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Zhang, Shuhai; de Roo, Gert

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Shuhai Zhang and Gert de Roo

Interdependency of self-organisation and planning: evidence from Nanluoguxiang, Beijing

Supported by questionnaires and interviews, we present a case study of urban transformations in Nanluoguxiang, Beijing at the neighbourhood level. Nanluoguxiang demonstrates key characteristics of self-organisation in its transformation. The case also illustrates that self-organisation sometimes runs counter to socially desired outcomes, which reminds us of the need to be aware of such a development, of the possibility of intervention and of the desirability of bearing in mind spatial planning perspectives. The Nanluoguxiang case also shows that self-organisation and intentional behaviour are not necessarily mutually exclusive. However, the coexistence of both processes does depend on the intentions of the institutions responsible for local developments and the conditions set by them.

Keywords: Nanluoguxiang, planning, self-organisation, urban transformation

Introduction

Urban systems are typically complex. Although we can plan for desired urban changes to become a reality in some circumstances, quite often it is not us but the urban system itself which changes or adapts ‘autonomously’. Such ‘autonomous’ and spontaneous changes strongly relate to a mechanism known as ‘self-organisation’. In such cases, planning could very well play a role, though not by aiming to create and to control. This paper explores self-organisation processes which have enjoyed an interdependent relationship with the planning regime.

Self-organisation emphasises a mechanism through which complex systems generate their own state of being while continuously evolving to find an optimum fit with their environment (Portugali, 2000; Heylighen, 2008). The concept of self-organisation originated from the hard sciences of physics and cybernetics (Ashby, 1947; Nicolis and Prigogine, 1977; 1989; Haken, 1980). It successfully crossed into biology (Kauffman, 1993; Kelso, 1995; Keller, 2000; Camazine, 2003) before being discovered by the social sciences (Luhmann, 1988; Comfort, 1994). Economics (Krugman, 1996; Witt, 1997; Buenstorf, 2000) was an early adopter, followed by urban and regional studies (Allen, 1997; Portugali, 2000; Batty, 2007) and more recently planning (De Roo, 2010; De Roo et al., 2012; Zhang et al., 2015).

The hard-science-rooted concept of self-organisation cannot simply be transferred into the realm of social sciences due to the primary differences of individual

components between natural systems (physical particles) and social systems (humans). Distinct from physical particles, interactions between humans are often fuzzy and plural in nature and display multiple causalities and correlations, out of which an order emerges which ranges from dynamically persistent to repetitive modes of change. While humans are part of self-organisation processes, they are also able to give meaning to these processes, and to agree or disagree, and to respond intentionally. It is therefore quite a task to consider in depth the concept of self-organisation as a mechanism of urban change in a social context (Collier, 2003), which is exactly what we are trying to do in this paper.

Within the small but steadily growing body of research on self-organisation and planning, there are some studies which explicitly link with various disciplines from the hard sciences. Some do this by transferring the concept into the domain of cities using quantitative models and simulation tools (Allen, 1997; Helbing et al., 2001; Chen and Zhou, 2006; Batty, 2008). Others have made serious efforts to adapt the concept of self-organisation to social contexts using qualitative approaches and conceptual frames of reference which relate to socially relevant aspects such as choice, decision-making and planning (Portugali, 2000; Boonstra and Boelens, 2011; Rauws and De Roo, 2011; Zhang et al., 2015). This has led to a wide range of interpretations and perspectives on self-organisation and its relationship with planning efforts. The result is twofold. On the one hand, the variation of research into self-organisation has enhanced our understanding and improved our ability to explain complex planning issues. On the other hand, we have to acknowledge the plurality of the social urban environment and that our human awareness of change does not always permit spontaneous self-organisation processes to be distinguished from processes which include human intent. This observation has consequences: how should we regard self-organisation as an *unintended* process in relation to spatial planning, the latter with its *intentional* interference in space and place and *intended* support of societal well-being?

We will focus on the three types of assumption in understanding or recognising self-organisation within a planning environment which are mentioned in the literature. First, self-organisation is interpreted as a radical, revolutionary or a vague concept, regarded from a postmodern perspective (Best and Kellner, 1997). Distinct from the linear (proportional) understanding of developments, and the direct causal relationships such developments are thought to have, the impact of change as a consequence of self-organisation is fundamentally unknown *a priori* (Bloom, 2000). Second, self-organisation is regarded by some (Ghnemat et al., 2009; Song et al., 2014) as being better than and having advantages over or being more efficient than regulated and planned actions in coping with uncertainties and creating new functions, structures and orderly environments within or as part of a social system. According to this interpretation, planning should stimulate and cultivate the conditions under which local initiatives can emerge by allowing self-organisation processes to occur (Boonstra

and Boelens, 2011; Van Meerkerk et al., 2013). Third, self-organisation is sometimes considered as being a bottom-up mechanism, and intentional local action an ingredient of self-regulation. According to these assumptions, the discovery or appreciation of autonomous self-organisation processes consequently leads to playing down the desirability of planning regulation (Alfasi and Portugali, 2007). As noted, if these assumptions addressed are to be considered valid and the consequences proposed, they can have a substantial impact on planning practices. The difficulty with the assumptions addressed is that when taken together they do not generate a coherent and mutually consistent reasoning. Instead, the assumptions contradict each other or seem to generate mismatches between each other. Our analysis tries to identify the mechanisms behind these mismatches and looks for supplementary results while strengthening the rationale behind the concept of self-organisation within spatial planning.

