal wellbeing or happiness consists in pursuing a virtuous life no matter what the physical situation is. While we cannot fully determine by ourselves whether we can be rich, fate can. Taoist philosophy originated in the mid-Warring States period when people were suffering from seriously disrupted social productivity caused by war and heavy taxation (He et al., 1991). With its stress on quiescence in mind and non-activity, Taoist ideology asserts that excessive material or moral satisfaction causes nothing but harm to our body and mind (Fingerhuth, 2004; Hansen, 1992).

These philosophical ideas dominated throughout the feudalistic Chinese periods and left their legacy over a lengthy period. Accordingly, many behaviours are at least partially rooted in such a cultural base. In Chinese society, values such as collectivism rather than individualism are strongly emphasized. People have a responsibility to contribute to optimizing the community, city or the state, even at the price of sacrificing personal benefit. Therefore, there is no strong social incentive to participate or to be involved in planning decision-making. In many people's minds, planning, as one type of public policy, produces results to which they should adjust their personal behaviour, rather than a process in which they can participate. Where individual problems are caused by planning, people are most likely to ask the authorities for help rather than protesting against planning measures. At the same time, government planning agencies feel responsible to optimize their planning and decision-making. It transpires that they come up with "scientific methods" to achieve this by embracing rational approaches.

## 2.4 CHALLENGES AND POSSIBLE TRANSITIONS

Planning in urban China over the last 5–10 years has been in transition from having a single economic objective towards encompassing multiple objectives, including the economy, society and the environment, especially since "scientific development" policy was advocated by the new central government in 2003 (Hu, 2003). After rapid growth for more than 30 years, many deep structural problems, rather than simple functional problems, have formed in the Chinese socioeconomic system. With respect to planning, interacting fuzzy issues are encountered such as regional inequality, environmental degradation and over-intensive use of central areas (Ding, 2007; Shen, 1997; World Bank, 2008), each of which is not a separate functional defect but a part of an interrelated systemic disorder, in which each part increasingly interacts with other parts. Consequently, the linear rational style of planning is confronting unprecedented challenges. One illustration is that the prediction of population growth, which is fundamental in Chinese urban planning, has become increasingly inconsistent with reality. For instance, in Beijing's urban planning scheme, completed in 2005, the forecast is a population of 18 million in 2020. This number, however, has already been reached in 2009 with 17.9 million inhabitants. As such, the accuracy and applicability of planning are doubted by the public. Meanwhile, both the speed and extent of information dissemination have greatly increased, thanks to the popularity of the internet in China. The internet has gradually become an efficient way for the public both to acquire information and to express ideas about planning.

Although attempts have been made to solve an increasingly varying number of spatial problems, it becomes obvious that it is no longer possible to solve all these complex problems through rational approaches. Obviously, solutions additional to rational and straightforward approaches are required. Reflections on and research into "how to construct Chinese planning theory" have increased greatly recently (Fang et al., 2002; He et al., 2008; Li & Ning, 2006; Liang, 2009; Qiu, 2003; Tang, 2000; Wang, 2003; Zhou, 2001). A broad discussion about how European planning theory can help in this process has also occurred in the Chinese literature (Cui, 2008; Zhang, 2006a, 2006b). In practice, several regions in China, named the "Comprehensive Reform Experiment Zone", were created to look for solutions to some key planning issues such as institutional reform. One of the issues is how to guarantee collaborative cooperation among governmental officials, companies, planners, economists, socialists and local residents.

At the same time, the disputes and contradictions in European theory have not ceased. Rational planning theory started to be criticized in Europe from the 1970s, when it was realized that society did not have a simple logical structure, as though designed by an engineer, but was in fact made up of logical and non-logical factors and the relationship between the two. Subsequently, communicative or collaborative approaches saw planning issues not as realities but more as the abstract constructions of the various people involved (Healey, 1987, 1997). In this context, planners would have to act as advocates rather than as the evaluators or decision-makers of the past (Davidoff, 1965). The communicative approach in planning thus arose (Healey, 1996; Innes, 1995; Sager, 1994; Woltjer, 2000). In addition, other planning theories, such as transactive planning (Friedmann, 1973) and alternative planning (Sandercock, 2006), also emerged and interacted with each other. Over the past 20 years or so, however, confidence and arrogance have been replaced by uncertainty and introspection (Allmendinger, 2002). There have also been growing criticism and debate about communicative planning (Faludi et al., 1994; Fischler, 1995; Tewdwr-Jones & Allmendinger, 2002). The limitations of communicative approaches are reflected in some aspects of Habermas' theory of communicative action, which thus has implications for communicative planning theory and collaborative planning practice (Huxley, 2000). An understanding is beginning to emerge that a sole focus on collaborative planning is likely naive as was a univocal perspective on technical rationality in the past. This opens up to new directions for planning development put forward (Fainstein, 2000) in response to communicative or collaborative planning which has been found inefficient or lacking consensus under some circumstances because the world is

individualistic, socially fragmented, competitive or, in other words, uncollaborative (Gaffikin & Brand, 2007).

## 2.5 ENHANCING PLANNING THEORY AND PRACTICE: LEARNING FROM BOTH WORLDS

Thus, in various ways, European planning theories and practices have had an impact on the development of Chinese spatial planning, in particular, during the pre-war period and over the last 30 years. Nevertheless, the two planning trajectories can be distinguished from each other due to differences in philosophy, institution and history. Both experienced utopian, symbolic planning in a very early period, which presented itself in a socialist sense in China through phenomena such as the social order made manifest through formalized physical design. For various reasons, technical–rational planning approaches have had priority and have been popular within the highly coordinated, top-down Chinese planning context until today. In Europe, however, out of a technical–rational attitude, communicative approaches have emerged being either complementary or replacements to technical–rational approaches, both in theory and in practices. The European context teaches us to find both technical and communicative approaches appropriate and helpful under certain conditions, while neither is able to convincingly handle the challenges that emerge from a dynamic, transitional reality on its own.

There is more to say about comparing both trajectories. While Chinese planning is very much focusing on rapid transformations, and its main intent seems to be coping with the "urban revolution" and the massive interventions needed, we see a slowly emerging European planning theory, which allows reflexivity towards contemporary communicative practices, out of which critique and new arguments do come forward. Out of both trajectories, we can distil a desire for better arguments to cope with realities being encountered, beyond the technical and the communicative side to planning.

Interesting are those arguments building on the ideas of complexity thinking, nonlinear development and transition management, all accepting a physical environment in a continuous state of change. This change is considered to be, by and large, autonomously driven. Induced change, for example, as a result of planners' interventions, is seen as a response and not as a direct causal effect out of which the world and its physical environment are being "created". We

are particularly stressing this point of view as we believe that both Chinese and European planning could meet each other on the basis of this perspective of change, evolution and emergence. Change, emergence, time and the notion of "becoming" matter in this new perspective and could colour Chinese and European planning in their own right. It will also relate them, with speed of transitions and developments taking place as a major difference between the two regions from which a comparison will likely result into important lessons to the whole of spatial planning. It means a shift in planning theory and practice towards evolutionary processes, with adaptivity and processes of self-organization as interesting notions.

Therefore, when we regard two trajectories of development of Chinese and European planning as two autonomous and meanwhile interacting processes, both trajectories allow reflections on adaptivity and self-organizing mechanisms. This means that in dynamic situations, we should attempt to improve our ability to cope with emerging circumstances by increasing the diversity of planning approaches among others benefiting from the existence of self-organizing mechanisms rather than attempting to control every step or to draw everyone into the process. Chinese planners have already started seeking improvements in managing planning processes, by bringing in the useful elements of communicative or adaptive and self-organizing approaches (Liang, 2009; Zhang & Richard, 2009), although most of their energy is currently being expended on keeping track of the urban revolution taking place. Meanwhile, European planning is reconsidering its strong focus on the communicative side of planning and seeking alternatives. There are a growing number of European scholars considering reality increasingly as an autonomous process, which can also lead to interest in adaptability and self-organizing mechanisms (Allen, 1997; Batty, 2005; De Roo, 2010; De Roo & Silva, 2010; Portugali, 2000; Webster, 2010; Webster & Lai, 2003). These mechanisms are usually related to dynamism but are not yet well understood in either planning theory or practice.

In other words, both planning traditions have their own path dependency, from which lessons can be learnt. This should not change in the future; however, these lessons will not be as unilateral as they were in the past. European planning may also wish to learn from Chinese planning developments. The Chinese are running fast to keep up with their own autonomous urban transformation processes. As such, there is a strong desire to grasp what drives the change, the dynamics and the transformation of the Chinese urban environment and how this will lead to a coherent but flexible urban space, its appreciation as an environment to live in and its consequences in the long term.

At the same time, European planners are reconsidering the communicative side of planning, proposing, among others, alternatives which include a focus on the notion of “becoming”, dynamics and adaptive planning. In particular, here Chinese and European planner shave mutual interests. From this, there are lessons that could be learnt to enhance both Chinese and European planning theories and practices, pointing to a more extensive research agenda that relates to the issues of time, nonlinearity, emergence, adaptivity, evolution and self-organization. As Confucius said in his “Doctrine of the Mean” (Li, 2006), “Benefit from the multifarious world to reach an ideal harmony by touching upon both worlds”.

# 3

# URBAN LAND CHANGES AS THE INTERACTION BETWEEN SELF-ORGANIZATION AND INSTITUTIONS[3]

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**Abstract:** There is interest among planners in autonomous behaviour and non-linear processes supporting urban development. Self-organization has attracted attention as a potential driver for urban transformations. This paper aims to explore the mechanisms behind urban land use patterns resulting from the interdependence of self-organization and institutions. Our argument is based on an empirical study of two land development cases in urban Beijing. The paper argues that urban land transformations include characteristics of symmetry breaks, self-organizing processes, unintended collective behaviour and spontaneous patterns while simultaneously being institutionally framed. The interdependence between self-organization and institutional rules builds upon a circular causality framework at various spatial levels.

## 3.1 INTRODUCTION

'Institutions are the rules of the game to a society to collectively live together. Or, more formally, institutional rules are the humanly devised constraints that shape human interaction' (North, 1990, p3). It is impossible to imagine urban space without any institutional design. Although the urban locale is never a fully controlled system, there are plenty of institutional rules that aim to restrict or steer activities. Despite this, urban areas are subject to self-organization processes and unplanned, spontaneously emerging spatial patterns. Self-organization is an adjustment process responding to symmetry breaks and resulting in pattern formation. Such adjustment processes can be found everywhere, in piles of sand (Bak, 1996), in flows of traffic and in urban transformations (Portugali, 2000). Understanding self-organization processes in urban areas supports adapting to unexpected and autonomous processes of land use change. Knowledge of the interdependence between self-organization and institutional rules is an as yet underexplored issue in current research.

This paper explores this gap in knowledge further, incorporating existing knowledge of self-organization as a process and as a result of other processes which displays characteristics of pattern formation. Self-organization as a

process is neither organized nor controlled by any external power (Heylighen, 2003). Self-organized pattern formation is often the result of behaviours of a number of individual agents responding to conditional change, structural breaks and mismatches between the function and structure of an urban system. Beyond a given threshold, an existing structure breaks, resulting in a reshuffle or adjustment behaviour out of which a spontaneous pattern can emerge at a higher scale level. There is no linear relationship between reaching a threshold (the break's criticality and the energy that went into it) and the pattern that will emerge from it. In other words: the consequence of adjustment behaviour to symmetry breaks within the urban is unpredictable. Self-organization therefore contributes to urban areas developing non-linearly.

Self-organization is not a new phenomenon. However, it has hardly ever been applied to urban development and planning (Portugali, 2000). Various scholars have addressed the need for a more detailed understanding of self-organization (political geographers such as Dreier Mollenkopf & Swanstrom, 1995; Lewis & Neiman, 2009; modellers such as Batty, 2007; Torrens & Benenson, 2005). The planning debate has taken various alternative routes, in the early days supporting a command-and-control approach, developing towards communicative approaches in the last twenty years. The 'communicative turn' to planning in Europe in the early 1990s was an acknowledgement of uncertainty. The planning community turned to agreed realities in response to failing, incomplete and unclear factual realities. Consensus on how to view the situation became the new paradigm to work from. However, just like the technical paradigm, the communicative approach to planning did not always yield the desired results, as the conditions under which both technical and communicative planning work are specific and cannot always be met. At the same time, Rittel's argument about fundamental uncertainty and his 'wicked' problems were rediscovered (Rittel, 1972). These and other arguments stress that coping with uncertainty is as important as investing in and seeking certainty. It means a shift in planning away from a generic frame of reasoning towards a situation-specific approach, which allows alternative views to flourish.

Throughout planning's history, governance and institutional design were considered to be essential to urban development. Only recently has the idea that urban areas could to some extent develop autonomously and non-linearly gained support (Kombe, 2005; Kironde, 2006; Verburg & Overmars, 2009). There is also growing interest in debate among various disciplines aligned to planning – such as organizational theory, decision theory and systems theory – within

which increasing attention is paid to non-linear, multi-level and plural contexts (Jarzabkowski & Wilson, 2006; Avelino & Rotmans, 2009; Flanagan, Uyarra & Larangja, 2010). This is just one step away from chaos theory and the complexity sciences. Planners used to consider these theories slightly exotic and avoided them. Only the modellers within the planning community (Batty, Torrens, White & Engelen, etc.) felt differently and had been exploring the potential of non-linear reasoning in their simulations (Batty, 2007; Torrens, 2002). Increasingly many planners are now willing to recognize autonomous behaviour and non-linear processes as supporting urban development. Self-organization is also attracting attention as a driver for urban land use change (Allen, 1997; Portugali, 2000; Liu et al., 2010). Within the urban, neither institutional development rules nor self-organizing processes are isolated activities. Two questions therefore arise: how does self-organization contribute to emergent urban land patterns while being interdependently related to institutional rules, and how will the answer to this question enhance our understanding of planning interventions in urban areas?

In response, we will critically explore this interdependence between institutional rules and self-organization and their effects on urban transformation, exploring how stakeholders individually interpret, understand and respond to certain regulation policy and spatial plans, how stakeholders interact individually and collectively during the development process, and how this leads to spontaneous change in urban land use patterns.

This paper is structured as follows. Section 2 will briefly elaborate on the conditions under which self-organization can occur in an urban environment, the impact it can have on planning, and the actions, interventions and strategies associated with it. Section 3 explains the case study methodology. Two detailed cases illustrating various self-organizing processes resulting from newly introduced conditions set by local planning authorities in Beijing are discussed in section 4. Finally, we will argue the importance of understanding, appreciating and adapting to urban self-organization processes, allowing self-organization to play a symbiotic role in interaction with institutional design and planning rules.

## 3.2 APPLYING COMPLEXITY THINKING TO PLANNING

Increasing appreciation for non-linear perspectives on development transformation and change also affects the disciplines of spatial planning and urban studies, providing them with alternative views and theoretical bases to address uncertainty in urban development (spatial design) and in

decision-making processes (institutional design). Self-organization has been touched upon implicitly in writings on cybernetics by McCulloch and Pitts (Portugali, 2011). More explicit are Ashby's studies of the relationships between psychology and the nervous system (Ashby, 1962). Yovits and Cameron (1960), and Forrester (1961) studied self-organization in the domain of system theory. Self-organization attracted great attention following Prigogine's introduction of dissipative structures (Nicolis & Prigogine 1977; Prigogine 1980; Prigogine & Stengers, 1984) and Haken's theory of synergetics (Haken, 1980, 1983, 1991, 2004).

