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MSC SPATIAL PLANNING

BARTLETT SCHOOL OF PLANNING

**Spatial planning during and after the COVID-19 pandemic in Changchun, China:
Effects of working from home, social distancing behaviour and resilient city**

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Being a dissertation submitted to the MSc Spatial Planning at University College London: I declare that this dissertation is entirely my own work and that ideas, data and images, as well as direct quotations, drawn from elsewhere are identified and referenced.

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List of Acronyms and Abbreviations

CDC	Centers for Disease Control and Prevention
CGTN	China Global Television Network
CPC	Communist Party of China
FAW	First Automobile Works
GLA	Greater London Authority
HSC	Health and Social Care
IFC	International Finance Corporation
NBS	National Bureau of Statistics
NHC	National Health Commission
NHS	National Health Service
WHO	World Health Organization

Abstract

COVID-19 poses a huge challenge to urban public-health emergency and governance systems. Those engaged in spatial planning and management are starting to think about how a 'people-oriented' principle can be incorporated into spatial-planning systems. The example of Changchun, China, is used to explore citizen views on the development of the post-pandemic city and on a future prevention and control system of spatial planning. Semi-structured interviews were used to explore the impact of COVID-19 on citizens' life and work. The prevention and control system of Changchun spatial planning will be explored. The results show a very negative impact on residents' lives as a result of the uncertainty of urban development and a crisis of efficiency in urban governance. Spatial planning should have a focus on public safety and health, as well as on meeting the basic needs of urban living. It is recommended that urban planners and policy makers think about public disease control and spatial planning together to improve urban upgrading and development in second-tier cities. The aim of this research is to explore the impact of COVID-19 on the spatial planning of the second-tier city of Changchun, and to propose suggestions for creating resilient cities that provide security and convenience for citizens.

1. Introduction

1.1 Background and context

The outbreak of COVID-19 caused most of the world's population to suddenly suspend and then slowly restart their normal ways of living. At this critical moment, the governments of many countries, including China, have committed to national and joint mobilisations to transparently prevent and control the the pandemic. People have braved the dangers of the virus and overcome many difficulties together (Xu et al., 2020). The pandemic has also exposed shortcomings in urban spatial planning. Spatial planning is the long- term planning and arrangement of territorial space resources and layouts by government departments. It aims to achieve effective control and scientific governance of territorial space and promote the balance between development and protection (Adams, Alden and Harris, 2016; OECD, 2001; Hu, de Roo and Lu, 2013). Spatial planning focuses on spatial balance and aims to influence the spatial activities of the public sector, provide rational regional organisation, and support sustainable development goals. Spatial planning systems are fundamentally based on the reasonable protection and effective use of spatial resources, including of the specific spaces available (such as land or sea) and of spatial elements as a whole. Many components must be considered in spatial planning including spatial structure optimisation, spatial efficiency. It also requires consideration of the 'multiple-gauge fusion' mode of planning, implementation, management and supervision mechanisms, and other factors such as the protection of ecology (Dühr, Colomb and Nadin, 2017; Faludi, 2002).

Jie Ming, observed that ‘the revelation from COVID-19 is that public health is not just a concept in a textbook but an event that has a real impact on daily life’ (2020). COVID-19 is likely to introduce many new requirements to the planning industry. Considering the transmission mode of virus causing COVID-19 and of the need for home-quarantine measures, urban and rural planning and governance will likely change considerably in the future to consider these types of risks. For example, research into integrated residential design and sustainable spatial planning strategies may be one of the priorities for future planning.

1.2 Key focus of the research

The impact of the pandemic has been a shock to the operation of most modern cities. China is a country with a vast territory and highly differentiated natural conditions, and it is often affected by natural and man-made disasters (Hayford and Cheng, 1997; Zhang et al., 2014). The negative effects of disease transmission, environmental pollution, and terrorist attacks can no longer be ignored, particularly in China’s large cities (Ibrahim, 2007; Seo, 2019). As cities need to accommodate a high population density and significant economic activity, these negative effects will be magnified.

In the months since the initial outbreak of COVID-19, it has seriously threatened the lives and health of the global population. For many years prior to this, urban planning had primarily focused on economy, function and aesthetics, and paid insufficient attention to disaster prevention and mitigation (Duan, Li and Lu, 2003). As a result, disaster prevention and mitigation measures can only be taken reactively , often with poor execution and negative

impacts (Kreimer, Arnold and Carlin, 2003; Long, 2020; Luo, 2013). This study analyses the prevention and control of the COVID-19 pandemic from the perspective of urban spatial planning and management. Information was gathered from interviews and questionnaires, and the second-tier Chinese city of Changchun, is used as an illustrative example. The data was analysed and problems in urban spatial planning and management as well as public health are considered. Furthermore, strategies are explored for more effective urban spatial planning to create a healthier, safer urban living environment in the future.