We will consider each of these three assumptions critically. First, self-organisation is not a radical, revolutionary or a vague concept but has always been a mechanism for urban transformation, visible in numerous planning situations. Second, although self-organisation is a systemic mechanism for pattern formation, it does not necessarily produce socially desired outcomes. Third, self-organisation is the result of unintended behaviour and therefore not synonymous with self-regulation, which stands for purposeful and intentional action. We also state that planning does not necessarily counteract but is interdependent with self-organisation.

Our contribution is structured around these three arguments on self-organisation through corresponding theoretical reasoning and empirical findings from the Nanluoguxiang case study. In the following sections, we will elaborate on the case and the methods we used to continue to discuss each of the three arguments in the light of theoretical reasoning and case findings. Concluding remarks will be made in the last part of this contribution.

Case and methods

To illustrate and test our reasoning, critique and arguments, we selected the case of Nanluoguxiang, a neighbourhood of Beijing, China. This specific case was chosen for three reasons. First, Nanluoguxiang has experienced explicit transformations which display self-organisation properties. Second, Nanluoguxiang has experienced a deterioration of its physical qualities and of its liveability. This deterioration adds to the argument that self-organisation as an order-creating mechanism can also negatively impact the social system. Finally, in comparison with many government-led neighbourhood renewal cases in China, which are being criticised for their negative impact on the diversity and vibrancy of neighbourhoods (Chan and Lee, 2008), Nanluoguxiang is considered to be a successful example for its organic regeneration. The renewal

plan of Nanluoguxiang concerns a balance between development and preservation, resident participation, courtyard and street preservation as an organic whole (Tian, 2011; Lu, 2013).

Case introduction

Nanluoguxiang is a residential neighbourhood in Beijing's inner city. This neighbourhood is within Beijing's historical centre and lies just north-east of the Forbidden City (See Figure 1). The Nanluoguxiang region (Jiaodaokou Jiedao) covers an area of 1.45 km² and has some 53,000 inhabitants (data from interview). The neighbourhood is renowned for its 'centipedestyle' spatial structure, centred on its eponymous

Figure 1 The location of Nanluoguxiang

786-metre-long main street. This is intersected by eight successive small lanes, called 'hutong'. This spatial configuration testifies to its 700-year-old Chinese Yuan Dynasty heritage. Nanluoguxiang is therefore regarded as being of great historical value, a 'living fossil in an ancient city' (Lu, 2012).

Another aspect of Nanluoguxiang's reputation relates to the residential buildings located in its 'hutongs', known as 'siheyuan', or quadrangle courtyards. These traditional Chinese compounds of dwellings are arranged around these open, rectangular courtyards.

Throughout its history, Nanluoguxiang has witnessed many waves of change. Although it has retained the general layout of streets it traditionally had, the neighbourhood has experienced transformations from quadrangle courtyards to 'warrens' in the 1960s, and from a residential community to a tourist destination from about 2000 onwards. Today, the traditional quadrangle courtyards mentioned above are rare, as most of the courtyards have been built into warrens of informal dwellings. Today, the quality of life in these warrens is a major source of complaint. These warrens in the hutongs behind the main street are overcrowded, have low living standards and their inhabitants are struggling under increased living costs. This is very much in contrast with Nanluoguxiang's main street, which has become one of the places to be for tourists visiting China, with attractive inner yards, cosy shops, cafeterias and so on. The main street has been successfully renovated, and as such was listed in *Time* magazine in 2009 as one of the 25 'Authentic Asian Experiences'.

This paper will look closely at all the changes Nanluoguxiang has gone through. Special attention will be on the role of self-organisation and the interrelations these self-organisation processes have generated with formal institutional settings. We will consider these findings regarding self-organisation in the light of the assumptions we brought to the fore earlier in this contribution.

Case study approach

The following research tools were used critically to assess the three assumptions on self-organisation central to this paper. We reconstructed the historic development of the case (since the 1950s) by describing and explaining its phases of transformation. Most of this reconstruction was conducted by means of desk research and field visits. To test the second and the third assumptions, we could not limit ourselves to studying physical changes alone. We also inquired about people's interpretations of space, their perceived quality of life in the neighbourhood and their attitudes towards the Nanluoguxiang renewal plan in order to find out the motives behind their responses to situational changes. We chose to use a questionnaire to gather generic information. Furthermore, detailed interviews were undertaken to obtain specific in-depth information. We surveyed with questionnaires in two rounds, investigating the differences

before and after the 2006 revitalisation of Nanluoguxiang. The first round was conducted in 2006, with questions focusing mainly on two aspects: local residents' perceptions of their living conditions, and their attitudes towards the potential changes brought by the future renewal project. Ninety-eight validated questionnaires were completed. The second round of investigation was conducted in 2011. As there has been a change in stakeholders, the interviewees not only included residents, but also local shop owners and tourists. Local residents completed 169 validated questionnaires, shop owners 79 and tourists 81. In addition, group interviews were also conducted in 2011 with local residents, shop owners and local government agencies. Questions were asked about their interpretation and appreciation of the Nanluoguxiang environment, their knowledge and opinions about the conservation and development plan and their thoughts about future developments. The information gathered proved to be relevant in understanding the emergence of self-organising processes within an intentionally revitalised environment.