Although the recent interest in self-organization builds on knowledge which has its origin in physics, it has now gradually come to be studied extensively in various domains (Allen & Sanglier 1981; Weidlich, 1994). Self-organization and other ideas of non-linearity – such as emergence, adaptivity, co-evolution and transition – are now the subjects of a rich body of research. Research groups focus for example on fractal cities (Batty & Longley, 1994), self-organization and the city (Portugali, 2000), cities and complexity (Batty & Xie, 1994; Batty, 2007), cellular automata and agent-based urban models (Chen et al., 2002; Benenson & Torrens, 2004; Liu & Zhou, 2005; He et al., 2006) and self-organized criticality (Bak & Chen, 1991). Aspects of non-linearity are also being explored in the fields of planning and institutional design (Rauws & De Roo, 2011; Boonstra & Boelens, 2011; De Roo, 2010; Byrne, 2003).

Spatial dimensions help knit institutional rules, symmetry breaks and the spontaneous pattern together. Macro-level institutional rules controlling specific spatial changes in many contexts can only exert limited direct control over actor behaviour. Instead, these changes create symmetry breaks and mismatches, but also the possibility space to allow actors to respond to symmetry breaks and mismatches creatively. Stakeholders at the micro level interpret, understand and respond to institutional rules in their own ways and interact with other stakeholders, which creates spontaneous urban land use patterns at the meso level. These 'institutionally' unanticipated urban land use changes at the meso level ultimately result from local interactions and responses between and from various stakeholders, though induced by institutional factors. Macro institutional rules, local responses and their contribution to the aggregated urban land use pattern are all interdependent. They form a framework with feedback and feed-forward loops (See Figure 3.1).

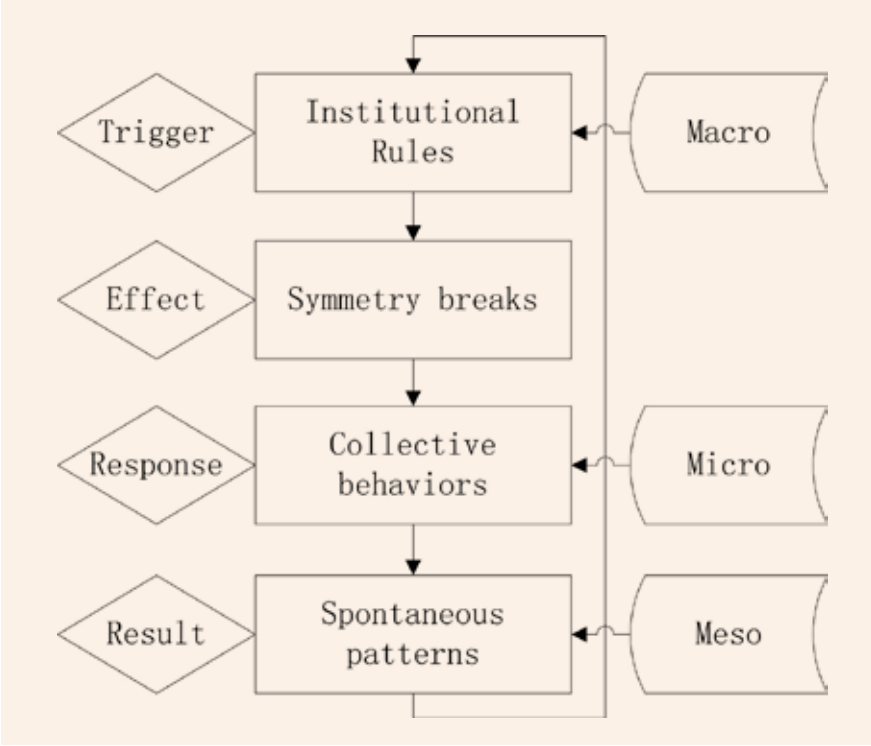


**Figure 3.1**

**Framework of the self-organization process in this paper**

*(Source: Author's own)*

This paper 'treats cities as systemic wholes, and scientists and planners as some of the many parts, agents and forces that participate in a complex and spontaneous urban game' (Portugali, 2011, p278). We consider this complex and spontaneous urban game to be a mix of intentional and unintended actions and motions. In other words, urban development is the result of a set of institutional rules and autonomous behaviours. Both are very real and influential. Therefore, both matter. Consequently, self-organization and intentional planning efforts are both parts of the same game. Sometimes the game is dominated by the former, while at others, it is conditioned by the latter. In abstraction we could consider a spectrum of contingencies with two extremes: self-organization and intentional interference through planning.

## 3.3 RESEARCH METHODS AND CASE BACKGROUND

Self-organization needs to be explored in action in a fast-growing city such as Beijing, which is known for its strict planning regime. This will demonstrate that self-organization is far more common than previously thought, which underlines that self-organization should somehow be made part of planning concern. It also bridges spatial policy and institutional design with self-organization processes occurring in an urban environment. To reveal the urban land use patterns resulting from interactions between institutional regulations and self-organization, we have to acquire information from related stakeholders. In the current context in China, public sector actors remain very powerful stakeholders (Zhang, 2002), though developers are becoming increasingly influential (Güneralpa & Setoa, 2008; Zhao et al., 2009). As the third force, planners also have their contribution to make to some extent, although their diverse roles could either benefit government, developers or the public. To explore this, we prepared illustrative case studies from Beijing, supported by interviews. We gathered information by interviewing actors on the reasons behind the development of recently developed sites. Semi-structured face-to-face interviews were conducted with various stakeholders on the micro-level determinants of urban growth in Beijing.

In total, seventeen interviewees[4] participated, eight of which were private developers, six government officials and three planning specialists. Developer interviewees were from eight different companies, with significant differences in ownership, organization, scale, development experience, relations with local officials from Beijing, etc. (See Table 3.1). They represent various types of development agencies in Beijing. Government official interviewees were from key departments related to growth management. Three were from the land resource bureau and three more interviewees from the planning, agricultural and industrial bureaus. The interviews were conducted as follows.

A preliminary list of items was used to structure the interviews. Each interviewee was informed that the information he or she provided would be stored and used in such a way that disclosing its origin would be impossible. Similar questions on the same item were asked to confirm the answers given. The interviews lasted from one to three hours. An assistant took notes while the author spoke with

4 One was interviewed by email and telephone due to a sudden schedule change.

| Company names | Characteristics |
|---|---|
| Wanke | Biggest real estate company in China |
| Huarun | Top 10 |
| Beijing Chengjian | Top 50, Beijing local state-owned enterprise |
| Zhongliang | One of the best commercial real estate developer, state-owned |
| Tianhong | State-owned |
| Wukuang | State-owned |
| Jinxiuzhiye | Small private enterprise |
| Qiyeshu | Small private enterprise |

Table 3.1

Basic information about land developers

*Source: Author's own. The ranking of real estate enterprises is in line with the Chinese real estate association.*

each interviewee. An interview report for each interviewee was prepared by the author immediately after each interview, to minimize information loss.

Being an explorative case study to identify the reasons underpinning urban development, the interviews were meant to be representative, to enable the reconstruction of illustrative examples of actor behaviour and their spatial outcomes. The interviews provided the material to analyse the cases in the following sections.

## 3.4 CASE ANALYSIS

### 3.4.1 PHYSICAL AND INSTITUTIONAL CONTEXTS

We focused our analysis on urbanization processes in Beijing, China. This enables us to identify self-organization processes in societies that are considered to be heavily regulated. The last few decades have witnessed unprecedented urban growth in eastern China (Wu, Xu and Yeh, 2007; Deng et al., 2010). Beijing is one of the most prominent and consequently one of the most dynamic metropolitan areas in the world. Its dynamics are manifold:

the rapid expansion of the Beijing urban region, the increasing investment and employment, the increase in education and healthcare services, the strong and highly accessible information networks, the increasingly wealthy population, the exponential increase in goods and traffic flows etc., are all having a severe impact on urban land consumption and transformation.

All these aspects are somehow regulated. These regulations order a world that 'is', a world full of sectors, with each sector having its own set of rules and tailor-made institutional designs: traffic rules, housing development rules, rules for work, school and healthcare regulation, and so on. While the rules order the world that 'is', change is quite a dominant factor within the Beijing urban space. We imagine the continuous creation of symmetry breaks emanating from rules trying to preserve conditions as they 'are', and conditions that are in processes of change. The various actors are adapting to these changing situations, taking advantage of newly created chances and opportunities and bypassing emerging constraints and obstacles. We identified some of these symmetry breaks and we explored adaptive behaviour by the various actors which have led to uncontrolled pattern formation within Beijing.

The demand and supply of construction land in the Beijing urban region are being positively and mutually promoted, supporting high-speed growth over an extended period. This situation is by-and-large the result of in-migration from rural areas and other cities across the nation. This has resulted in quite complex, intensive and persistent dynamics, which are becoming a great challenge for both planners and policymakers, not least because many natural resources are at risk. Urbanization causes a decrease in the quality of arable land (Tan et al., 2005), groundwater is being overexploited (Bao & Fang, 2012; Varis & Vakkilainen, 2001), the air is polluted (Wang & Xie, 2009) and traffic is congested (Zhao, 2010; Wei & Zhao et al., 2009; Kombe, 2005; Gwilliam, 2003).

In terms of the institutional setting, Beijing is characterized by strong top-down regulation and a homogeneous urban governance structure (Zhang, 2006a; Maskin et al., 2000), which is mainly a consequence of and guaranteed by the centre-dominated federal system in China. Higher-level government sets a yardstick to evaluate the performance of local officials, which acts as a political incentive and career objective. Meanwhile, local governments are in principle obliged to accept the tax rates and revenue-sharing rules that higher-level government set (Chen, 2004).

Beijing also functions within a unique land property system (Liu et al., 1998), which stamps its mark on its urbanization. For example, Cartier (2001) argued that inconsistencies in China's land use regime lead to 'zone fever' (the booming of industrial zones in 1990s), arable land loss and real estate speculation. Deng and Huang's (2004) work exposes institutional motives which reveal two seemingly contradictory phenomena in Beijing's urban development: development zones and semi-urbanized villages.

In China there are two categories of land ownership: state ownership of urban land and collective ownership by villagers of rural land. These two types of ownership, however, are not equivalent, with collective ownership being subordinate to state ownership. This is firstly because villagers' collective ownership is not complete ownership in that it is strictly forbidden to use, lease or sell such land for non-agricultural purposes. Urban use can only be achieved after transfer of land ownership from collective to state ownership through a process called requisition. For the loss of rural land, villagers receive one-off monetary compensation or compensation in kind, which according to current national and local standards, however, remains relatively low and unfair (Ding, 2007; Lichtenberg & Ding, 2009). A land developer can only lease land for a fixed period (e.g. seventy years in the case of residential land) from local government before it can start any development activities. This institutional setting gives local government a dominant position in urban land supply.

The chair of a village representative committee tends to have dual loyalty. The chair makes decisions for villagers as a collective, but in practice also acts as the bottom level in the Chinese top-down government system. The chair's decisions are largely dependent on the higher government levels. This causes urban growth to be firmly controlled by the top-down government system. The institutional link between this top-down structure and land use changes is land use planning, through which the distribution and regulation of urban land use is realized.

Land use plans are embedded in the Chinese top-down governance system and characterized by a technical rationale. They contain regulations on land use, intended to programme the spatial distribution of various land uses – usually for a fifteen to twenty-year period – such as industry, residential, commercial, etc., and they assign various land use quotas for each lower-level urban region, all of which are mainly predetermined by a strictly technical planning system.

This state-owned land property system and the technical spatial planning system together provide Beijing with a unique context for urban growth and urban control, in contrast to many Western countries, which have private land ownership and which appreciate and apply communicative planning methods to some extent. Nevertheless, as in Western cities, buildings are constructed only if and where developers are prepared to invest.

We will continue by critically evaluating two cases. One is Dingxiu, a case which shows how a change in planning rules compelled various independent actors to change their behaviour, which led to a collective result: a pattern formation. The other case, Maofangchang, is slightly more controversial in the sense that we argue that any plan or idea bridging the status quo with a desired future is a symmetry break or a mismatch, to which actors independently respond by adjusting their behaviour, and pattern formation results as a consequence.

### 3.4.2 DINGXIU COMMUNITY DEVELOPMENT CASE: HOW SMALL DEVELOPERS CAUSE SPATIAL DECENTRALIZATION

This case shows how local policymaking triggers self-organizing behaviour in the real estate market by small land developers, which has ultimately resulted in a more decentralized urban land use pattern.

The real estate market in Beijing has been growing prosperously for two decades and consequently the average housing price has doubled four times since the mid-1990s. The land developer interviewees expressed repeatedly that the key to profiting from the Beijing real estate market was to obtain land use rights from the municipal government, which exposed an uneven market from which the selling party takes advantage. To calm the overheating real estate market, to restrict speculation on real estate products and to stabilize the rapid increase in house prices, since 2005 the Beijing municipal government has adopted specific policy measures. These policy measures have been revised and enhanced several times since then. According to the latest official policy, Municipal regulation and control on real estate market (Beijing Municipal Government, 2011), only two groups of people possess the right to buy housing in the Beijing urban region. The first group comprises Beijing local residents with Hukou (household registration, see Chan & Zhang, 1999) and owning no more than one residential property. The other group are people without Beijing Hukou, who do not already own a home, and who have been living and working in Beijing for more than five consecutive years. This land use policy has reduced the number of potential house buyers by one third, and reduced the number of houses

that they can buy to one. The indirect consequences of this land use policy are even more significant than its direct effect, mainly evidenced in two structural changes which can be regarded as symmetry breaks.

First, the municipal land use policy has a spatially heterogeneous effect. The Beijing municipal government is confronted with choosing between housing price control and local economic development. On the one hand, a controlling institution for the real estate market is required by higher-level government to address the public's complaints about housing prices. On the other, land use policy would no doubt harm the local economy by reducing the number of potential buyers, which will reduce local job opportunities and revenue income. A solution to this dilemma comes in the form of a partially regulated spatial policy, with an emphasis on regulating the central city, and paying less attention to the urban periphery. Secondly, due to this regulation, most people only have one opportunity to buy a house in Beijing, which causes them to be very cautious in the selection of real estate products. This has created a shift in real estate product preferences away from functionality to quality (a conclusion from interview results). The market has seen a shift favouring relatively spacious and high quality neighbourhoods over proximity to business or commercial centres.

No doubt this spatial policy has obstructed many land developers, small land developers in particular. The policy has forced them either to lower their prices or leave the Beijing market. Some have responded to this land use policy in a third way, which has led to unexpected land use changes.

Dingxiu Company was founded in the late 1990s and is a representative of small real estate companies in the Beijing market. Confronted by this institutional intervention on the real estate market, Dingxiu diagnosed the intentions and psychology of the Beijing municipal government. They became aware of the dilemma mentioned above, and the public's changing preferences in real estate products. We argue that they were confronted with a symmetry break: a change in conditions due to the latest local policy fundamentally altered the business potential of their area of operation, reducing its expected profit yield as a real estate market for house sellers. It caused Dingxiu to develop an alternative option: leaving the central city, transferring their development activities to suburban districts and developing high quality communities.