1.3 Research aim and objectives

The aim of this research is to explore the impact of COVID-19 on the spatial planning of the second-tier city of Changchun, and to propose suggestions for creating resilient cities that provide security and convenience for citizens. To address that aim, the following objectives are developed:

- 1.To Identify problems related to productivity and living in the context of COVID-19 pandemic and to explore the general impact of working from home on the spatial planning of cities;
- 2.To consider spatial planning from the perspective of employment demands and life needs;
- 3.To promote resilient cities as a way to transform urban crisis management.

1.4 Dissertation structure

The study is divided into five chapters followed by appendices: Chapter 1 presents the background, and the research aim and objectives; Chapter 2 outlines the relevant literature and research gaps; Chapter 3 explains the selection of Changchun as a case study, and describes and discusses the study's data collection and analysis; Chapter 4 presents the study's findings and discusses the extent to which these address the research objectives; and Chapter 5 summarises these findings in relation to the research objectives and addresses the study's implications and limitations and the areas for future research.

2. Literature review

2.1 The spread of infectious diseases

There is a long history of infectious-disease outbreaks, including the Black Death (bubonic plague) prevalent in Europe and Africa in the 14th–16th centuries and cholera in Britain in the mid-19th century (Haensch et al., 2010; Sloane, 2011; Ziegler, 2010). These diseases, and many others, caused huge casualties in cities. Infectious diseases generally spread on a large scale through densely populated cities, threatening human health and seriously endangering people's lives (Fonkwo, 2008; Snowden, 2019). Some scholars propose that increased city-planning preparation can prevent or reduce the spread of infectious diseases, using systems for 'infectious-disease s prevention and control planning.' This planning requires incorporating infectious- disease prevention and control measures into spatial planning. This can include infectious-disease isolation and treatment facilities, research systems, and early warning systems (Li, 2020).

According to epidemiological studies, the spread of infectious disease is influenced by ecological and social processes (Silman, Macfarlane and Macfarlane, 2018). Prior to the development of mass transportation systems in urban areas, diseases were transmitted primarily through the proximity effect (Diamond, 1999; Sattenspiel and Lloyd, 2009). In modern cities, and as a result of changes in urban regional structures affecting social processes and methods of communication, infectious diseases spread quickly through more developed and integrated urban network connections (Baroyan and Rvachev, 1970; Daily and

Ehrlich, 1996; De Cock et al., 1988). Transmission of the COVID-19 virus is mainly dependent on social processes, meaning that our urban network relationship, transportation modes, and emergency systems, impact the spread of the disease.

The 2003 SARS outbreak provides some useful examples of elementary effective spatial planning for infectious diseases. In 2003, SARS swept through more than 20 provinces and cities in China and affected 37 countries around the world (Davis and Siu, 2014; Sattenspiel and Lloyd, 2009). There were outbreaks in Guangzhou, Hong Kong, Beijing and other megacities with dense populations and developed economies. This outbreak provides just one example of the prevalence of infectious diseases in large and medium-sized cities. On May 14, 2003, the Ministry of Health and the Ministry of Construction jointly issued the *Guidelines for the Architectural Design of Hospitals for the Admission of SARS Patients*. These provide specific guidance for the renovation and expansion of hospitals for the centralised admission of SARS patients. According to principles of urban planning, hospitals should not be placed in densely populated areas, or near facilities such as schools, houses, or water sources. The ideal position for hospitals in terms of infectious-disease management is high-altitude, geologically stable and flat, and positioned downwind of the main urban area (Li and Zhang, 2003; Wen, 2003). The 2003 SARS infection demonstrated that other effective measures to prevent the spread of the disease are isolation and ventilation. For isolation and ventilation to be executed properly, a ‘wholesome segregated zone’ should be established. Some scholars also propose the use of the ‘sanitary isolation land’ classification in the *Urban Land Classification and Construction Land Planning Standard*, to effectively prevent the spread of

diseases (Chen and Zheng, 2017; Ren, 2003).

The recent outbreak of COVID-19 in Wuhan, a crowded transportation hub, once again demonstrates that China's megacities and large cities are not well-equipped to mitigate disease spread. The cluster and satellite cities in China are particularly underdeveloped from this perspective. After the SARS outbreak, experts in spatial planning presented proposals for how to slow the spread of infectious diseases, but most of these remained at the theoretical level and were not effectively implemented (Cyranoski, 2003). The Urban Planning and Design Institute of China, for example, compiled the *Study on Human Living Environment and Control of Infectious Diseases* (Communist Party of China (CPC), 2003). This study was completed in the construction industry. Proposals were put forward for the application of planning, design, construction, and other technical conditions and living environments which could mitigate the spread of infectious diseases. This included establishing emergency measures to manage infectious diseases, providing recommendations on urban and rural planning, architectural design, garbage disposal, and living environments related to the control of infectious diseases (Kou, 2003). It is difficult to assess the impact of these recommended interventions but in view of the current pandemic, there is a clear need for greater research in this area.