Self-organisation as a mechanism for urban transformation

We consider self-organisation to be a non-linear transformative process which follows certain steps. First, a symmetry break occurs. This symmetry break builds up tension until criticality is reached. The origin or cause of the 'symmetry break' (a triggering event) has no determining or predictable 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 one another. 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 (De Roo, 2016).

The concept of self-organisation relates to 'complex adaptive systems' (CAS), systems with the capacity to change while being able to remain 'alive' and able to retain some sort of identity. These complex adaptive systems are at once robust and flexible. While the flexibility of a system allows it to adapt to external conditions, it is also able to reorganise itself internally through a process of self-organisation. This brings the system's parts into the picture, which also responds to the system's imbalance, mismatch or symmetry break with its environment. Their response is no less than adjusting behaviour after criticality has been reached. Cities are considered to behave as complex adaptive systems (Batty, 2008).

Within a system, various agents or sub-systems are unintentionally triggered to respond to this state of disequilibrium. Collective results emerge at the system level. It is the result of individual behaviour seeking the best possible position in an environment of change through which the individual parts start to influence each other selfishly,

competitively, cooperatively or imitatively. In time (which is sometimes extremely quickly), individual actions resonate with their environment, producing results out of independent behaviours which become dominant within and outside the system as spontaneous patterns, structures and functions, and new levels of temporary stability emerges.

Within social environments the responses from various agents are influenced by institutional conditions. These institutional conditions, a set of prescriptions and constraints that humans use to organise their interactions in a structured and legitimate way, will have an immediate effect on the costs which result from such actions. In other words, when social and economic benefits are being pursued, action taken does face hurdles. Institutional conditions can also enable actions to be taken, reducing the action costs and, therefore, also stimulating such actions. In this case institutional conditions enable spontaneous actions to become key elements of self-organisation.

Spontaneous urban transformations can thus be understood as the formation of new physical and social patterns or functions resulting from systemic agents at various spatial levels (individuals, neighbourhoods, cities and regions) responding unintentionally as collectives to external changes or internal needs. It is not at all difficult to find these mechanisms of self-organisation.

The densification of development of the quadrangle courtyards in Nanluoguxiang is an illustration of the above-mentioned mechanism of self-organisation in a process of urban transformation. The developments in Nanluoguxiang have transformed these valued quadrangle courtyards into warrens filled with buildings in the previously open spaces of the courtyards. What can be seen today are former courtyards filled with a chaotic mix of extensions to existing houses and stand-alone buildings (See Figure 2).

The transformation process from quadrangle courtyard to warrens in China's pre-reform era experienced two major phases. The first phase relates to courtyards

Figure 2 Illustration of quadrangle courtyard and the modern-day warrens, and their distribution in Nanluoguxiang

changing from being privately owned houses inhabited by a single family into publicly owned houses intended for multi-occupancy (Wang, 2000). This phase displays an institutional setting of unclear ownership and loosened regulation under which self-organisation can occur.

Before 1949, most courtyards in Nanluoguxiang were single-occupancy households and privately owned. The demographic boom which followed this period changed the socioeconomic environment of the neighbourhood and created a demand for change. Beijing's inner city saw an increase from 4.2 million inhabitants in 1949 to 7.4 million by 1960 (Beijing Statistical Bureau, 2010). The planned economy system in China at that time failed to develop adequate new housing to accommodate the increasing population. As a remedy for the shortage of housing supply, the government developed its 'Jingzu policy'. The Jingzu policy was part of the Chinese socialisation process in the 1950s. It transferred the ownership of the houses with quadrangle courtyards from private hands to the state, in the interests of the common good. Subsequently, the state-owned houses were then divided into small rooms and leased to many low-income tenants. However, institutions failed to respond to the changes caused by the Jingzu policy. There is no institutional setting on the ownership and user rights of public space within the courtyards which were privately owned before the Jingzu policy. Nor were there any institutional regulations on self-building activities within the courtyards. While the Jingzu policy proved to be an efficient policy tool, creating living space to accommodate more households, it also led to the various initiatives resulting in additional living space occupying the courtyards' open space, an unintended consequence of the policy.

The second phase was the transformation from quadrangle courtyards into warrens by individuals starting building activities. The Jingzu policy was temporarily suspended to avoid an irresponsible or uncontrollably increasing disparity between the demand for living space and the adequacy of the housing supply. However, it did not solve the problem in housing supply. With rapid population growth (the one-child policy only started in the late 1970s), the supply–demand disparity increased further. While people within a courtyard no doubt communicated with one another, proposing and discussing various options to address the increasing population pressure, individual needs led to autonomous self-building activities to create individual extra rooms. These self-building activities were initially quite tentative. Only extensions attached to existing buildings, to be used as kitchens or storage space and thus freeing space for bedrooms in the existing parts of a house, were constructed. Although these extensions inevitably reduced the open space in the courtyards, no one chose, or was able, to prevent others from building further extensions. Instead of complaining about the loss of public and open space, residents imitated one another and competed for the available remaining space. The self-building activities then jumped from being tentative to substantive. Gradually, most courtyards were replaced by self-built houses,

with only narrow paths left in between the constructions. After a while, the spatial structure of the quadrangle courtyards was totally altered and they were transformed into warrens. This transformation was by no means exceptional: it became common practice across Beijing's inner city (Lu, 2013).