In October 2007, after two years of preparation with cautious investigation and successful attempts to build cooperative relationships with peripheral local governments, they bid for and acquired a 310,000 square-metre plot. This site

was 50 km north of the Beijing city centre and 5 km south of Huairou District centre, and was not subject to geographic proximity rules (See Figure 3.2). A nearby industrial research park for the Chinese Academy of Science was already under construction. Further, the new national digital centre for Chinese film and television is to be located here, and the comprehensive development of the nearby Yanxi Lake area provided a promising prospect for real estate development.

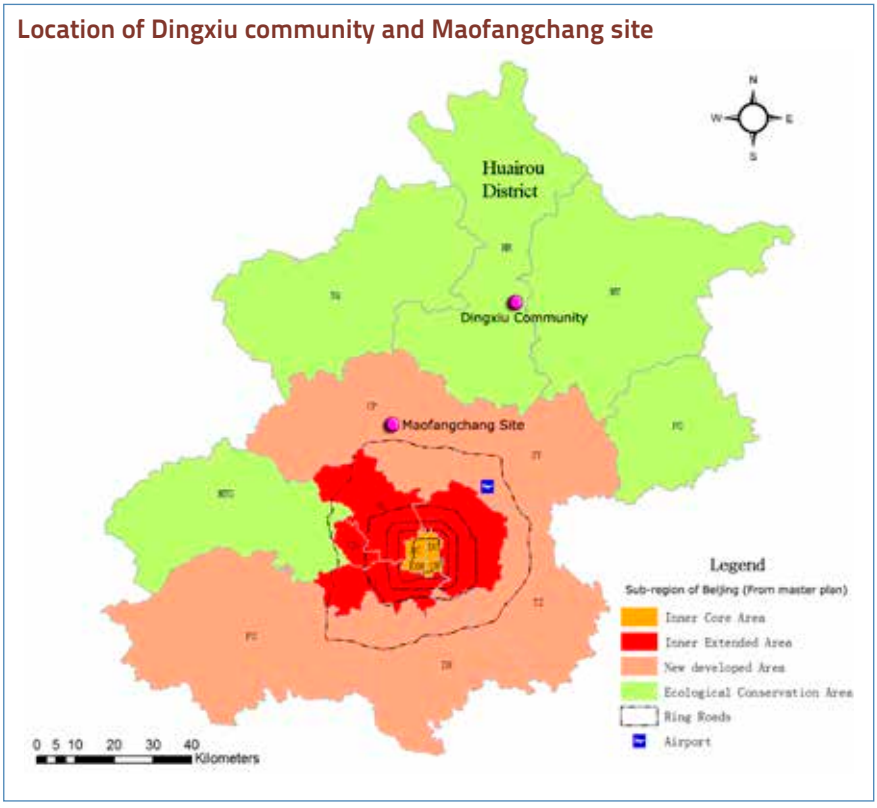


Figure 3.2
Location of Dingxiu community and Maofangchang site
*(Source: Author's own)*

Dingxiu's peripheral developments focused on relaxing dwellings and European-style houses, integrated within and supported by the region's natural environment (See Figure 3.3). The planned real estate products matched the changed preferences of potential buyers and the company achieved more than twenty percent annual growth (Data source: interview) in a very unstable period.


**Figure 3.3**

**Appearance of Dingxiu community**

*(Source: Author's own)*

Dingxiu's response to the local change in land use planning reflects comparable moves made by other land developers. Quite a number of companies like Dingxiu also survived the regulatory restrictions by moving out. The Shijia Guangzhigu real estate project in Huairou district undertaken by the Junjianyulong company, the Shanghewan real estate project in Miyun district developed by the Beijingchengjian company, the Huijingwan real estate project in Pinggu district of the Beijing Shouchengzhiye company, are just a few of a long list of developments and companies that have adopted this strategy. All have opted for similar adjustments regarding their activities in urban land development, moving from the inner city to peripheral districts of the Beijing urban region in response to changes in land use policy. In comparison to residential communities which have emerged so far on the basis of functionality, these projects relate strongly to specific preferences of the customer. Therefore, they are spatially more extensive: larger area per household, lower density of buildings, higher ratio of green space, a parking space for every single household and advanced security systems. Collectively, these land developers have created a prosperous real estate market away from the city centre. Aside from their business success, there is a collective result visible in the rise of alternative and spontaneously emerging land use patterns within the urban region of Beijing: a diffuse, polycentric urban morphology of Beijing (Feng et al., 2009).

### 3.4.3 THE CASE OF THE MAOFANGCHANG SITE: TRANSCENDING TRADITIONAL PATTERNS OF DECISION-MAKING RESULTING IN UNPRECEDENTED BEHAVIOUR

Unlike the Dingxiu case, which to some extend is 'self-explaining' with regard to self-organization, the Maofangchang case is meant to break barriers of thought. The Maofangchang case is brought forward here to invite us to reconsider 'symmetry breaks' as a fundamental step of self-organization. Our argument is to consider the construct of a 'desired future' as a 'symmetry break' with the reality of today. If this argument is considered valid, even the most basic activity of planners – composing a plan with a desired future and a route towards it – should be regarded as a condition for self-organizing mechanisms. In other words: if so, any planning action regarding desired futures will include (to various degrees) processes of self-organization and non-linear behaviour.

A spatial plan is commonly seen as a means of either giving expression to a future world to be, or to enable agreement on the actions to be taken to realize a plausible world under discussion. The intent behind the plan is to guide (and to some extent to control) actions and interventions. If we shift perspective from factual and agreed realities to a perspective of non-linearity and to an adaptive and self-organizing world, a plan would have to be seen as a mismatch generator: a mismatch between what 'is' in reality and what is considered desirable to become. In terms of 'self-organization' a mismatch will be followed by adjustment behaviour after criticality has been reached. The impact of this adjustment behaviour is supposed to be non-linear and includes fundamental uncertainty.

Beijing's land use plan is a statutory institutional rule made by the municipal government. In 2005 a new Beijing land use plan was released to the public, as the formal strategy for Beijing's spatial future in 2020. The ambition of the plan is immense: Beijing will incrementally develop 587 square kilometres of new construction land over the 15 years to come in order to support its multiple functions as national capital, global city and liveable municipality (Beijing municipal government, 2009). Consequently, Beijing's strategic plan creates a mismatch between ongoing land use developments and newly stated targets. This 'mismatch' has caused land developers to adjust their actions and strategies. Huarun Company is representative of these land developers.

Although the strategic plan is no blueprint, it is still concrete enough in its allocation of future land development to be taken seriously by Huarun and many

other land developers reconsidering their position in the real estate market and thinking of newly emerging opportunities and threats. Huarun is one of the top ten real estate enterprises in China. Unlike small companies such as Dingxiu, Huarun closely focuses on long term targets and strategies, while evaluating its structural actions annually. The common project-level factors such as profitability, overall investments, risks to return on investments and local authority relations, are secondary to its long-term strategy. Huarun is an ambitious company. As such it sought to progress towards high-level targets planned for achievement within the Beijing urban region in the five years from the plan becoming operational in 2005. With respect to its performance in 2004 and 2005, the company maintained a low profile. Therefore, its high level targets were somewhat surprising and seemingly impossible to achieve. A comment from its competitors offers an explanation: 'they were anxious about annual performance, pressures were coming from headquarters'.

In this situation the issuance of the Beijing urban land use plan and the mismatch it created could be perceived as an opportunity for Huarun to improve its performance in the Beijing market. What we know is that Huarun was – as others were and as was to be expected – triggered into action by the plan, and was eager enough to adapt its policy. What it did, however, was not to change its existing activities to achieve compliance, but to follow a new route to achieve its own desires and needs. Both its initiative to develop a real estate project and its actions to fulfil its obligations were unexpected and out of line with common practice. Nevertheless, the result was copied by many others: a landslide of similar initiatives followed. The first step Huarun made was to bid for the Maofangchang site, at any cost.

This is what happened: Maofangchang is the largest development site in the Beijing urban region since the open-market land leasing policy was implemented in 1988 (For more information, see Ho & Lin, 2003). It is a suburban area outside the fifth ring road, northwest of Beijing's city centre. Seven major real estate companies in Beijing participated in the auction, one of them having had a long-established interest, including long-standing investment in preparatory work. Compared to its competitors, that company was willing to accept a lower profit margin to win the auction. After 81 rounds of bidding, however, the Huarun company bought the site. The price paid, CNY 2565 million, was almost three times higher than the floor price at auction. It was an absolute record for a single sale. Compared to the surrounding properties and the investments made there, hardly any profit could to be expected for Huarun.

Only in retrospect does it become clear that Huarun wanted to win the bid at any cost, which was at that time considered by most if not all parties as a move totally out of touch with reality. Huarun compensated for its 'irrational' bid for the Maofangchang site mainly through publicity and land banking. First, Huarun undertook a publicity programme, including television commercials, a forum and a series of items in the regional news – even a book was published – all of which described a magnificent future for the region, trying to create an image for potential customers that was too good to deny. The image created was intended to express the region's outstanding real estate potential. Second, due to its confidence in expected land use in the area, Huarun adopted a land banking strategy. In the first stage less than twenty percent of the Maofangchang site was developed. For Huarun this meant supporting two goals. On the one hand the remaining eighty percent of the site could be held back in the expectation that land prices would go up due to Beijing's rapid urban development. On the other, this limited development led to a temporary shortage in real estate products for this 'promising' region. Consequently, housing prices rose. In 2006 the price per square metre was around CNY 8000. This figure rose to CNY 9000 in 2009 and all the way up to CNY 35,000 in 2012.[5] The rise in terms of land and real estate value at the Maofangchang development site was an immediate result of Huarun's strategy (mismatch between land use plan expectation and land use reality resulted in manipulation and speculation).

Huarun is not the only land developer who recognised the real estate potential of the new land use plan. The Dongba southern site (1105-655), the Shahezhen site (C-X06), Guangqulu 36 and the Qingheying site, to name but a few, are profitable due to the rapid land value increase. The success of companies like Huarun resulted in similar actions and decisions by other land developers. It contributed to land speculation practices and market manipulation in Beijing's urban region. Since 2006, the sale price record for a single plot of land in Beijing has been broken many times.

Before the depression affected the real estate market in the latter half of 2011, both land developers and house buyers were by and large blind, overly confident and full of expectations. The depression made them aware of the illusions that had been created. In 2012 many previously record-breaking plots, such as Number 14 Baiziwan Road and the Number 22 Tianzhu development zone

5 These price figures were acquired from interviews.

were withdrawn due to the developers' financial difficulties. This development was an immediate consequence of a policy to regulate credit more strictly. The overheated land market began to cool down. No doubt this will again create a mismatch and a new round of adjustment behaviour by quickly adapting land developers.

In retrospect the housing manipulation and land speculation can be regarded as the collective action of land developers. It had massive impact on Beijing's urban development. The urban development occurred at a larger scale and with greater speed than ever before, creating massively built up areas (see the analyses by Yan & Feng, 2010; and Hui & Shen, 2006). Aside from the housing manipulation and land speculation, this real estate expansion came with some spontaneous features: 1) the unexpected speed of the transfer of land use rights from the municipal government to land developers (urban land use rights expected to be leased for 15 years was transferred in 5 years); 2) the unexpected form (large land parcels far from built-up area, lack of urban infrastructure); and 3) the unexpected process (land speculation with a very slow building process).

This case shows how the urban land use plan proposed by the Beijing municipal government was interpreted by developers as an attractive business opportunity, instead of regarding the plan as a blueprint. The plan created a break between the current land use conditions and the land developers' expectations. These expectations were cumulatively amplified in the real estate market through peer interactions among developers and real estate customers. This gave rise to unexpectedly high investments, but also to manipulation of the housing market and to land speculation. This change was due to the individual motives and long-term strategies of Huarun and other real estate companies, which had previously been unheard of, and had been overlooked as possibilities. The independent activities of land developers like Huarun, who substantially took the same speculative path, resulted in the formation of a spontaneous pattern of land use expansion in the Beijing urban region, on a surprising scale.

## 3.5 DISCUSSION

Assumptions about linearity and the direct causal responses to the intentions of policymakers in spatial plans overlooked the local behaviour of actors who are no longer under the immediate control of the authorities. In Beijing this resulted in manipulation of the housing market and speculation by real estate developers. Not surprisingly, the relationship between

the conditions set by spatial planners and local authorities, and the autonomous actions taken by real estate companies, are being reconsidered. Various proposals for top-down and regulated policies have been launched to try to get a grip on a vastly changing urban environment and on a dynamic real estate market with its various actors and their strategic behaviours. This reconsideration was not meant to bring back the good old days, which are remembered in China as the pre-reform period, with economic factors such as labour, finance agencies, taxation and foreign direct investment all under strict control at state level (Zhang, De Roo & Lu, 2012). The urban environment and the markets are far too dynamic to allow a technical and control-driven policy approach. The dynamics, being the result of liberalizing reforms, have resulted in increasing interactions and strong, open and emerging networks which have passed the point of no return (Bardhan, 2002).

We cannot deny that the unexpected outcomes of the independent, strategic and non-linear behaviour of the real estate market have confused policymakers. Originally they had the power to define and control reality. A first response could have been to regain this power by proposing more regulations to reduce uncertainties and autonomous actions. Our point is to consider the opposite, and to take into consideration characteristics of self-organization. These will emerge in any situation which is not fully controlled: a symmetry break reaches a critical point beyond which adjustment behaviour is expected, without also conforming to a guaranteed and well-defined set of expected outcomes.

A spatial plan which proposes a particular future, and which is meant to trigger action instead of controlling parties to participate in the process towards this future, has to be flexible in how it envisions a future will enfold. Only then can creativity in support of the plan and related local developments become an advantage. Actors adjust their strategies, activities and interactions creatively, competing with and imitating each other, under the existing conditions. Therefore, local stakeholders desire conditions under which their activities can take place, resulting in both a fair market and a liveable environment. In a non-linear world in which self-organizing processes are expected along with institutional trajectories, conditions are becoming as important as content and process. Conditions under which content and process co-evolve enable plans to be implemented, the various actors to relate their responsibilities, and processes of self-organization to unfold in support of societal development. Local entrepreneurs, real estate developers, housing constructors and house buyers need the confidence that under these conditions their actions will pay off. Therefore, there are various reasons for planners to consider not only

content and process, but also the conditions under which the various actors will be willing to invest in a development area.

In other words, policymakers, planners, real estate companies and local entrepreneurs have to accept that they have to find a synergy between the plan, its conditions, the spatial products being proposed and their qualities. The various actors have to understand and to appreciate the interdependence between institutional conditions and self-organizing behaviours, and all should have a keen eye for the non-linear processes that might emerge, stressing the positive effects such as producing products people desire, and reducing the impact of negative effects, such as housing market manipulation and land speculation.

This will be a learning process which should allow adjustments to occur, for the better good of all parties involved. This can only be if all parties – policymakers as well as market actors – appreciate the interdependence of institutional design and self-organizing processes, and of actors who trust in each other's capabilities to work mutually together and the conditions under which each can fulfil their responsibilities.

If our argument is followed through, self-organization should not just to be regarded as a physical or material process causing a symmetry break and criticality out of which non-linear adjustment behaviour and pattern formation emerges. Even a spatial plan, still being a conceptual idea, can create a symmetry break which results in a process of self-organization. When are processes of self-organization to be expected? They are the moment when a plan deviates from command-and-control and from being a blueprint to being a set of conditions which constrain and enable the planning playing field. This is what we have seen in Beijing's cases. Within an institutional setting which has undergone a shift from strong control to a set of guidelines about visualizing the urban future, it allowed self-organization processes to occur. It is relevant to consider the consequences: after creating a criticality, the responses of developers in complying with the conditions of the local land use plan resulted in their following a non-linear route with unexpected results. Our call is for awareness of such unexpected effects due to self-organizing behaviours, as their impact can be substantial, uncontrollable, and both negative and positive.