In the quadrangle courtyard transformation process we can identify all the key elements of self-organisation: a symmetry break emerged due to increasing population pressure and a lack of living space; the temporary relaxation of the Jingzu policy (a criticality) triggered people to respond individually to their desires (adjusting behaviour) to create more space, with the collective result (spontaneous patterns) being the disappearance of the open courtyards, hidden beneath the warrens. This process of spontaneous pattern formation is revealed throughout inner-city Beijing, resulting in an intensification in the use of the hutongs. In retrospect, neither the underdeveloped housing market nor the central planning system could have prevented or solved the mismatch between the desire for living space and the lack of housing. At some point this mismatch or symmetry break would have triggered a bottom-up response by individual residents.

Self-organisation is not necessarily socially desirable

Self-organisation is a non-linear mechanism of CAS to create order, through reference to the world of physics. However, physics does not expect order to be evaluated as being positive or negative, appreciated or despised. The world of physics is in that respect different from social environments and the world that spatial planners are used to dealing with. Spatial planners must consider how the outcomes they achieve are evaluated by citizens, collectives and society as a whole as either desirable or undesirable. This consideration points to a particular category of interest within the social sciences: the world of social complexity. Social complexity differs from a more generic interpretation of complexity, taking into account human beings, their consciousness of their environment, their capacity to learn or to adapt and their ability independently to oppose, or to act contrary to, generic rhythms, flows, attitudes or conventions. It is from within this world of social complexity that we have to consider the process of self-organisation which has affected Nanluoguxiang.

We can see differences in people's attitudes to self-organisation processes at the level of the quadrangle courtyards in Nanluoguxiang. Residents consider their actions in expanding their living space as responding to necessity. This was reason enough to encourage the widespread process of self-building among residents and ultimately transformed the original structure of the courtyards, generating a new pattern of living throughout the hutongs: the warrens. While this development was regarded as the only alternative by its residents, it does not necessarily mean that it was also appreciated.

Figure 3 Negative aspects of living in Nanluoguxiang

First, the spatial pattern of the warrens negatively impacted on the quality of life there. Interview results show that most residents in Nanluoguxiang are dissatisfied with their current living conditions. The building initiatives ruined the open spaces, so highly valued by most residents. Despite their investments in their building initiatives, residents are increasingly confronted by limited living space. In 2006, a single family of three in Nanluoguxiang had an average of 30.9 square metres for its own

use. This means that each individual had an average of some 10 square metres of residential space in which to live. This is in sharp contrast to the average residential space available in the Beijing municipality, which is 20.1 square metres per resident (Beijing Statistical Bureau, 2007).

Second, all these building activities within the courtyards and the intensive use of the space available no longer allows any flexibility. There is hardly any space left for site renewal or redevelopment, or to improve the pathways through the courtyards to allow people to move around tolerably. Moreover, exposed electrical wires mar the local landscape and are a threat to public safety. Furthermore, in Nanluoguxiang, most households do not have their own private toilet. Some residents have to walk several hundred metres to use a public toilet (see Figure 3). The neighbourhood still has open sewers.

In addition, the policy to preserve cultural heritage at the city level has generated various kinds of economic activity in historical neighbourhoods through self-organisation mechanisms. Depending on the impact of such activity, it is either appreciated or perceived as a nuisance. After the regeneration of Nanluoguxiang, tourism-generated income for residents involved in businesses such as shops, cafés, restaurants or hostels increased dramatically. For a period, it was one of the places adventurous tourists discovered when visiting Beijing. This caused the area to evolve into an unmissable landmark on the mainstream tourist's itinerary. Today the pressure of the crowds in the area is such that it is hard to move around at all. This footfall has drawn international companies to the neighbourhood. Starbucks opened a coffee shop here in 2014, a sign the neighbourhood has begun to link with the globalised world. This will have unavoidable effects on local shop owners and residents, including congestion, higher prices and gentrification.

Thinking through the situation in Nanluoguxiang, we can identify a mixture of developments, partly imposed intentionally, partly triggered by policy measures and partly the consequence of macro changes affecting the neighbourhood. We should also not forget the autonomous processes initiated by residents' responses to all these changes, compelled by a mismatch between an increase in population, a lack of housing, and having no financial means to leave. This mixture of developments reveals a strong interdependence beyond the control of the resident, the neighbourhood and the municipality. The developments created tensions to which residents responded by claiming the nearby space as their own. These activities resulted in additional tensions at various levels. There are calls to reconstruct the courtyards and to interfere with the uncontrollable influx of tourists and international companies. Beijing is being confronted similarly by increasing pressures regarding heritage sites, to name just a few of these tensions. These frictions seem to grow beyond the control of all those involved. This reminds us to consider the idea of influencing the conditions under which self-organisation processes within social environments occur. If this is possible, how should we view the relationship between spatial planning and self-organisation?

Interdependency of self-organisation and planning

Traditionally, spatial planning is a government-driven activity, with a focus on implementing development strategies and spatial regulations from the top down. How this relates to the idea of self-organisation and spontaneous patterns emerging in a world which is evolving more or less autonomously is an interesting question. It opposes intentional interventions with unintended change, which we believe are not mutually exclusive. Accepting the consequences of self-organisation would also mean that it ceases to be a task for spatial planning to suppress or overrule spontaneous change, or consider it to be undesirable, as a process beyond the planner's control. As we have shown here, not all the consequences of self-organisation are desirable. The ultimate question would therefore be: could spatial planning influence the various phases of a self-organisation process by constraining or enabling it?

One way of exploring the relationship between spatial planning and self-organisation is to consider the role of the actor, in particular when responding to 'symmetry breaks'. Spatial planning could interact with the individual actor seeking to respond to a symmetry break reaching criticality. Spatial planning could also come with conditions which could influence the intended and unintended collective behaviour of the various actors acting in response to a symmetry break reaching criticality. The Nanluoguxiang case illustrates how spatial planning can influence the self-organisation process with strategies aiming to support positive social outcomes.

The undesirable social outcomes of the self-building developments of Nanluoguxiang have led to a desire within local government to intervene. The plan package, including the Nanluoguxiang Conservation and Development Plan (2006–20), which focuses on the main street of Nanluoguxiang and its adjacent area, and the Jiaodaokou Community Development Plan (2006–20), which focuses on the whole Jiaodaokou region residential district, was implemented by the Dongcheng district government (Jiaodaokou Street Office, 2006a; 2006b; Shin, 2010). The plan package (hereafter referred to as 'the conservation and development plan') concentrates on the period from 2006 to 2010.

Above all, the plan set strict spatial regulations for conservation purposes. It is clear in the plan that Nanluoguxiang's overall spatial structure, appearance, building density and other essential characteristics were to be strictly preserved. Independent renovation and building activities, undertaken spontaneously by residents, were therefore prohibited.

In the meantime, the plan also provided 'smart' possibilities for coping with inadequate living space. This plan offered a package of options to encourage individual or collective activities likely to yield socially desired outcomes from the bottom up. First, the plan initiated substantial interventions in the neighbourhood's physical space. These included the repair of dilapidated houses, increasing the availability of refuse receptacles,

paving the roads, converting homes from coal to electricity for their daily needs, laying electrical cables underground, etc. Moreover, a metro station was constructed at one end of the main street in Nanluoguxiang. Second, the plan initiated a special fund of RMB 13 million (approximate 1.87 million euros, as at February 2015) to subsidise the establishment of 'cultural and innovative' shops, including products such as creative accessories, musical instruments, etc. mainly for the main street of Nanluoguxiang. Third, compensation was available to residents willing to move out of the courtyards and hutongs. This compensation was not just about money, but also included replacement accommodation. The size of the apartment granted and the amount of money were determined by the size of the residents' existing homes. In addition, the earlier the residents decided to move out, the higher the compensation they obtained.

These interventions created tremendous dynamics in the neighbourhood, and altered the conditions under which actors behaved, causing symmetry breaks, which kept on expanding and ultimately reaching criticality. The improvement in infrastructure and facilities increased the accessibility of and available facilities in Nanluoguxiang, which meant an increase in perceptions of its heritage value and consequently meant an increase in opportunities for development. Stakeholders act and interact as response to situational changes. And local residents began to ask for a share in the achievements from neighbourhood development. With the financial support from the special fund, residents were getting involved in neighbourhood business in terms of renting their house, working in the shop or starting their own business. Many residents responded by renovating their homes using public subsidies, intending to rent them out to tourists. Another smaller group of residents took advantage of the opportunity to leave the neighbourhood. Shop owners invested in and gained benefit from the increasing business opportunities. The local community office has attempted to enhance the implementation of the renewal plan by supporting residents' relocation, through cooperation between neighbourhood and market, regulation on investment of creative shops etc. A community dialogue platform was autonomously set up for interactions between local residents and business owners, and for expressing local voices and complaints to the district government.

The consequences of the actors' reactions were quite mixed – partially intentional and partially spontaneous. Since 2006, Nanluoguxiang has transformed from one hutong among many others in decline, which tourists rarely visited, into a hot spot for tourists which in 2013 received an average of 20,000 visits per day. This has created new commercial opportunities, attracting new businesses and burgeoning private investments. Some of these changes were intended, at least according to the plan. However, the speed of the various transformative processes, the intensity of the interactions within the area and also with the external world, and the fast emergence of new functions, all continuously reinforce each other, turning the neighbourhood into an increasingly powerful magnet.

This magnet is attracting so many people and activities that it is now rapidly challenging the neighbourhood's carrying capacity and its ability to absorb all that it generates. The facilities that were envisaged in the plan are no longer enough to deal with the rapidly increasing numbers of tourists. Tensions between tourists and locals are increasing. For instance, residents living next to a newly opened bar were confronted with a nuisance; residents complained about the smell from the public toilets located at the various junctions with the main street; and the main street had become an overbearing money machine, overruling the desires of residents to use it in support of their daily activities.

Another consequence is that Nanluoguxiang's main street has experienced a process of marketisation, which influences both individual actions and the planning outcome. Many residents have stopped cooperating with the renewal plan and are demanding higher compensation given the potential value of the neighbourhood. The popularity of Nanluoguxiang pushed up rents, forcing out many small shops, which are in a process of being replaced by international companies, such as Starbucks. With internationally active commercial organisations knocking on Nanluoguxiang's doors it is obvious that the neighbourhood is facing a new stage in its development. Part of the conservation and development plan's ambitions and assumptions became obsolete, which will unavoidably affect its residents and local initiatives.

These controversial developments resonate within the neighbourhood. We therefore have examined the effect of the conservation and development plan from another angle: that of the subjective opinions, feelings and degree of satisfaction of local residents. To explore how local residents feel about the changes to their quality of life in the neighbourhood, we incorporated twenty indicators into the questionnaire, including safety, accessibility, service facilities etc. A positive score indicates satisfaction and a negative score dissatisfaction, and the score's value reveals the extent of satisfaction or dissatisfaction. Figure 4 presents the evaluation results of living conditions before (2006) and after (2011) the plan's implementation.