We have used the two cases in Beijing's urban region to identify mechanisms of spontaneous, unplanned and unexpected urban land use patterns within a policy environment which was traditionally considered to be highly controlled

and strictly planned. This unexpected behaviour is a consequence of interdependence between self-organization and institutional rules which allow flexibility and creativity by market parties. Our cases show self-organizing mechanisms which include the following phases of development: institutional change resulting in symmetry breaks between what was and what is being proposed; self-organized behaviour due to the independent actions of real estate actors; and which unintentionally resulted in spontaneous pattern formation as a collective outcome. The increase of economic and spatial dynamics in China after reform shows the relevance of a better understanding of self-organization, not just because of the identified negative effects, but also to appreciate and enhance the positive effects.

We presented these two cases in support of our argument, and we considered carefully the mechanisms of self-organization in situations where outcomes differed substantially from the expected, usual ones. Specifically, a new spatial policy plan created spontaneous, unplanned and unexpected land use patterns in Beijing's urban region. The argument in this paper is that the interdependence between self-organization and institutional rules was not well understood, if at all, despite this interdependence being very much in evidence. Lacking direct control and the expected linear result, the institutional rules played a role in creating symmetry breaks which triggered adjustment behaviours and non-linear, unpredictable outcomes.

# 4

# INTERDEPENDENCY OF SELF-ORGANIZATION AND PLANNING: EVIDENCE FROM NANLUOGUXIANG AT BEIJING [6]

6 A revised version of this chapter with slight changes has been accepted in December 2015 by the journal Town Planning Review.

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# 5

# UNDERSTANDING SELF-ORGANIZING URBAN TRANSFORMATION AND THE ROLE OF FORMAL INSTITUTIONS[8]

**Evidence from Gaobeidian, Beijing, China**

8 This chapter has been submitted to journal Cities and is now under review.

# 6

# CONCLUSIONS, POLICY IMPLICATIONS AND RESEARCH RECOMMENDATIONS

## 6.1 RECONSIDER URBAN TRANSFORMATIONS: INTERACTIONS BETWEEN SELF-ORGANIZATION AND PLANNING

People incline to prefer and get used to a world full of linearity and certainty. This allows us to understand and position ourselves in the world we are part of and make predictions on possible futures. In particular for planners, certainties and causal-relationships within urban development justify an urban reality which can be reduced, reexamined, predicted and therefore can be well understood and managed. Despite all the advantages and conveniences certainties can bring, the urban regions within which we live manifest itself to be complex, full of non-linearity, uncertainties and unexpected changes (Abbott, 2005; Gerrits et al, 2012; De Roo & Rauws, 2012). An increasing number of urban transformations have been observed which are not top-down pre-planned, not progressed in an linear route, but come up from the bottom-up in a spontaneous manner (Cheng & Masser, 2003; Batty, 2012). These new characteristics of urban transformations are challenging the conventional wisdom of planners and request alternative thinking and strategies to supplement the positive-oriented planning and governance. Moreover, a shift with relate to urban system from Cartesian-Newtonian mechanism to complex sciences, from equilibrium system to complex adaptive system also requests alternative thinking from planning (Allen, 1997; Batty, 2008a). This thesis therefore is conceived as a response to such a challenge and request.

This thesis has studied four cases, in all of which urban transformations to a larger or smaller extent have shown characteristics of the non-linearity and spontaneity. The re-creative, circular causality, and emerging characteristics during the process of urban transformations are not happening by coincidence, but represent a new type of urban transformations. This new type of urban transformations is the result of the new situations of urban society.

Both theoretical debate and planning practices have highlighted the new situations of urban society under which such type of urban transformations are getting widespread and fundamental. The increased connectivity of urban society, amplified by broadly available information technology, has significantly increased the social-spatial networks and dynamics within urban systems (Newman et al., 2006; Healey, 2006). Supported by low cost information, the interactions between individuals are getting more influential on macro urban transformations. To sum up, the intrinsic complexity of urban system lead to the spontaneous urban transformations.

Urban systems had its connections to complexity. In the past decade, cities have been used as metaphoric example in complexity research of dissipative structure in physics (Prigogine, 1980; Allen, 1997). Urban researchers further developed complexity theories of cities (CTC) (Portugali, 2011. p2). The research concern of CTC has been focusing on cellular automata and agent-based simulation models (Portugali, 2011. p3). These studies showed how transformations mechanisms of complexity systems can be related to urban transformation processes. However, these studies are often also somewhat disconnected from the core of urban studies and instead become a branch of complexity theories as studied in the hard sciences (Batty, 2012). As a consequences, many of these studies portray cities as inanimate physical complex system disregarding or oversimplifying human dimensions of cities. One could think of research on fractals (Chen & Feng, 2012), or scaling law (Bettencourt, 2013). As a supplement, this thesis relates complexity theories to urban system and planning within social context from qualitative perspective, which is considered urgent and valuable in planning debate (Collier, 2003, Portugali, 2012). More specific, this thesis is dealing with self-organizing urban transformations and its institutional implications.

Above all, complexity is not a simple notion expressing basic feelings about an encountered planning situation which is getting complicated and 'complex'. Self-organization is not a general saying for all process of 'unplanned' activity in cities. Instead, self-organizing urban transformation in this thesis stands for a "reset" of positivist mind frame of planers, to be able to see the world in a different way (De Roo & Silva, 2010).

Such a "reset" of attitude means a different perspective of considering urban changes. Urban changes which were regarded as linear outcomes of planning and policy are now taken as nonlinear results of emerging, adaptive and co-evolving process due to interactions of various actors within urban system. Urban changes which were believed to get organized with intervention and would become disorganized otherwise are now considered to be able to create ordered pattern by themselves.

This thesis is contributing to the complexity perspective on planning by revealing a bottom-up mechanisms behind urban transformations. According to the four cases, we have summarized a primary mechanism underlying spontaneous urban transformations. Such a self-organizing mechanism is featured by an autonomous and non-linear process, situational changes as the trigger, unintended individual behaviors as response, and spontaneous patterns as the

result. This mechanism on the one hand better explain the seemingly complex urban transformations, and on the other reminds us to reconsider the role of planning and institutions.

This thesis also contributes to uncovering the inter-relations between institutions and self-organizing urban transformations. Institutional intervention can still find its way to influence on the transformations albeit not through a controlling manner. Instead of direct regulation, institutions can are actually constraining or enabling the conditions which allows the happening of self-organizing process. On the contrary, self-organizing process can also lead to institutionalization.

Correspondingly, the role of planners should go beyond the assistant of policy makers with expertise on design, economic analysis, consensus building et al., and become the manager of changes. By watching and dealing with the trends of urban evolution, planers should explore approaches to avoid negative and embraces the positive effects of both expected and unexpected changes.

In sum, this thesis is contributing to the debate on relating self-organization theories to spatial planning and urban system within social context, by using qualitative approach. Supported by four case studies, we can find out the answers to the three main questions we raised up in the beginning of this thesis:

1. What is the alternative solution for planning in face of complexity, which is challenging both technical rationale and communicative rationale?
2. How to understand and identify self-organization in urban transformation?
3. How can institution as manifestation of collective intent relate to an unintended self-organizing process?

### 6.1.1 WHAT IS THE ALTERNATIVE OF PLANNING WHEN FACING COMPLEXITY?

In this thesis we argued that self-organization theories provided a beneficial alternative perspective to understand the spontaneous urban changes. Correspondingly, planning is dealing urban reality changing through time, not only content and process, but also contexts and situations. In face of complexity, it is suggested for planning to go beyond technical rationale and communicative rationale and shift its focus towards situational changes which influence the behaviors of components of urban system.

Chapter two of this thesis critically reviewed the evolution of planning theories and practices in China and Europe. We found planning in both China and Europe had undergone several waves of changes in the past sixty years. Currently China is still very much focusing on rapid transformations, coping with the “urban revolution” with massive interventions while

European planning theory is slowly emerging, which allows reflexivity towards contemporary communicative practices. Out of both trajectories, we can distil a desire for better arguments to cope with realities being encountered, beyond the technical and the communicative side to planning.

Interesting are those arguments building on the ideas of complexity thinking, nonlinear development and transition management, all accepting a physical environment in a continuous state of change. This change is considered to be, by and large, autonomously driven. Induced change, for example, as a result of planners’ interventions, is seen as a response and not as a direct causal effect out of which the world and its physical environment are being “created”. We believe that both Chinese and European planning could meet each other on the basis of this perspective of change, evolution and emergence. Change, emergence, time and the notion of “becoming” matter in this new perspective and could colour Chinese and European planning in their own right.

The planning practice in China and Europe also informed us that both technical and communicative approaches to planning were appropriate and helpful under certain conditions, while neither were able to convincingly handle the challenges that emerge from a dynamic, transitional and situational reality on its own. Both the technical rationale and communicative rationale emphasized the role of how various actors and factors can shape the urban environment rather than the urban environment could develop itself.

Both technical rationale and communicative rationale focused on an urban reality frozen in time: a reality was understood and coped with through either scientific methods or communication of stakeholders but was lack of consideration of time.

In face the complexity, an alternative perspective for planning is that we moved one step further shifting the focus of planning from technical rationale (factual reality) and communicative rationale (agreed reality) to evolutionary rationale (situational reality) which considered the matter of time, taking urban reality

from being to becoming. Correspondingly, urban region is regarded as a complex adaptive urban system which to a larger or smaller extent could create patterns and transform itself. The mechanism behind pattern formation of complex adaptive urban system therefore were explored in the following chapters, which related to the second main question of this thesis.

### 6.1.2 HOW TO UNDERSTAND AND IDENTIFY SELF-ORGANIZATION IN URBAN TRANSFORMATION?

Four cases from Beijing metropolitan area China were studied to explore the mechanism behind spontaneous urban transformation and the role of institutions in these transformative processes. The empirical study included two land development cases in suburban area of Dingxiu and Maofangchang, one case of inner city regeneration and one case of rural development of Nanluoguxiang, and one case of rural development of Gaobeidian. We studied these cases as the transformations in these areas were largely unplanned and unexpected. We have found out that instead of being pre-planned or externally organized, physical and functional transformations in these cases were featured by non-linearity, bottom-up driven and were resulted from unintended individual actions. We employed the theories of self-organization from complexity sciences to interpret and analyze these transformations.

The contribution of this thesis to understanding the self-organizing urban transformations mainly lied in two aspects. First, an analytical framework with relate to self-organizing process of urban transformation was built and applied to case study which could be widely used in similar research topic. This will help complexity theories better link into the debate of planers. Second, the concept of self-organization was considered within a social context in which actors share their perceptions, positions and interests. The effect of self-organization which is normally regarded as a mechanism of order creation was also evaluated. This made supplementary contribution to self-organization research in hard sciences.

We've explored the mechanism of bottom up pattern formation by an analytical framework of self-organizing urban transformations. We examined that a self-organizing urban transformation followed certain steps. First, a symmetry break occurs within urban system. Such a break could be resulted from macro environmental changes such as economic booming or micro changes within urban system, local desire to improve living quality for instance. This symmetry break builds up tension upon the urban system until criticality is reached. The

origin or cause of the 'symmetry break' (a triggering event) has no effect, either on the 'criticality' or on anything which follows. Second, reaching criticality means adjusting behaviour to the symmetry break, by actors (or parts, particles or whatever mobile entities adjusting their positions) responding and behaving autonomously from each other. Before the criticality was reached, there will be various types of adjusting behaviours which could lead the transformation towards different direction. We call this a period of no identity, or a period of making choice. Third, out of this adjusting behaviour new, spontaneous patterns will emerge. While these spontaneous patterns are spatial or social representations of dynamic persistency, the impact of these new patterns is fundamentally unknown beforehand.

In chapter three, we used the two cases in Beijing's urban region to identify mechanisms of spontaneous, unplanned and unexpected urban land use patterns within a policy environment which was traditionally considered to be highly controlled and strictly planned.

In these two estate development cases, linearity and the direct causal responses to the intentions of policymakers in spatial plans overlooked the local behaviour of actors who were no longer under the immediate control of the authorities. Various proposals for top-down and regulated policies had been launched to try to get a grip on a vastly changing urban environment and on a dynamic real estate market. However, what role these intentions did play was triggering land developers to seek for business opportunity on the basis and within the framework of these proposals and plans. The unintended but collective actions of many land developers created scattered land use patterns and resulted in manipulation of the housing market and speculation on land trade. Dingxiu case was a standard self-organization process in term of institutional trigger to case a symmetry break, independent individual behavior reaching criticality, and spontaneous outcome in new physical pattern. Maofangchang case was unique in the sense that it illustrated that even the most common activities of planner, a blueprint plan can be the starting point of a self-organization process.

Chapter four further explored the self-organizing mechanism with a case study of inner city redevelopment. In comparison to the real estate development cases which happened on vacant land, Nanluoguxiang case got more stakeholders involved due to the high density of residents, developed commercial activities and tourism within the neighbourhood. Nanluoguxiang neighbourhood had experienced two typical self-organizing process in its evolution, both of the two times transformation manifested the various steps of self-organization

we proposed. Initially in the pre-reform era local residents were increasingly confronted with a symmetry break due to an increase in resident numbers without a commensurate increase in living space. At a certain point (criticality) they responded individually and without collective intent by undertaking building activities. This adjusting behaviour unintentionally resulted in the transformation of courtyards into warrens.

For the second time transformation of Nanluoguxiang, the renewal plan triggered various actors – particularly local residents, businessmen and tourists responded to the symmetry break created. The revitalization plan of Nanluoguxiang turned to become a commercial leisure opportunities far exceeding the carrying capacity of the neighbourhood to accommodate all these commercial facilities and the unprecedented attraction they had to a wider audience, tourists in particular. Nanluoguxiang transformed from being a local residential community into a well-known tourist destination attracting people not just locally or regionally, but even globally.

Beyond the above mechanism, this chapter also show that although self-organization was a mechanism of complex adaptive system to acquire order, it didn't always lead to positive social outcomes. Both objective facts and subjective opinions had proved the negative consequences resulted from self-organization including the poor living quality in warrens and the over-commercialization of the neighbourhood. This reminded planners the necessity to link self-organizing process to spatial planning and to guide the direction of self-organization, which related to the third main research question of this thesis.

### 6.1.3 HOW CAN INSTITUTIONS RELATE TO A SELF-ORGANIZING PROCESS?

The thesis provided evidence to support the argument that urban development including the process of self-organization did not downplay the relevance of formal institutions as an effective governance tool. Instead, the understanding on self-organizing mechanism would enhance the role of institutions in relation to the spontaneous urban changes, and the constraining and enabling conditions being part of these changes.

Chapter 3 and 4 already mentioned the influences of institutions on a self-organizing urban transformation. Chapter 5 further dig into the interrelationship between self-organization and spatial planning. The mechanism behind the functional transformations of the case Gaobeidian which transferred form a

rural village into a bedroom area for migrant workers, then into a furniture center and further into a renovated village was discussed. This chapter concluded the role of institutions on a self-organizing urban transformation and as well as how self-organization could influence institutions. Besides, this chapter also pointed at the world in between top-down planning and self-organization, by looking at the positions of shared-governance and self-governance. We would summarize these conclusions in the following respectively.