According to the results, most residents in Nanluoguxiang considered their quality of life to have improved. Sixteen of the twenty indicators, including community activities, cultural facilities, public space etc. showed evidence that residents felt their situation had been significantly improved. Only four indicators, including sports facilities, showed heightened levels of dissatisfaction.

We further evaluated the effectiveness of the plan by examining the thirteen items which relate to the plan objectives. We used five levels (2 very positive; 1 positive; 0 neutral; -1 negative; -2 very negative) to indicate the opinions of residents on these indicators (positive or negative) and the extent (from 0 to 2) to which they agreed or disagreed with a specific item. The evaluation results are presented in Figure 5.

At that time the average comprehensive score from local residents is 0.39, which tells us that local residents agreed in general that the plan helped to improve the

Figure 4 How local residents interpreted space before and after the plan (in 2006 and 2011)

Figure 5 Resident opinion on the changes of neighbourhood space before and after the plan

quality of the neighbourhood's living environment. Considering the individual items, we find that local residents were satisfied with the efforts made to conserve their historical heritage and improve neighbourhood attachment, shopping conditions, leisure activities, public facilities and job opportunities. The survey also shows that income level, physical quality of living conditions and problems caused by the development of tourism were considered to be negative influences. These results will no doubt need special attention in any revisions to the plan.

Initially, the plan created the necessary conditions in Nanluoguxiang to encourage the various actors to act to improve their lives and the neighbourhood as a whole. The quality of the neighbourhood was expected to improve, while maintaining its spatial structure and historical identity. The plan was initially quite effective in fostering positive social and economic outcomes. The planned interventions included constraints and incentives. By setting constraints, the plan blocked the progress of self-building activities, which brought to an end a process of self-organisation which had led to undesired social outcomes. In the meantime, the plan created opportunities for local development by building facilities and providing financial support. Such supporting actions are necessary conditions for the possibility of a bottom-up increase in the number of visits by tourists, and investment from business and the relocation of local residents resulted in the functional transformation of Nanluoguxiang from a traditional residential neighbourhood into a well-known destination for tourism and for creative shops.

These changes were not organised from the top down and would not have occurred without the plan, which stimulated, encouraged and improved the likelihood of individual actions. What we see here is a plan which has undeniably caused the transformation of Nanluoguxiang. What we can also see is that the manifestation and impact of the transformation is by and large autonomous and therefore uncertain. This uncertainty is a consequence of the non-linearity that is a fundamental part of the self-organisation process. However, while Nanluoguxiang had initially shown positive results, this transformation did not stabilise, but continued to drive Nanluoguxiang's main street into becoming a commercial zone, which is beginning to become a source of negative and unwanted externalities.

The transformation has generated a multitude of developments which are no longer part of the plan, which exceed the limits set by the plan or which are contrary to the plan's intentions. Negative spillovers have started to emerge from the transformation and their impact has become structural. What started as a way of stopping a self-organising mechanism of individuals turning their courtyards into overly crowded warrens of self-built structures has become a self-organising mechanism itself, on a larger scale, and seemingly unstoppable. The cause of this all was the plan itself. Initially, the plan created liveable and attractive spaces, which in retrospect proved to be just the beginning of an avalanche of initiatives and activities. This chain of

developments is now beginning to become a nuisance. The neighbourhood may well deteriorate as a result of its success if the outside pressure is not redirected away from Nanluoguxiang to other areas. Other hutongs may also be willing to adapt their environment to accommodate leisure activities and accept coping with tourists and the accompanying mix of economic opportunities and intrusion into residential life.

Self-organisation in Nanluoguxiang became manifest due to symmetrical breaks (a mismatch between available living space and increasing population pressure) reaching criticality, after which actors started behaving independently to achieve a collective result (courtyards transforming into warrens, resulting in a decline in living conditions). The authorities interfered in this process by implementing a plan to encourage alternative developments in the neighbourhood, intended to improve its liveability. Among the many initiatives undertaken, supporting people to move out, and encouraging economic activities in the neighbourhood's main street were the most dominant strategies. This again resulted in the emergence of symmetry breaks at various levels. Individual residents are beginning to reconsider the entire process of transformation, feeling increasingly uncomfortable due to the nuisance and congestion around the main street. There is an ongoing deluge of tourists and commercial activities putting increasing pressures on the neighbourhood's carrying capacity. Neighbouring areas are also beginning to adapt to the developments in Nanluoguxiang, seeking to benefit from the incoming financial opportunities, while hesitating about how to absorb the negative effects. While it is as yet unclear at what point a new pattern formation will occur at the individual, neighbourhood and city-district levels, it is clear that the plan for Nanluoguxiang has triggered various and counter-responding interdependencies at all of these levels. These interdependencies are an interesting phenomenon from a complexity sciences perspective. However, they also reveal the difficulties planners are being confronted with when trying to incorporate or trigger non-linear self-organisation processes in urban development programmes.

Discussion and conclusion

Our study of Nanluoguxiang focuses on self-organisation processes that demonstrate qualities of relevance as mechanisms for spatial transformation. These independent and unintended actions have proved to being closely intertwined with intentional spatial planning processes. This focus resonates with the three assumptions this paper started with deduced from the contemporary planning debate on the relationship between self-organisation, spatial planning and urban development.

The first assumption is about self-organisation being a radical, revolutionary or vague concept. It is the contrary: self-organisation is a generic and common mechanism in spatial transformation processes. So far, self-organisation processes occurred outside the planner's field of vision as they do not align with traditional

linear planning thinking, which seeks maximum certainty and control over urban development. Nanluoguxiang is a model of a world evolving non-linearly, with its accompanying uncertainties. It presents us with a non-linear path of development through two periods of transformation.

Nanluoguxiang is a neighbourhood which evolved discontinuously, seeking a better internal fit between the various actors, their interests and the local environment they are part of. 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, which can be regarded, from a self-organisation perspective, as an instance of spontaneous pattern formation.

The authorities responded intentionally and purposefully to this undesirable development with the conservation and development plan, which included strategies to relieve the pressure on the neighbourhood's liveability and to introduce strategies to encourage positive developments. One of the plan's intentions was to provide incentives for local residents to move away or to start commercial activities within the neighbourhood. The degree to which various actors – particularly local residents, businessmen and tourists – responded to the symmetry break the plan created was unexpected. The revitalisation of Nanluoguxiang was such that commercial leisure opportunities were considered on a massive scale, 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. Consequently, we can observe a spontaneous pattern formation occurring again, due to an interaction between a plan full of good intentions and a reality which played out in a self-organising way, beyond the plan's range of vision.

The second assumption considers self-organisation a better alternative than contemporary spatial planning for coping with non-linear urban development. We have shown, however, that the question is not so much about considering self-organisation as an alternative but as an integral part of urban development processes, regardless whether this development is planned or not. Instead, we have seen that intended action at Nanluoguxiang did not result in a restoration of control. The plan merely influenced the internal and external dynamics which were part of the change processes affecting Nanluoguxiang. In this respect the plan was partly conditional on the change processes and partly created a symmetry break out of which a new self-organisation process followed. It is debatable whether the symmetry break was intended or not. What was intended, however, was to create the opportunities for

economic development, in the hope that the fresh income would make the residents more resilient. In a sense, this was also a symmetry break, but it would be an understatement to say that its magnitude and its characteristics were merely underestimated. Consequently, the spontaneous pattern resulting from self-organisation has shown a trend of departing from local desires regarding liveability though the overall level of satisfaction is rather high. Intended policy and spatial planning are once again required to redirect the developments in Nanluoguxiang in a healthier and sustainable direction. Spatial planning relates strongly to causing desired change and countering undesired change. Changes due to spontaneous self-organisation processes do not necessarily have a positive effect on the sociospatial domain, and can therefore elicit a planning response. It would also be interesting to consider the possibility of working towards an understanding of an engaged interdependency, a mutually adjusting coexistence or achieving balanced symbioses between unintended self-organisation processes and actions initiated intentionally by spatial planning. Contemporary spatial planning has to incorporate the idea of a reality which is non-linear, uncertain and open to discontinuous change, including encounters with known and unknown consequences. This also includes a shift in focus from content and process towards conditions of change.

The third and last assumption of this paper is the idea of self-organisation being related to local action, the emergence of bottom-up approaches and self-governance. Viewing self-organisation from the perspective of the complexity sciences, incorporating the idea of non-linearity and unpredictability is not the same as to 'doing it yourself' or 'doing it without the authorities', which is what self-governance or self-regulation implies. In Nanluoguxiang we have seen actors taking actions independently of each other. This means this behaviour lacks the intention to become part of a collective initiative or collective action, but nevertheless produces a collective result – spontaneous pattern formation. The effects of such patterns emerging can be positive or negative, which meant that the responsibility of the relevant institutional bodies remained to take action the moment liveability in Nanluoguxiang came under pressure. This brings us back to planning becoming conditional. The institutional bodies could consider constraining and enabling factors to influence self-organisation processes. In Nanluoguxiang we have seen how Jingzu policy provided the opportunity for actors to use the open space in their courtyards, which was a necessary condition enabling the spontaneous formation of warrens, by granting residents the space to absorb the increasing population pressure. The conservation and development plan in turn provided the necessary conditions to constrain and enable various actions, behaviours and initiatives, resulting in people leaving the area, and in the formation of a commercialised main street which led to an increase in neighbourhood income from which residents benefited. In other words, spatial planning is able to influence self-organisation processes by conditioning these processes using constraining and enabling factors. Such smart interventions are not isolated decisions resulting in clear

end results defined *a priori*. On the contrary, it spells a kind of planning which is willing to adjust, to respond and to counter-respond continuously, combining robustness and flexibility in its encounters. Spontaneous changes and spatial planning will have to find a beneficial and mutually dependent arrangement to coexist and co-evolve for the good of society.