### *(1) The role of institutions on a self-organizing urban transformation*

Institutional role on a self-organizing urban transformation was constraining or enabling instead of control. As we mentioned earlier, a self-organizing process was an autonomous changing process due to the independent individual behaviors as responses to situational changes. Institutions brought dynamics into urban system and changed the conditions within which individuals behave. The independent individual behaviors were unstable and adjustable, basing on the information and resources individuals can acquire. The constraining or enabling role of institutions on self-organization attribute to how they can influence these individual behaviors.

Prohibition items of institutions will eliminate or increase the cost of options which individual can choose and behave through restricting on necessary resources. For instance in the Gaobeidian case, such constraining role of institutions are visible in two aspects: constraints on land trade and special land use regulation. Thus, individual villagers selling the land to developers transforming Gaobeidian into a part of the urban expansion of Beijing was constrained.

Institutions also stimulated individual behaviors by providing incentives. These incentives will on the one hand provide necessary conditions which supported individual behaviors and on the other hand would cause individuals re-evaluated various options at hand and therefore reframed the probability of these options. For instance, in the Gaobeidian case the incentive package resulted from the “development strategy of culture and creative industries” stimulated people in Gaobeidian getting involved in antique furniture industry in term of renting part of their house for furniture renovation, sale and operating antique furniture shops themselves, which resulted into functional transformation of Gaobeidian.

### *(2) Self-organization leads to process of institutionalization*

On the contrary, self-organizing process also had impacts on institutions. The Gaobeidian case has shown that a positive outcome resulted from self-organization can increase trust among individuals. The increasing trust will further elevate the willing to cooperate, to build consensus, and to solve a problem collectively. In such a way, individual intent became collective intent which instructed individual actions. Self-organization process in such a way was replaced by self-governance, which could be taken as institutionalized self-organization, mostly in an informal term. When such a cooperation, a collective intent not only include individuals from within, but also agents and organizations from outside, self-governance further turned into shared governance, which was the pre-mature period of formal institution. This indicated a route how societies produced institutions in a bottom up manner. Moreover, it provided a solution to reduce uncertainties, and to be assured of stable structures supporting people to interact well with each other within their social environments.

### *(3) In between of self-organization and institution: shared-governance and self-governance*

Government controlled planning, shared governance, self-governance and self-organization are all important mechanisms contributing in their own particular ways to urban transformations. In the study of Gaobeidian case, we found out bottom-up mechanism of self-governance and shared governance which seemed similar but differentiate from self-organization. The key to distinguish self-organization from self-governance and shared-governance is to see whether the intent and actions are pre-defined. In a self-organizing process, there is no pre-defined collective intent and individuals act spontaneously. In a process of self-governance, individuals intend to solve the problem mutually. They interact by discussions and negotiations to build consensus, an agreement based on which they act. Therefore, such a process is internally coordinated, manifested by a collective intent. Shared-governance process get the government or the authorities to be involved, although no longer in a stirring or controlling way, instead trying to facilitate or to guide stakeholders in their actions to push developments further or to solving specific problems. So in a process of shared governance, there is a pre-defined collective intent like self-governance. But what distinguishes from self-governance is that the collective intent is resulted from the consensus of both individuals from within and governmental agencies from outside.

## 6.2 POLICY IMPLICATIONS

This thesis emphasized that the effectiveness and efficiency of planning was largely depending on the situations within which the planning approach has been implemented. Currently planning is confronted with a world with unprecedented dynamics and complexities. Interactions among residents, markets and governments from local, regional and even global level are intensive, dynamic, seemingly unstable and chaotic but meanwhile are able to create order spontaneously, which is challenging conventional planning aiming to regulate and control.

This thesis has uncovered the self-organizing mechanism underneath the spontaneous urban transformations. We also clarified the constraining and enabling role of institutions and planning onto the process of self-organization. The vital but elusive characteristics of self-organization is its spontaneity. While influenced by the actions of other organizations or groups, it cannot be imposed by external regulation nor can it be suppressed by perpetual chaos. From either order or chaos, a system will move toward the creative balance of order and flexibility that distinguishes an effective complex system. These distinguished characteristics lead to the following policy implications.

### 6.2.1 SHIFT FROM GETTING THINGS UNDER CONTROL TO GETTING READY FOR CHANGE

As policy makers and planners, the awareness of and preparation for the unexpected effects due to self-organizing behaviours is necessary. In face of complex situations, the impact of spontaneous effects can be substantial, uncontrollable, and both negative and positive. It becomes rather difficult (if not possible at all) for planning to control urban transformations. It is relevant to consider the consequences: after creating a criticality, the responses of actors in complying with the conditional changes resulted in a non-linear route with unexpected results.

What was suggested are smart interventions initiated by spatial planning. The mismatch of urban system, the consequences out of intentions of policy resulted from adjusting behaviours of actors should be realized beforehand. The conditional change due to policy implementation which will constrain or enable self-organization processes should also be considered. The constraining and enabling role of institutions are the basis which policy makers and planners can rely on in order to influence the process of self-organization. Self-organizing

process was a major challenge for spatial planning due to the uncertainties and spontaneous formation of patterns it brought forward. At the meantime however, self-organizing process also revealed a way to stimulate initiatives to actively behave in urban transformation, which will improve the efficiency and effectiveness of spatial planning. To achieve this, planning and policy should focus on the situations in which self-organizing processes are deliberately triggered and conditioned.

### 6.2.2 FOCUS ON SITUATIONS OF CONTENT AND PROCESS

In a non-linear world in which self-organizing processes are expected along with institutional trajectories, conditions are becoming as important as content and process. Conditions under which content and process co-evolve enable plans to be implemented, the various actors to relate their responsibilities, and processes of self-organization to unfold in support of societal development.

Actors relating to an urban transformation, local entrepreneurs, real estate developers, housing constructors and house buyers need the confidence that under these conditions their actions will pay off. Therefore, there are various reasons for planners to consider not only content and process, but also the conditions under which the various actors will be willing to invest in a development area.

#### *(1) How to play with conditions*

Instead of traditional perspective which asserts that planning and institutions are designated to create order or control behavior or process, they actually change the situations of urban system within which behaviors and process are undergoing. Therefore, institutions can influence the process of self-organization by playing with the conditions which are necessary for actors to respond collectively. Synergetics sheds light on ways how to steer a complex system.

Complex adaptive system is in dynamic equilibrium, which means a continuous process of systemic breaks, responses, new balance and systemic breaks again. Systemic breaks are caused by systemic dynamics. Responses to systemic breaks can be top-down intervention or bottom-up individual activities. Normally the top-down intervention responds slower while bottom-up individuals respond quicker. The response from individuals are subject to many conditions such as

information sources, financial ability and the willing to conduct. Moreover, the bottom-up responses vary due to the diverse interest of individuals, creating many order parameters. Planning therefore can change the conditions of self-organization and change the probability of various order parameters becoming the control parameter, through constraining regulations and enabling incentives.

Specific constraining items of policy or a plan will suppress an undesirable scenario. But it has to be realized that such a constraining institutions can be also a stimulator to trigger self-organizing process on different space, in different forms, which might cause negative consequences. A suggestion is to supplement the constraining items with a supporting package which will support a self-organizing process to occur, but towards the socially desirable direction.

### *(2) Fostering institutional settings allow self-organization to occur*

It is suggested to shift the institutional setting from strong control to a set of guidelines about visualizing the urban future, which allowed self-organization processes to occur. A spatial plan which proposes a particular future, and which is meant to trigger action instead of controlling parties to participate in the process towards this future, has to be flexible in how it envisions a future will enfold. Only then can creativity in support of the plan and related local developments become an advantage. Actors adjust their strategies, activities and interactions creatively, competing with and imitating each other, under the existing conditions. Therefore, local stakeholders desire conditions under which their activities can take place, resulting in both a fair market and a liveable environment.

### *(3) Dealing with complexity needs more collaboration*

Policy makers and planners are suggested to use incremental interventions and get ready for dynamic adjustments to cope with the consequences resulted from plan implementation. Moreover, dealing with complexity is not a duty only for planers, but for all stakeholders. In other words, policymakers, planners, real estate companies and local residents have to accept that they have to find a synergy between the plan, its conditions, the spatial products being proposed and their qualities. The various actors have to understand and to appreciate the interdependence between institutional conditions and self-organizing behaviours, and all should have a keen eye for the non-linear processes that might emerge, stressing the positive effects such as

producing products people desire, and reducing the impact of negative effects, such as housing market manipulation and land speculation.

## 6.3 FUTURE RESEARCH RECOMMENDATION

The application of complexity theories into urban planning is still in its infancy. This thesis is an exploration on how to bridge self-organization and spatial planning. Substantial research efforts are still needed in order to further link self-organization and complexity sciences into planning theories and practices, to improve the utility of complexity theories and approaches in dealing with complex planning issues, and to enrich the application of complexity theories within social context. Amongst the others, we advise the following two aspects for research efforts in the next period.

### 6.3.1 RELATE SELF-ORGANIZING URBAN TRANSFORMATION TO THEORY OF SYNERGETICS

Urban system has manifested to be a platform on which various flows (people, materials, energy et al.) meet and interact. Urban functional and structural changes are manifestations as well as outcomes of such interactions and in continuous evolution. From this perspective, sustainable urban development can be understood as symmetry of various actors, sections, functions, et al. instead of single or multiple development criteria. With relate to the coordination of systemic ingredients, theories of synergetics has a lot to offer. This paper has unfold a self-organizing process with symmetry break, criticality and pattern formation. More can be achieved in the light of theories of synergetics, which mainly include: (1) Research on the emerging of order parameter, as well as vanishing of order parameter in the period of no identity with relate to urban transformation; (2) the conditions which allow the formation of a control parameter, which will result in reaching criticality and new pattern formation. This is a key issue to the efficiency of planning approach.

### 6.3.2 STRENGTHEN INSTITUTIONAL ANALYSIS WITH RELATE TO SELF-ORGANIZING PROCESSES

Self-organization is a bottom-up mechanism indicating how actors collectively behave as responses to environmental changes, which relates to the content of institutional analysis. Institutional analysis has been focusing on the systematic study of people's collective behaviours, on how institutions

as manifestation of collective thinking can have a direct impact on behaviors. Since the 1980s, a shift can be witnessed in institutional analysis to explain how organizations and individuals within organizations make economic and managerial decisions, particularly by investigating the non-rational, non-economic, and non-psychological factors, known as the New Institutional Analysis (Powell & Dimaggio, 2012). In our opinion, such a turn to some extent reflects the influences of complexity theories on the methods of institutional analysis. The new institutional analysis therefore provides good framework and reference for the complexity-based urban research.

By bridging self-organization studies and institutional analysis on urban transformation, self-organization can be also better related to the realm of governance by further explore the interdependency between self-organization and institutions. Many mechanism in between of self-organization and spatial planning such as self-regulation, self-governance, shared governance, etc. can be well studied. We made a start in this thesis and more could be done to find out whether there is a complete landscape where we can position all these many forms of mechanism for urban transformation in one picture.

# BIBLIOGRAPHY

**Abbott, J. (2005)** Understanding and Managing the Unknown: The Nature of Uncertainty in Planning, Journal of Planning Education and Research, 24(3): 237-251.

**Abramson, D. (2006)** Urban Planning in China: Continuity and Change: What the future holds may surprise you, Journal of the American Planning Association, 72(2): 197-215.

**Acemoglu, D., Johnson, S. and Robinson, J. (2005)** Institutions as a fundamental cause of long-run growth, Handbook of Economic Growth, 1(A): 385-472.

**Akira, K. (1978)** China's urban planning: Toward development without urbanization, Urban Planning, 16(1): 3-33.

**Albrechts, L. (2004)** Strategic (spatial) planning re-examined, Environmental and Planning B: Planning and Design, 31: 743-758.

**Alfasi, N. & Portugali, J. (2007)** Planning Rules for a Self-Planned City, Planning Theory, 6(2): 164-182.

**Allen, A. (2003)** Environmental planning and management of the peri-urban interface: perspectives on an emerging field, Environment and Urbanization, 15(1): 135-147.

**Allen, M. (1997)** Cities and regions as self-organising systems: Models of complexity, Gordon and Breach: Amsterdam.

**Allen, P. & Sanglier, M. (1979)** A dynamic model of growth in a central place system, Geographical Analysis, 11(2): 256-272.

**Allen, P. & Sanglier, M. (1981)** "Urban evolution, Self-organization, and decision making", Environment and Planning A, 13(2): 167-183.

**Allmendinger, P. (2002)** Planning Theory, Palgrave: New York.

**Anas, A., Arnott, R. and Small, K. (1998)** Urban spatial structure, Journal of Economic Literature, 36(3): 1426-1464.

**Arnouts, R., Van der Zouwen, M. and Arts, B. (2012)** Analysing governance modes and shifts -Governance arrangements in Dutch nature policy, Forest policy and economics, 16: 43-50.

**Ashby, W. (1947)** Principles of the self-organizing dynamic system, Journal of General Psychology, 37: 125-128.

**Ashby, W. (1962)** "Principles of the self-organizing system," in Principles of Self-Organization: Transactions of the University of Illinois Symposium, H. Von Foerster and G.W. Zopf, Jr. (eds.), Pergamon Press: London, UK, pp. 255-278.

**Avelino, F. & Rotmans, J. (2009)** Power in Transition: An Interdisciplinary Framework to Study Power in Relation to Structural Change, European Journal of Social Theory, 12(4): 543-569.

**Bak, P. & Chen, K. (1991)** Self-organized criticality, Scientific American, 264: 46–53.

**Bak, P. (1996)** How Nature Works: The Science of Self-Organised Criticality, Copernicus Press: New York.

**Bao, C. & Fang, C. (2012)** Water Resources Flows Related to Urbanization in China: Challenges and Perspectives for Water Management and Urban Development, Water Resources Management, 26(2): 531-552.

**Barbieri, E., Di Tommaso, M.R. and Huang, M. (2010)** Industrial development policy and innovation in Southern China: Government targets and firms' behaviour, European Planning Studies, 18(1): 83-105.

**Bardhan, P. (2002)** Decentralization of Governance and Development, The Journal of Economic Perspectives, 16(4): 185-205.

**Batty, M. & Longley, P. (1994)** Fractal Cities: A Geometry of Form and Function, Academic: London/San Deigo.

**Batty, M. & Xie, Y. (1994)** From cells to cities, Environment and Planning B, 21: 31-48.

**Batty, M. (2007)** Cities and Complexity: Understanding Cities Through Cellular Automata, Agent-Based Models, and Fractals, MIT Press: Cambridge.

**Batty, M. (2008a)** The Size, scale, and shape of cities, Science, 319(5864): 769-771.

**Batty, M. (2008b)** Cities as Complex Systems: Scaling, Interactions, Networks, Dynamics and Urban Morphologies, in The Encyclopedia of Complexity & System Science, Springer, Berlin. BÉNARD, H. (1901), Les tourbillons cellulaires dans une nappe liquide, Méthodes optiques d'observation et d'enregistrement, Journal de Physique Théorique et Appliquée, 10 (1): 254-266 (Archives Journal de Physique).