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References

- ALFASI, N. and PORTUGALI, J. (2007), 'Planning rules for a self-planned city', *Planning Theory*, **6**, 164–82.
- ALLEN, P. M. (1997), *Cities and Regions as Self-Organising Systems: Models of Complexity*, Amsterdam, Gordon & Breach Science.
- ASHBY, W. (1947), 'Principles of the self-organizing dynamic system', *Journal of General Psychology*, **37**, 125–28.
- BATTY, M. (2007), *Cities and Complexity: Understanding Cities with Cellular Automata, Agent-Based Models, and Fractals*, Cambridge, MA, MIT Press.
- BATTY, M. (2008), 'Cities as complex systems: scaling, interactions, networks, dynamics and urban morphologies', in *The Encyclopedia of Complexity & System Science*, Berlin, Springer.
- BEIJING STATISTICAL BUREAU (2007), *Statistical Communiqué of Beijing on the 2006 National Economic and Social Development* (Government Report, Beijing).
- BEIJING STATISTICAL BUREAU (2010), *Beijing Statistics Year Book*, Beijing: China Statistics Press.
- BEST, S. and KELLNER, D. (1997), *The Postmodern Turn*, New York, The Guilford Press.
- BLOOM, S. L. (2000), 'Chaos, complexity, self-organization and us', 1–5 (reprinted from *Psychotherapy Review*, **2**), <http://nextreformation.com/wp-admin/resources/Chaos.pdf>.
- BOONSTRA, B. and BOELEN, L. (2011), 'Self-organization in urban development: towards a new perspective on spatial planning', *Urban Research & Practice*, **4**, 99–122.
- BUENSTORF, G. (2000), 'Self-organization and sustainability: energetics of evolution and implications for ecological economics', *Ecological Economics*, **33**, 119–34.
- CAMAZINE, S. (2003), *Self-organization in Biological Systems*, Princeton, NJ, Princeton University Press.
- CHAN, E. and LEE, G. (2008), 'Critical factors for improving social sustainability of urban renewal projects', *Social Indicators Research*, **85**, 243–56.
- CHEN, Y. and ZHOU, Y. (2006) 'Reinterpreting central place networks using ideas from fractals and self-organized criticality', *Environment and Planning B: Planning and Design*, **33**, 345–64.
- COLLIER, J. (2003), 'Fundamental properties of self-organization', in V. Arshinov and C. Fuchs (eds), *Causality, Emergence, Self-Organisation*, Moscow, NIA-Priroda, 150–66.

- COMFORT, L. (1994), 'Self-organization in complex systems', *Journal of Public Administration Research and Theory*, **4**, 393–410.
- DE ROO, G. (2010), 'Planning and complexity: an introduction', in G. de Roo and E. A. Silva (eds), *A Planner's Encounter with Complexity*, Farnham, Ashgate, 1–18.
- DE ROO, G. (2016), 'Self-organization and spatial planning: foundations, challenges, constraints and consequences', in G. de Roo and L. Boelens, *Spatial Planning in a Complex Unpredictable World of Change*, Groningen, InPlanning.
- DE ROO, G., HILLIER, J. and VAN WEZEMAEL, J. (eds) (2012), *Complexity and Planning: Systems, Assemblages and Simulations, New Directions in Planning Theory*, Farnham, Ashgate.
- GHENMAT, 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**, 501–13.
- HAKEN, H. (1980), *Dynamics of Synergetic Systems*, New York, Springer.
- 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 B*, **35**, 183–211.
- HEYLIGHEN, F. (2008), 'Complexity and self-organization', in M. J. Bates and M. N. Maack (eds), *Encyclopedia of Library and Information Sciences* (3rd edition), London, Taylor & Francis, 1215–24.
- JIAODAKOU STREET OFFICE (2006a), *Conservation and Development Plan of Nanluoguxiang, Beijing*, Beijing, Dongcheng District Government.
- JIAODAKOU STREET OFFICE (2006b), *Jiaodaokou Community Development Plan, Beijing*, Beijing, Dongcheng District Government.
- KAUFFMAN, A. (1993), *The Origins of Order: Self-Organization and Selection in Evolution*, New York, Oxford University Press.
- KELLER, E. (2000), *The Century of the Gene*, Cambridge, MA, Harvard University Press.
- KELSO, S. (1995), *Dynamic Patterns: The Self-Organization of Brain and Behavior*, Cambridge, MA, MIT Press.
- KRUGMAN, P. R. (1996), *The Self-Organizing Economy*, Oxford, Blackwell.
- 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. (1988), 'The autopoiesis of social systems', in F. Geyer, and J. van der Zouwen (eds), *Sociocybernetic Paradoxes Observation, Control and Evolution of Self-Steering Systems*, London, Sage, 172–92.
- NICOLIS, G. and PRIGOGINE, I. (1977), *Self-Organization in Non-Equilibrium Systems*, New York, Wiley.
- NICOLIS, G. and PRIGOGINE, I. (1989), *Exploring Complexity*, New York, Freeman.
- PORTUGALI, J. (2000), *Self-Organization and the City*, Heidelberg, Springer.
- RAUWS, W. and DE ROO, G. (2011), 'Exploring transitions in the peri-urban area', *Planning Theory & Practice*, **12**, 269–84.
- SHIN, B. (2010), 'Urban conservation and revalorisation of dilapidated historic quarters: the case of Nanluoguxiang in Beijing', *Cities*, **27**, 43–54.

- 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**, 113–23.
- TIAN, J. (2011), 'Preservation and organic regeneration for historical neighbourhood: case of Nanluoguxiang' (Lishiwenhua Jiequ Zhengtibaohu Ji Youjigengxin De Lujing), *Economic Forum*, **11**, 134–36.
- VAN MEERKERK, I., BOONSTRA, B. and EDELENBOS, J. (2013), 'Self-organization in urban regeneration: a two-case comparative research', *European Planning Studies*, **21**, 1630–52.
- WITT, U. (1997), 'Self-organization and economics - what is new?', *Structural Change and Economic Dynamics*, **8**, 489–507.
- 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**, 160–78.