**Batty, M. (2012)** Building a science of cities, Cities, 29(1): S9-S16.

**Beckert, J. (1999)** Agency, Entrepreneurs, and institutional change. The role of strategic choice and institutionalized practices in organizations, Organization Studies, 20(5): 777-799.

**Beijing Municipal Bureau of Statistics. (2008, 2009, 2010)** Beijing Statistics Year Book, China Statistics Press: Beijing.

**Beijing Municipal Commission of Development and Reform. (2006)** Development strategy of culture and creative industries (The original Chinese name in Pinyin is: Beijingshi Cujin Wenhua Chuangyi Chanye Fazhan de Ruogan Zhengce), Governament policy, No printer.

**Beijing municipal government. (2009)** Congress report of small town construction, Government report no formal printer, Beijing.

**Beijing municipal government. (2011)** Municipal regulation and control on real estate market (The original Chinese name in Pinyin is: Beijingshi renminzhengfu bangongting guanyu guancheluoshi guowuyuan bangongting wenjianjingshen jinyibu jiaqiang benshi fangdichan shichang tiaokong gongzuo de tongzhi), Government report no formal printer, Beijing..

**Benenson, I. & Torrens, P. (2004)** Geosimulation: Automata Based Modeling for Urban Phenomena, Wiley: London.

**Bénard, H. (1901)** Les tourbillons cellulaires dans une nappe liquide, Méthodes optiquesd'observation et d'enregistrement, Journal de Physique Théorique et Appliquée, 10 (1): 254-266 (Archives Journal de Physique).

**Best, S. & Kellner, D. (1997)** The Postmodern Turn, The Guilford Press: New York.

**Bettencourt, L. (2013)** The Origins of Scaling in Cities, Science, 340(6139): 1438-1441.

**Bloom, S. (2000)** Chaos, complexity, self-organization and us, Chaos, Complexity and Self-organization, 1-5, Community Works: Philadelphia.

**Boelens, L. & De Roo, G. (2014)** Planning of undefined becoming: First encounters of planners beyond the plan, Planning Theory, Published online before print: doi: 10.1177/1473095214542631.

**Bonabeau, E., Theraulaz, G., Deneubourg, J. L., Aron, S. and Camazine, S. (1997)** Self-organization in social insects, Trends in Ecology & Evolution, 12(5): 188-193.

**Bonabeau, E., Dorigo, M. and Theraulaz, G. (1999)** Swarm Intelligence: From Natural to Artificial Systems, Santa Fe Inst. Studies in the Science of Complexity Series, Oxford Press: Oxford.

**Boons, F., Spekkink, W. and Mouzakitis, Y. (2009)** The dynamics of industrial symbiosis: a proposal for a conceptual framework based upon a comprehensive literature review, Journal of Cleaner Production, 19(9-10): 905-911.

**Boonstra, B. & Boelens, L. (2011)** Self-organization in urban development: towards a new perspective on spatial planning, Urban Research & Practice, 4(2): 99-122.

**Breslin, S. (2000)** Decentralisation, Globalisation and China's Partial Re-engagement with the Global Economy, New Political Economy, 5(2): 205-226.

**Brown, M. (2001)** Market failures and barriers as a basis for clean energy policies, Energy Policy, 29(14): 1197-1207.

**Buckley, W. (2008)** Society as a Complex Adaptive System, Emergence : Complexity and Organization, 10.3 (2008): 86-112.

**Buenstorf, G. (2000)** Self-organization and sustainability: energetics of evolution and implications for ecological economics, Ecological Economics, 33(1): 119 -134.

**Burtenshaw, D. (1985)** The future of the European city: A research agenda, The Geographical Journal, 151(3): 365-370.

**Byrne, D. (1998)** Complexity theory and the social sciences: an introduction, Routledge: London.

**Byrne, D. (2003)** Complexity theory and planning theory: a necessary encounter, Planning Theory, 2(3): 171-178.

**Cai, Y., Zhang, W. and Zhao, Y. (2009)** Discussion on evolution of land-use planning in China, China City Planning Review, 18(1): 32-37.

**Camazine, S. (2003)** Self-organization in biological systems, Princeton University Press: Princeton.

**Cao, K. & Gu, C. (2005)** A review of 20th century western urban planning history, Urban Planning Forum, (1): 57-62.

**Cars, G., Healey, P., Madanipour, A. and De Magalhaes, C. (eds) (2002)** Urban Governance, Institutional Capacity and Social Milieux. Ashgate: Aldershot.

**Cartier, C. (2001)** Zone fever' the arable land debate, and real estate speculation: China's evolving land use regime and its geographical contradictions, Journal of Contemporary China, 28 (10): 445–469.

**Cartier, C. (2011)** Urban Growth, Rescaling, and the Spatial Administrative Hierarchy, Provincial China, 3(1): 9-33.

**Castells, M. (2010)** The Information Age: Economy, Society and Culture. Volume I: The Rise of Network Society (Second Edition), Willey-Blackwell: West Sussex.

**Chan, E. & Lee, G. (2008)** Critical factors for improving social sustainability of urban renewal projects, Social Indicators Research, 85(2): 243-256.

**Chan, K.W. & Zhang, L. (1999)** The Hukou System and Rural-Urban Migration in China: Processes and Changes, The China Quarterly, 160: 818-855.

**Chen, J., Gong, P., He, C., Luo, W., Tamura, M. and Shi, P. (2002)** Assessment of the Urban Development Plan of Beijing by Using a CA-Based Urban Growth Model, Photogrammetric Engineering & Remote Sensing, 68(10): 1063-1071.

**Chen, K. (2004)** Fiscal centralization and the form of corruption in China, European Journal of Political Economy, 20(4): 1001-1009.

**Chen, Y. & Feng, J. (2012)** Fractal-based exponential distribution of urban density and self-affine fractal forms of cities, Chaos, Solitons & Fractals, 45(11): 1404-1416.

**Chen, Y. & Zhou, Y. (2004)** Multi-fractal measures of city-size distributions based on the three-parameter Zipf model, Chaos, Solitons & Fractals, 22(4): 793-805.

**Chen, Y. & Zhou, Y. (2006)** Reinterpreting central place networks using ideas from fractals and self-organized criticality, Environment and Planning B: Planning and Design, 33: 345-364.

**Cheng, J. & Masser, I. (2003)** Urban growth pattern modeling: a case study of Wuhan city, PR China, Landscape and Urban Planning, 62(4): 199-217.

**Chinese Statistical Bureau. (2012)** China Statistical Yearbook-2012, China Statistics Press: Beijing.

**Christensen, K. (1985)** Coping with Uncertainty in Planning, Journal of the American Planning Association, 51 (1): 63-73.

**Coen, D. & Richardson, J. (2009)** Lobbying the European Union: Institutions, Actors, and Issues, Oxford University Press, Oxford.

**Collier, J. (2003)** Fundamental properties of self-organization. In: Arshinov V, Fuchs C. (eds) Causality, Emergence, Self-Organisation, NIA-Priroda: Moscow, pp. 150-166.

**Collier, J. & Esteban, R. (1999)** Governance in the participative organisation: freedom, creativity and ethics, Journal of Business Ethics, 21(2-3): 173-188.

**Comfort, L. (1994)** Self-Organization in Complex Systems, Journal of Public Administration Research and Theory, 4(3): 393-410.

**Cui, G. (2008)** The six big transforms of China urban planning idea: Review of China urban planning for the 30 years, Shanghai Urban Planning Review, (6): 5-7.

**Davidoff, P. (1965)** Advocacy and pluralism in planning, Journal of American Planning Association, 31(4): 331-338.

**De Roo, G. (2010)** Planning and complexity: An introduction, in: G. de Roo & E.A. Silva (Eds) A Planner's Encounter with Complexity, Ashgate: Farnham, pp.1-18.

**De Roo, G., Hillier, J. And Van Wezemael, J. (eds), (2012)** Complexity and Planning: Systems, Assemblages and Simulations, New Directions in Planning Theory, Ashgate: Farnham.

**De Roo, G. & Rauws, W. (2012)** Positioning planning in the World of order, chaos and complexity: On perspectives behavior and interventions in a non-linear environment, In: Portugali, J., Meyer, H., Stolk, E., and Tan, E. (eds) Complexity Theories of Cities Have Come of Age, An Overview with Implications to Urban Planning and Design, Springer-Verlag: Heidelberg, pp. 207-220.

**De Roo, G. & Silva, E., (2010)** A Planner's Encounter with Complexity, Ashgate: Farnham.

**Deng, F. & Huang, Y. (2004)** Uneven land reform and urban sprawl in China: the case of Beijing, Progress in Planning, 61(3): 211-236.

**Deng, X., Huang, J., Rozelle, S. and Uchida, E. (2010)** Economic Growth and the Expansion of Urban Land in China, Urban Studies, 47(4): 813-843.

**Ding, C. (2003)** Land policy reform in China: assessment and prospects, Land Use Policy, 20 (3): 109–120.

**Ding, C. (2007)** Policy and Praxis of Land Acquisition in China, Land Use Policy, 24(1): 1-13.

**Dong, J. (2004)** Zhongguo Chengshi Jianshe Shi (Construction history of Chinese cities), Chinese Architecture and Building Press: Beijing.

**Dreier, P. Mollenkopf, J. and Swanstrom, T. (1995)** Place Matters: Metropolitics for the Twenty-first Century, University Press of Kansas: Kansas.

**Elicin, Y. (2014)** Neoliberal transformation of the Turkish city through the Urban Transformation Act, Habitat International, 41: 150-155.

**Ellis, N. & Larsen-Freeman, D. (2009)** Language as a complex adaptive system, Blackwell: West Sussex.

**Fainstein, S. (2000)** New directions in planning theory, Urban Affairs Review, 35(4): 451-78.

**Falleth, E., Hanssen, G. and Saglie, I. (2010)** Challenges to democracy in market-oriented urban planning in Norway, European Planning Studies, 18(5): 737-753.

**Faludi, A. (1973)** Planning Theory. Pergamon Press, Oxford.

**Faludi, A. & Willem K.A. (1994)** Evaluating communicative planning: A revised design for performance research, European Planning Studies, 2(4): 403-418.

**Fan, G. (2008)** China's economic growth in a context of globalization, Institut Français des Relations Internationales, pp. 1-10.

**Fang, L., Yu, T. and Qian, X. (2002)** Zhanhou xifang chengshi guihua lilun de liubian (Transformations of European planning theory after WWII), Urban Problems, (1): 10-13.

**Farh, J., Earley, P. and Lin, S. (1997)** Impetus for action: A cultural analysis of justice and organizational citizenship behavior in Chinese society, Administrative Science Quarterly, 42(3): 421–444.

**Feng, J. Wang, F. and Zhou, Y. (2009)** The Spatial Restructuring of Population in Metropolitan Beijing: Toward Polycentricity in the Post-Reform ERA, Urban Geography, 30(7): 779-802.

**Fingerhuth, C. (2004)** Learning from China: The Tao of the City, Birkhäuser Architecture: Washington DC.

**Fischler, R. (1995)** Strategy and history in professional practice: planning as worldmaking. In H. Liggett and D. Perry (eds.), Spatial practices, Sage: Thousand Oaks, pp. 13-58.

**Fisher, J.C. (1962)** Planning the city of socialist man, Journal of the American Institute of Planners, 28(4): 251-65.

**Flanagan, K., Uyarra, E. and Larangja, M. (2010)** The 'policy mix' for innovation: Rethinking innovation policy in a multi-level, multi-actor context, Manchester Business School working paper, No. 599.

**Fleming, L. & Sorenson, O. (2001)** Technology as a complex adaptive system: evidence from patent data, Research Policy, 30(7): 1019-1039.

**Florida, R. (2002)** The Rise of the Creative Class, Basic Books: New York.

**Foerster, G. & Zopf, G. (1962)** Principles of Self-Organization, Pergamon: New York.

**Folke, C., Hahn T., Olsson P. and Norberg, J. (2005)** Adaptive governance of social-ecological systems, Annual Review of Environment and Resources, 30: 441-473.

**Forrester, J. (1961)** Industrial dynamics, Productivity Press: Massachusetts.

**Foerster, H. (1984)** Principles of self-organization in a sociomanagerial context, in H. Ulrich and G. J. B. Probst (eds), Self-Organization and Management of Social Systems, Springer-Verlag: Berlin, pp. 2-24.

**Friedmann, J. (1973)** Retracking America: A Theory of Transactive Planning, Anchor Press, New Jersey.

**Friedmann, J. (1998)** Planning theory revisited, European Planning Studies, 6(3), pp. 245-253.

**Friedmann, J. (2005)** China's urban transition, University of Minnesota Press: Minneapolis.

**Foley, J., DeFries, R., Asner, G., Barford, C., Bonan, G., Carpenter, S., Chapin, F., Coe, M., Daily, G., Gibbs, H., Helkowski, J., Holloway, T., Howard, E., Kucharik, C., Monfreda, C., Patz, J., Prentice, I., Ramankutty, N. and Snyder, P. (2005)** Global Consequences of Land Use, Science, 309 (5734): 570-574.

**Fuchs, C. (2003)** Structuration Theory and Self-Organization, Systemic Practice and Action Research, 16(2): 133-167.

**Gaffikin, F. & Brand, R. (2007)** Collaborative Planning in an Uncollaborative World, Planning Theory, 6(3): 303-334.

**Gaubatz, P. (1999)** China's Urban Transformation: Patterns and Processes of Morphological Change in Beijing, Shanghai and Guangzhou, Urban Studies, 36(9): 1495-1521.

**Gerrits, L., Rauws, W. S. & De Roo, G. (2012)** Policy and planning brief: Dutch spatial planning policies in transition, Planning Theory & Practice, 32(2): 336 – 341.

**Ghnemat, R., Bertelle, C. and Duchamp, G. (2009)**, A methodology for urban and land-use management simulation using spatial self-organization processes, Dynamics of Continuous, Discrete and Impulsive Systems, 16(4): 501-513.

**Giddens, A. (1981)** A contemporary critique of contemporary materialism, Volume 1: power, property and the state, Macmillan: Basingstoke.

**Giddens, A. (1984)** The Constitution of Society, Cambridge, Polity: Massachusetts.

**Gilbert, N. & Troitzsch, K. (2005)** Simulation for the Social Scientist (Second Edition), Open University Press: Berkshire.

**Glaeser, E., Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2004)** Do institutions cause growth?, Journal of Economic Growth, 9(3): 271-303.

**Glasbergen, P. (2000)** The Environmental Cooperative: Self-Governance in Sustainable Rural Development, The Journal of Environment Development, 9(3): 240-259.

**Graham, S. & Healey, P. (1999)** Relational concepts of space and place: Issues for planning theory and practice, European Planning Studies, 7(5): 623-646.

**Güneralpa, B. & Setoa, K (2008)** Environmental impacts of urban growth from an integrated dynamic perspective: A case study of Shenzhen, South China, Global Environmental Change, 18(4): 720-735.

**Guo, Y. (1989)** Xifang guihua gainian he xingongye jingji chengshi (Western planning concepts and new industrial cities), City Planning Review, 4: 52-56.

**Gwilliam, K. (2003)** Urban transport in developing countries, Transport Reviews, 23 (2): 197–216.

**Hajer, M. & Wagenaar, H. (2003)** Deliberative policy analysis: understanding governance in the network society, Cambridge University Press: Cambridge.

**Haken, H. (1980)** Dynamics of Synergetic Systems, Springer: New York.

**Haken, H. (1983)** Synergetics: An Introduction, Springer: New York.

**Haken, H. (1991)** Synergetic Computers and Cognition, Springer: Heidelberg.

**Haken, H. (2000)** Information and Self-organization: A Macroscopic Approach to Complex Systems, 2nd edition, Springer: Heidelberg.

**Haken, H. (2004)** Synergetics: Introduction and Advanced Topics, Springer: Heidelberg.

**Haken, H. (2006)** Information and self-organization: A macroscopic approach to complex systems, Springer: Heidelberg.

**Hall, P. & Taylor, R. (1996)** Political Science and the Three New Institutionalisms, Political Studies, 44(5): 936–957.

**Hansen, C. (1992)** A Taoist theory of Chinese thought: A philosophical interpretation, Oxford University Press: New York.

**Hartman, H. (2000)** Symmetry breaking and the origin of life. In Bar-Yam, Y. (Ed), Unifying themes in complex systems: Proceedings of the International Conference on Complex Systems, Cambridge, MA: Perseus Book, pp. 248-257.

**Harvey, J. & Jowsey, E (2004)** Urban land economics, Palgrave MacMillan, Basingstoke.

**He, C., Okada, N., Zhang, Q., Shi, P. and Zhang, J. (2006)** Modelling urban expansion scenarios by coupling cellular automata model and system dynamic model in Beijing, China, Applied Geography, 26(3-4): 323-345.

**He, C., Tian, J., Shi, P. and Hu, D. (2011)** Simulation of the spatial stress due to urban expansion on the wetlands in Beijing, China using a GIS-based assessment model, Landscape and Urban Planning, 101(3): 269-277.

**He, M., Tian, J., Shi, P. and Hu, D. (2008)** Paradigm shift of urban planning theory in west countries and its implication, City Planning Review, 32(2): 71-77.

**He, S. & Wu, F. (2005)** Property-led redevelopment in post reform China: a case study of Xintiandi redevelopment project in Shanghai, Journal of Urban Affairs, 27(1): 1-23.

**He, Z., Bu J., Tang, Y. and Sun, K. (1991)** An intellectual history of China, Foreign Language Press: Beijing.

**Healey, P. (1987)** Collaborative Planning: Shaping Places in Fragmented Societies, Palgrave Macmillan: New York.

**Healey, P. (1996)** The communicative turn in planning theory and its implications for spatial strategy formation, Environment and Planning B, Planning and Design, (23): 217-234.

**Healey, P. (1997)** Collaborative Planning: Shaping Places in Fragmented Societies, UBS Press: Vancouver.

**Healey, P. (1999)** Institutionalist analysis, communicative planning, and shaping places, Journal of Planning Education and Research, 19(2): 111–121.

**Healey, P. (2004)** The Treatment of Space and Place in the New Strategic Spatial Planning in Europe, International Journal of Urban and Regional Research, 28(1): 45-67.

**Healey, P. (2006)** Relational complexity and the imaginative power of strategic spatial planning, European Planning Studies, 14(4): 525-546.

**Helbing, D. & Vicsek, T. (1999)** Optimal self-organization. New Journal of Physics, 1:13.1–13.17.

**Helbing, D., Hennecke, A., Shvetsov, V. and Treiber, M. (2001)** MASTER: macroscopic traffic simulation based on a gas-kinetic, non-local traffic model, Transportation Research Part B: Methodological, 35(2): 183-211.

**Heylighen, F. (1990)** Representation and change. A Metarepresentational Framework for the Foundation of Physical and Cognitive Science, Communication and Cognition: Gent.

**Heylighen, F. (2003)** "The Science of Self-organization and Adaptivity", in: Knowledge Management, Organizational Intelligence and Learning, and Complexity, in: The Encyclopedia of Life Support Systems, EOLSS Publishers, Oxford, pp. 1-26.

**Heylighen, F., Cilliers, P. & Gershenson, C. (2006)** Complexity and philosophy, in Complexity, Science and Society Edited by Bogg, J. & Geyer, R., Radcliff Publishing: New York, pp. 177-132.

**Heylighen, F. (2008)** Complexity and Self-organization, in: M. J. Bates & M. N. Maack (Eds) Encyclopedia of Library and Information Sciences, Taylor and Francis: London, pp. 1215-1224.

**Ho, S. & Lin, G. (2003)** Emerging Land Markets in Rural and Urban China: Policies and Practices, The China Quarterly, 175: 681-707.

**Holland, J. H. (1992)** Complex adaptive systems. Daedalus, 121: 17-30.

**Howard, E. (1898)** To-morrow: A peaceful path to real reform, Faber and Faber: London.

**Hu, J. (2003)** Report of 17th Chinese Communist Party Conference, Beijing.

**Hu, Y. (2009)** In search of geomantic omen while coping with crises——commentary on the research of geomantic omen at home and abroad, Journal of Qingdao University of Science and Technology, 25(1): 16-20.

**Huang, L. (2006)** A Study on the History of Chinese Modern City Planning, 1949-1965, PhD thesis.

**Hudalah, D., Winarso, H. and Woltjer, J. (2008)** Peri-urbanisation in East Asia, a new challenge for planning?, International Development Planning Review, 29: 503-520.

**Hui, E. & Shen, Y. (2006)** Housing price bubbles in Hong Kong, Beijing and Shanghai: A comparative study, The journal of Real Estate Finance and Economics, 33(4): 299-327.

**Huxley, M. (2000)** The limits to communicative planning, Journal of Planning Education and Research, 19: 369-377.

**Innes, J. (1995)** Planning theory's emerging paradigm: Communicative action and interactive practice, Journal of Planning Education and Research, 14(3): 183-189.

**Innes, J. & Booher, D. (2002)** Network Power in Collaborative Planning, Journal of Planning Education and Research, 21(3): 221-236.

**Innes, J. & Booher, D. (2010)** Planning with Complexity: An Introduction to Collaborative Rationality for Public Policy, Routledge: Abingdon.

**Ismael, J. (2011)** Self-organization and Self-governance, Philosophy of the Social Sciences, 41(3): 327-351.

**Jacobs, J. (2010)** The death and life of great American cities (Second Edition), Wiley-Blackwell: West Sussex.

**Jarzabkowski, P. & Wilson, D. (2006)** Actionable Strategy Knowledge: A Practice Perspective, European Management Journal, 24(5): 348-367.

**Jessop, B. (2001)** Regulationist and Autopoieticist Reflections on Polanyi's Account of Market Economies and the Market Society, New Political Economy, 6(2): 213-232.

**Jessop, B. (2004)** Institutional re(turns) and the strategic-relational approach, In: Wood A, Valler D. Governing local and regional economies institutions, politics and economic development edited by Aldershot and Burlington: Ashgate, pp. 23-55.

**Jhagroe, S. (2012)** Redemption, Ambivalebnce and Self-deceit: A Discourse Analysis of Surinamese Independence (1973-1977), PhD Thesis: Erasmus University Rotterdam.

**Jiaodaokou Stree Office. (2006a)** Conservation and Development Plan of Nanluoguxiang, Beijing.

**Jiaodaokou Stree Office. (2006b)** Jiaodaokou Community Development Plan, Beijing.

**Johnson, T. (2010)** Environmentalism and NIMBYism in China: promoting a rules-based approach to public participation, Environmental Politics, 19(3): 430-448.

**Jun, Y. & Zhou, J. (2007)** The failure and success of greenbelt program in Beijing, Urban Forestry & Urban Greening, 6(4): 287-296.

**Kalnay, E. & Cai, M. (2003)** Impact of urbanization and land-use change on climate, Nature, 423: 528-531.

**Kauffman, A. (1993)** The Origins of Order: Self organization and Selection in Evolution, Oxford University Press: New York.

**Kauffman, S. (1995)** At Home in the Universe: the Search for the Laws of Self-organization and Complexity, Oxford University Press: New York.

**Keller, E. (2000)** The century of the gene, Harvard University Press: Cambridge, MA.

**Kelso, S. (1995)** Dynamic Patterns: the Self-organization of Brain and Behavior, The MIT Press: Massachusetts.

**Kelso, J. & Tuller, B. (1984)** Converging evidence in support of common dynamical principles for speech and movement coordination, American Journal of Physiology, 246(6): 928-935.

**Kironde, J. (2006)** The regulatory framework, unplanned development and urban poverty: Findings from Dar es Salaam, Tanzania, Land Use Policy, 23(4): 460–472.

**Klijn, E. & Snellen, G. (2009)** Complexity theory and Public Administration: a critical appraisal, In: Teisman GR, Buuren AV, Gerrits LM (eds.), Managing Complex Governance Systems, Routledge: London, pp. 17–36.

**Knieling, J. & Othengrafen, F. (2009)** Planning cultures in Europe: decoding cultural phenomena in urban and regional planning, Ashgate: Farnham.

**Kooiman, J. (2003)** Governing as Governance, Sage: London.

**Kombe, W. J. (2005)** Land use dynamic in peri-urban areas and their implications on the urban growth and form: the case of Dar es Salaam, Tanzania, Habitat International, 29(1): 113–135.

**Krugman, P. (1996)** The Self-organizing Economy, Blackwell: Oxford.

**La Porta R, Lopez-de-Salinas, F. and Schleifer, A. (2008**) The Economic Consequences of Legal Origins, Journal of Economic Literature, 46(2): 285–332.

**Landry, C. (2008)** The Creative City: A Toolkit for Urban Innovators, Earthscan: London.

**Lane, D. (2002)** Complexity and Local Interactions: Towards a Theory of Industrial Districts, In: Curzio, A. and Fortis, M. (eds) Complexity and Industrial Clusters: dynamics and models in theory and practice, Physica-Verlag: Heidelberg, pp. 65-82.

**Langton, C. (1997)** Artificial life: An overview, The MIT Press: Cambridge.

**Lehn, J. (1990)** Perspectives in supramolecular chemistry—from molecular recognition towards molecular information processing and self-organization, Angewandte Chemie International Edition in English, 29(11): 1304-1319

**Lewis, P. & Neiman, M. (2009)** Custodians of Place: governing the growth and development of cities, Georgetown University Press: Washington DC.

**Lewis, P. (1996)** Shaping Suburbia, How Political Institutions Organize Urban Development, University of Pittsburgh Press: Pittsburgh.

**Li, C. (2006)** The Confucian Ideal of Harmony, Philosophy East and West, 56(4): 583-603.

**Li, H. & Haynes, K. (2011)** Economic structure and regional disparity in China: Beyond Kuznets transition, 34(2): 157-190.

**Li, J. & Ning, Y. (2006)** Xifang chengshi shehui dilixue zhuyao lilun ji yanjiu de yiyi-jiyu kongjian sixiang de fenxi (Theoretical research of western urban social geography- analysis based on spatial perspective), Urban Problems, (6): 84-89.

**Li, L. & Li, X. (2007)** Land readjustment: an innovative urban experiment in China, Urban Studies, 44(1): 81-98.

**Li, W. & Yang, D. (2005)** The great leap forward: Anatomy of a central planning disaster, Journal of Political Economy, 114(4): 840-877.

**Li, Y. (2012)** Urban–rural interaction patterns and dynamic land use: implications for urban–rural integration in China, Regional Environmental Change, 12(4): 803-812.

**Liang, J. (2007)** Research on the Evolvement of the Traditional Residential Courtyard Houses of Beijing's Old City, Thesis, Tsinghua University: Beijing.

**Liang, H. (2009)** Development of China's planning theory: Some initial thoughts, Urban Planning Forum, (1): pp. 14-17.

**Lichtenberg, E. & Ding, C. (2009)** Local officials as land developers: Urban spatial expansion in China, Journal of Urban Economics, 66(1): 57-64.

**Lin, G., Li, X., Yang, F. and Hu, F. (2014)** Strategizing urbanism in the era of neoliberalization: State power reshuffling, land development and municipal finance in urbanizing China, Urban Studies, 52(11): 1962-1982.

**Lin, J., Cai, F. and Li, Z. (2003)** The China miracle: Development strategy and economic reform, The Chinese University Press: Hong Kong.

**Liu, D. (1994)** Learn from the West and Examine the Future of China Urban Planning Education, Planning Study Overseas, 2: 136-140.

**Liu, G. (2009)** Thirty years of reform and opening up summarized from the perspective of Marxist philosophy, Social Sciences in China, 1: 20-35.

**Liu, H. & Zhou, Q. (2005)** Developing urban growth predictions from spatial indicators based on multi-temporal images, Computers, Environment and Urban System, 29(5): 580-594.

**Liu, S., Prieler, S. and Li, X. (2002)** Spatial patterns of urban land use growth in Beijing, Earth and Environmental Science, 12(3): 266-274.

**Liu, S., Carter, M. and Yao, Y (1998)** Dimensions and diversity of property rights in rural China: dilemmas on the road to further reform, World Development, 26(10): 1789-1806.

**Liu, Y., He, S., Wu, F. and Webber, C. (2010)** Urban villages under China's rapid urbanization: Unregulated assets and transitional neighbourhoods, Habitat International, 34(2): 135-144.

**Lu, B. (2012)** Sustainable regeneration of Nanluoguxiang neighbourhood (Nanluoguxiang jiyu shequ de kechixu zaisheng shijian), Beijing plan and construction, 6: 14-20.

**Lu, B. (2013)** Spatial structure and historical-cultural value of Nanluoguxiang (Nanluoguxiang diqu de kongjian geju yu lishi wenhua jiazhi), Beijing plan and construction, 1: 98-103.

**Luhmann, N. (1982)** The world society as social system, International Journal of General Systems, 8(3): 131-138.

**Luhmann, N. (1988)** The autopoiesis of social systems, In Geyer, F., and van der Zouwen, J. (eds.), Sociocybernetic Paradoxes Observation, Control and Evolution of Self-Steering Systems, Sage: London, pp. 172–192.

**Mandelbrot, B. (1983)** The Fractal Geometry of Nature, Freeman: New York.

**Manneville, P. (1990)** Dissipative Structures and Weak Turbulence, Academic: San Diego, CA.

**Marshall, T. (2007)** After structure planning: The new sub-regional planning in England, European Planning Studies, 15(1): 107-132.

**Maskin, E., Quan, Y. & Xu, C. (2000)** Incentives, scale economies, and organization form, Review of Economic Studies, 67 (2000): 359–378.

**Maturana, H. & Varela, F. (1980)** Autopoiesis and cognition: The realization of the living, D. Reidel Publishing Company: Dordrecht.

**McLoughlin, B. (1969)** Urban and Regional Planning: A Systematical Approach, Faber and Faber: London.

**Meerkerk, I., Boonstra, B. and Edelenbos, J. (2013)** Self-Organization in Urban Regeneration: A Two-Case Comparative Research, European Planning Studies, 21(10): 1630-1652.

**Merry, U. (1999)** Organizational strategy on different landscapes: A new science approach, Systemic Practice and Action Research, 12(3): 257-278.

**Ministry of housing and urban-rural construction. (2007)** Urban and Rural Planning Act, Beijing.

**Moulaert, F., Martinelli, F., Swyngedouw, E. and Gonzalez, S. (2005)** Towards Alternative Model(s) of Local Innovation, Urban Studies, 42(11): 1969-1990.

**Newman, K. (2011)** Transforming Organizational Culture Through Nursing Shared Governance, Nursing Clinics of North America, 46(1): 45-58.

**Newman, M., Barabasi, A. and Watts, D. (2006)** The Structure and Dynamics of Networks, Princeton University Press: Princeton and Oxford.

**Nicolis, G. & Prigogine, I. (1977)** Self-organization in Non-Equilibrium Systems, Wiley: New York.

**Nicolis, G. & Prigogine, I. (1989)** Exploring Complexity, Freeman: New York.

**North, D. (1990)** Institutions, Institutional Change and Economic Performance, Cambridge University Press: Cambridge.

**North, D. (2005)** Understanding the Process of Economic Change, Princeton University Press: Princeton and Oxford.

**Pahl-Wostl, C. (2009)** A conceptual framework for analyzing adaptive capacity and multi-level learning processes in resource governance regimes, Global Environmental Change, 19(3): 354-365.

**Peng, H. (1994)** Tiaozhan yu jiyu – xifang guihua lilun dui zhongguo chengnanguihua de qishi (Challenges and opportunities- reference of western planning theory), Urban Planning Overseas, 4: 14-19.

Phan, P. (2005) Enriching the land or the political elite? Lessons from China on democratization of the urban renewal process, Pacific Rim Law & Policy Journal Association, 14(3), 607-654.

Pierre, J. (2005) Comparative urban governance uncovering complex causalities, Urban Affairs Review, 40(4): 446-462.

Portugali, J. (2000) Self-organization and the City, Springer: Heidelberg.

Portugali, J. (2006) Complex Artificial Environments: Simulation, Cognition and VR in the Study and Planning of Cities, Springer: Heidelberg.

Portugali, J. (2011) Complexity, Cognition and the City, Springer: Heidelberg.

Portugali, J. (2012) Complexity Theories of Cities: Achievements, Criticism and Potentials. In: Protugali, J., Meyer, H., Stolk, E., Tan, E., Complexity theories of cities have come to age: an overview with implications to urban planning and design, Springer: Dordrecht, pp. 47-62.

Powell, W. & DiMaggio, P. (2012) The new institutionalism in organizational analysis, The University of Chicago Press: Chicago.

Prigogine, I. & Stengers, I. (1984) Order Out of Chaos: Man's Dialogue with Nature, Bantam Books: New York/Toronto.

Prigogine, I. (1978) Time, structure, and fluctuations, Science, 201(4358): 777-785.

Prigogine, I. (1980) From Being to Becoming, Freeman: San Francisco.

Prigogine, I., Allen, P. & Herman, R. (1977) The evolution of complexity and the laws of nature, In: Laszlo E, Bierman J (eds.), Goals in a global community, Pergamon: New York.

Qiu, B. (2003) 19 shiji yilai xifang chengshi guihua lilun yanbian de liuci zhuanzhe (six transformations of western planning theory within the 19 century), Planners, 11: 5-10.

Randolph, J. (2008) Comment on Reid Ewing and Fang Rong's "The impact of urban form on US residential energy use", Housing Policy Debate, 19(1): 45-52.

Rauws, W. & De Roo, G. (2011) Exploring Transitions in the Peri-Urban Area, Planning Theory & Practice, 12(2): 269-284.

Rittel, H. (1972) On the planning crisis: Systems analysis of the first and second generations, Beprifts Konomen, NR 8, pp. 390-396.

**Romero, E. & Ruiz, M. (2013)** Framework for Applying a Complex Adaptive System Approach to Model the Operation of Eco-Industrial Parks, Journal of Industrial Ecology, 17(5): 731–741.

**Rynasiewicz, R. (2004)** Newton's views on space, time, and motion. In Stanford encyclopedia of philosophy, edited by E. N. Zalta. Available at http://plato.stanford.edu.

**Saarinen, E. (1942)** The City: Its Growth, Its Decay, Its Future, The MIT Press: Massachusetts.

**Sager, T. (1994)** Communicative Planning Theory: Rationality versus Power, Avebury, Aldershot.

**Salet, W. & Faludi, A. (eds) (2000)** The Revival of Strategic Spatial Planning, Royal Netherlands Academy of Arts and Sciences: Amsterdam.

**Salet, W., Thornley, A. and Kreukels, A. (2003)** Metropolitan governance and spatial planning: comparative case studies of European city-regions, Spon Press: London.

**Sandercock. L. (2006)** Twists and turn: The dance of explanation, Planning Theory & Practice, 7(3): 241-244.

**Schinz, A. (1989)** Cities in China, Gebruder Borntraeger: Berlin-Stuttgart.

**Shen, Q. (1997)** Urban transportation in Shanghai, China: Problems and planning implications, International Journal of Urban and Regional Research, 21(4): 589-606.

**Shi, N. (1981)** Collections of essays on Chinese historical geography, Shanxi Remin Press: Xi'an.

**Shin, B. (2010)** Urban conservation and revalorisation of dilapidated historic quarters: The case of Nanluoguxiang in Beijing, Cities, 27(1): 43-54.

**Skinner, C. (2000)** Getting institutions right?, Urban Forum, 11(1): 49-71.

**Song, T., Cai, J., Xu, H., Deng, Y., Niu, F., Yang, Z. and Du, S. (2014)**, Urban metabolism based on emergy and slack based model: A case study of Beijing, China, Chinese Geographical Science, 25(1): 113-123.

**Song, Y. & Ding, C. (2007)** Urbanization in China: Critical Issues in an Era of Rapid Growth, Lincoln Institute of Land Policy: Massachusetts.

**Stockman, N. (2000)** Understanding Chinese Society, Polity Press: Cambridge.

**Tacoli, C. (1998)** Beyond the rural-urban divide, Environment and Urbanization, 10: 3-4.

**Tan, M., Li, X., Xie, H. and Lu, C. (2005)** Urban land expansion and arable land loss in China - a case study of Beijing-Tianjin- Hebei region, Land Use Policy, 22(3): 187-196.

**Tan, Z. (2005)** Introduction to urban planning and design, Press of Tsinghua University, Beijing. pp. 84-85.

**Tang, K. (2004)** Urban Planning System in China – Basic Facts and Reform Progress, Governmental Report of Central State, Beijing.

**Tang, W. (2000)** Chinese Urban Planning at Fifty: An assessment of the planning theory literature, Journal of planning literature, 14(3): 347-366.

**Taylor, N. (1999)** Anglo-American town planning theory since 1945: Three significant developments but no paradigm shifts, Planning perspectives, 14 (4): 327-345.

**Taylor, P., Hoyler, M. and Verbruggen, R. (2010)** External urban relational process: introducing central flow theory to complement central place theory, Urban Studies, 47(13): 2803-2818.

**Tewdwr-Jones, M. & Allmendinger, P. (eds.) (2002)** Planning Futures: New Directions in Planning Theory, London: Taylor and Francis, pp. 206-216.

**The United Nations. (2011)** World Urbanization Prospects: The 2011 Revision, United Nations Population Division: New York. Available at www.unpopulation.org.

**Torrens, P. (2002)** Cellular automata and multi-agent systems as planning support tools, In Planning support systems in practice, ed. Geertman, S. and Stillwell, J. 205–22. Springer-Verlag: London.

**Torrens, P., & Benenson, I. (2005)** Geographic automata systems, International Journal of Geographical Information Science, 19(4): 385-412.

**Varis, O. & Vakkilainen, P. (2001)** China's challenges to water resources management in the first quarter of the 21st century, Geomorphology, 41: 93–104.

**Verburg, P. & Overmars, K. (2009)** Combining top-down and bottom-up dynamics in land use modeling: exploring the future of abandoned farmlands in Europe with the Dyna-CLUE model, Landscape Ecology, 24(9): 1167-1181.

**Vesterby, V. (2008)** Measuring complexity: Things that go wrong and how to get it right, Emergence: Complexity and Organization, the 3rd International Workshop on Complexity and Philosophy, ISBN: 0979168813. pp. 1-16.

**Waldrop, M. (1992)** Complexity: the emerging science at the edge of order and chaos, Viking: London.

**Wallerstein, I. (1991)** Unthinking social science: The limits of nineteenth-century paradigms, Cambridge University Press: Cambridge.

**Wang, K. (2003)** Weak point of the Chinese urban planning theory as compared with Western ones, Planning Studies Overseas, 27(6): 66-71.

**Wang, T. & Xie, S. (2009)** Assessment of traffic-related air pollution in the urban streets before and during the 2008 Beijing Olympic Games traffic control period, Atmospheric Environment, 43(35): 5682-5690.

**Wang, X. (2009)** Transitions in planning thoughts of modern China, research manuscript.

**Wang, Y. (2004)** Geomantic configuration and ancient Chinese city planning, Shanxi Architecture, (20): 12-13.

**Weaver, W. (1948)** Science and complexity. American Scientist, 36: 536-544.

**Webster, C. (2010)** Emergence, spatial order, transaction costs and planning, in: G. de Roo & E. A. Silva (Eds) A Planner's Encounter with Complexity, Asghate Publishers Ltd, Farnham, pp. 117–132.

**Webster, C. J. & Lai, L. W. C. (2003)** Property Rights, Planning and Markets: Managing Spontaneous Cities, Edward Elgar, Cheltenham.

**Wei, Y. & Zhao, M. (2009)** Urban spill over vs. local urban sprawl: Entangling land-use regulations in the urban growth of China's megacities, Land Use Policy, 26(4): 1031-1045.

**Wei, Z., Cong, L. and Yan, G. (2005)** Review on western theory on urban planning and related periodicals, Planners, 21(12): 28-34.

**Weidlich, W. (1994)** Synergetic modelling concepts for sociodynamics with application to collective political opinion formation, Journal of Mathematics and Sociology, 1(4): 267-291.

**Wen, J. (2010)** Annual working report of Chinese government for the year 2009, Beijing.

**White, R. (1998)** Cities and cellular automata, Discrete Dynamics in Nature and Society, 2: 111-125.

**White, R. & Engelen, G. (1993)** Cellular automata and fractal urban form: a cellular modelling approach to the evolution of urban land-use patterns, Environment and Planning A, 25(8): 1175-1199.

**Williams, G., Batho, S. and Russell, L. (2000)** Responding to urban crisis: The emergency planning response to the bombing of Manchester city centre, 17(4): 293-304.

**Witt, U. (1997)** Self-organization and economics - what is new? Structural Chang and Economic Dynamics, 8(4): 489-507.

**Wolfram, S. (1984)** Universality and complexity in cellular automata. Physica D, 10: 1-35.

**Wolfram, S. (2002)** A New Kind of Science. Wolfram Media, Inc.: Champaign.

**Woltjer, J. (2000)** Consensus in Planning, Ashgate Publishing Ltd: Aldershot.

**World Bank. (2008)** China's Rapid Urbanization: Benefits, Challenges & Strategies, World Bank Research: East Asia's Economic Prospects: Geneva.

**Wu, F. & Zhang, J. (2007)** Planning the Competitive City-Region: The Emergence of Strategic Development Plan in China, Urban Affairs Review, 42(5): 714-740.

**Wu, F., Xu, J. and Yeh, A. (2007)** Urban Development in Post-Reform China: State, Market, and Space, Routledge: Abingdon and New York.

**Xie, Y. & Costa, F.J. (1991)** Urban design practice in socialist China, Third World Planning Review, 13(3): 77-96.

**Xie, Y. & Costa, F.J. (1993)** Urban planning in socialist China, Cities, 10(2): 103-114.

**Yan, J. & Feng, L. (2010)** House price dynamics: Evidence from Beijing, Frontiers of Economics in China, 5(1): 52-68.

**Yang, Z. (2000)** Comparative study on urban planning theories of China and the west, Shanxi Architecture, 33(29): 8-9.

**Yin, M., Bertolini, L. and Duan, J. (2015)** The effects of the high-speed railway on urban development: International experience and potential implications for China, Progress in Planning, 98 (2015): 1-52.

**Yovits, M. & Cameron, S. (1960)** (Eds.). Self organizing systems, Pergamon: New York.

**Yu, X. (2005)** Theory and Practice of Geomantic Omen in China, Guangming Daily Press: Beijing.

**Yuan, Y. & Liu, X. (2009)** On the development of Chinese modern city planning theory based on historical point, Shanxi Architecture, 35(9): 10-11.

**Zhan, J. (2009)** Undermining State Capacity: Vertical and Horizontal Diffusions of Fiscal Power in China, Asian Politics & Policy, 1(2): 390-408.

**Zhang, F. (2006)** Study and preservation of Chinese modern architecture, Anthology of 2006 conference on modern history of Chinese architecture: Beihai, pp. 625-627.

**Zhang, S. (1983)** Liuqishi niandai xifang de chengshi duohu zhuzhai (western residential building in 1960s and 1970s), World Architecture, 5: 14-24.

**Zhang, S., De Roo, G., and Lu, B. (2012)** China: What about the urban revolution? Rapid transformations in Chinese planning and its links with a slowly emerging European planning theory, European Planning Studies, 20(12): 1997-2011.

**Zhang, S., De Roo, G. And Van Dijk, T. (2015)** Urban Land Changes as the Interaction between Self-organization and Institutions, Planning Practice and Research, 30(2): 160-178.

**Zhang, T. (2002)** Urban development and a socialist pro-growth coalition in Shanghai, Urban Affairs Review, 37(4): 475-499.

**Zhang, T. (2006a)** Planning theory as an institutional innovation: The non-linear trajectory of planning theory evolution, City Planning Review, 30(8): 9-18.

**Zhang, T. & Richard, L. (2009)** Changing planning paradigm in China in the post neo-liberalist era, Urban Planning Forum, (5): 1-13.

**Zhang, X. (2006b)** Fiscal decentralization and political centralization in China: Implications for growth and inequality, Journal of comparative economics, 34(4): 713-726.

**Zhao, D. (1983)** Ye tan daixing chengshi (Thoughts on belt city), New Architecture, 1: 36-39.

**Zhao, P., Lu, B. and Woltjer, J. (2009)** Growth management and decentralisation: An assessment of urban containment policies in Beijing in the 1990s, International Development Planning Review, 31(1): 55-79.

**Zhao, P. (2010)** Sustainable urban expansion and transportation in a growing megacity: Consequences of urban sprawl for mobility on the urban fringe of Beijing, Habitat International, 34(2): 236-243.

**Zhao. X. (1984)** Woguo chengshi guihua sanshinian jianji (Comments on developments of Chinese planning from 1949 to 1982), City planning Review. 1: 42-48.

**Zhi, F. (2011)** Cong ‘sanwu’ dao ‘sanyou’, Gaobeidian cun jin shi nian de bian qian (Changes of Gaobeidian in the past ten years: development from nothing), Dangdai Beijing Yanjiu, 4: 40-46.

**Zhou, L. (2001)** Xifang Chengshi guihua lilun fazhan dui zhongguo zhi qidi (Influence of western planning thoughts on Chinese planning), Guowai Chengshi Guihua, 1: 34-37.

**Zhu, J. (2004)** From land use right to land development right: institutional change in China’s urban development, Urban Studies, 41(7): 1249-1267.

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## SELF-ORGANIZING URBAN TRANSFORMATION AND ITS INSTITUTIONAL IMPLICATIONS

This book concerns the mechanism behind those spontaneous urban transformations and is seeking for the effective way of conducting planning and institutional intervention. It embraces the complexity science by bridging the concept of self-organization and the understanding of urban changes which emerge in a bottom-up and spontaneous manner. Self-organization is regarded as an alternative and innovative perspective which is helpful to cope with new challenges resulted from increasing uncertainties that planners have encountered in recent years. The role of institutions and spatial planning is reflected with consideration of self-organizing processes.

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