There are many complex human needs to account for in spatial planning, including economic conditions and the development of social civilisation (Roodbol-Mekkes and van den Brink, 2015). Health is a basic human need, and spatial planners must fully consider the positive and

negative health effects on public health of any planning programmes. Previously, major infectious disease outbreaks such as SARS and Ebola virus, have affected far fewer people than has COVID-19. Furthermore, related research has generally focused on large and medium-sized cities. Where recommendations have been made in the wake of a previous pandemic, the implementation has been patchy. This pandemic is more complicated, and significant research is required to identify the future direction of spatial planning in the context of infectious diseases.

2.2 Spatial planning thoughts from the perspective of employment and life demands

2.2.1 Employment demand

For regional industries, systems allowing for a rational flow of people, logistics and information are crucial to the healthy development of cities and for emergency response (Kauf, 2016; Krykavskyy and Woronina, 2015). Many diseases spread due to people moving for employment, and the systems supporting this behaviour have a key role in addressing this weakness. With central cities at the core, urban agglomerations drive the flow of people, things, information and business in surrounding cities, which is a key stage of development crucial to the balanced development of cities across the country (Jiao, 2020; Korczak and Kijewska, 2019). This can, however, leave cities vulnerable to infectious disease. The outbreak of COVID-19 in Wuhan during the Spring Festival travel rush meant the virus spread to other cities with the flow of migrant workers (see Figures 1 and 2). From a spatial perspective, Chinese cities with a relatively large number of confirmed COVID-19 cases were

in the Wuhan 1+8 City Circle (Wuhan Metropolitan Area). This refers to the city of Wuhan and the eight large and medium-sized cities located around it. (Hubei Provincial Development and Reform Commission, 2009). The large number of people travelling across the region for their places of work to a social event was a key factor making it difficult to control the pandemic.

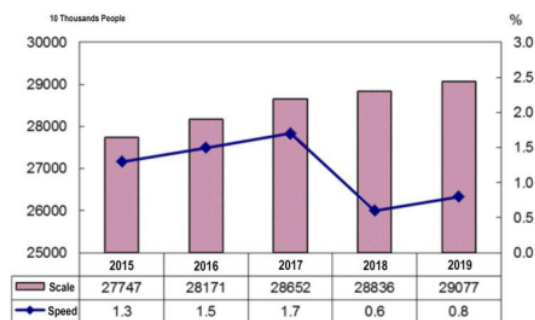


Figure 1 The Scale and Growth Rate of Migrant Workers
(Source: NBS, 2020, p1)

Units: 10 Thousands People. %

Output Region	Total Number of Migrant Workers			Form		
	Migrant Workers		Interprovincial Mobility	Migrant Workers		
	Mobility in the Province	Interprovincial Mobility		Mobility in the Province	Interprovincial Mobility	Interprovincial Mobility
Total Count	17425	7508	9917	100.0	43.1	56.9
East Region	4792	821	3971	100.0	17.1	82.9
Midland Region	6427	3802	2625	100.0	59.2	40.8
West Region	5555	2691	2864	100.0	48.4	51.6
Northeast Region	651	194	457	100.0	29.8	70.2

Figure 2 Distribution and Composition of Migrant Workers in 2019
(Source: NBS, 2020, p1)

There are three components to successful urban spatial planning with regards to employment demand. First, small and medium-sized cities should have the capacity to be self-sufficient, and should be equipped to complete their basic and non-basic functions (Chen, He and Jin,

2006). Differentiated response levels and variations in urban management in different regions under COVID-19, meant that some cities experiencing a low impact were given priority permission to return to normal operation, while some large cities remain in a primary response state. This demonstrates the importance of a city being self-sufficient: not only to ensure its normal operations can go ahead, but also to operate efficiently in response to emergencies (Gao et al., 2019). Second, small and medium-sized cities should be able to provide basic employment services and guide the return to work of migrant workers. In recent years, measures have been taken to attract talented individuals and to encourage population return, which will be a necessary process for the development of cities in the future. This must be carefully planned to ensure it can be undertaken safely (Chen, He and Jin, 2006). Thirdly, in the layout of urban interior space, due attention should be given to the balance between areas of employment and residence. The balance between the distribution of employment and residential space should be rationally arranged to reduce long-distance daily commuting within the city (Zhuang and Zhang, 2002). This will have benefits for daily life, and clear advantages in infectious-disease mitigation. With the continuous improvement of industries and employment within a region and city, the long-term development of a city can guide the orderly flow of people through space. This promotes urban development, improves quality of life, and can have a positive effect on the prevention and control of public-health emergencies (Zou, 2020).

2.2.2 Life demand

Cities provide people with rich environments for business, medical care, housing, and public services. Many services which support people's daily lives are not well-developed from the perspective of public safety. These include transportation, logistics, and health services. It was only when the pandemic broke out that it became apparent that the capacity of medical and health facilities in many cities was insufficient (Ye and Luo, 2020). When disaster strikes suddenly, civil infrastructures and transportation conditions are likely to be affected. Moreover, the lack of access, coordination, and standardization of emergency-medical or infrastructure resources might impair decision-making and execution capabilities (Disaster Research Center, 1995; NRC, 1999; Holguín-Veras et al., 2007).

The COVID-19 pandemic required the use of temporary emergency facilities. Temporary emergency facilities are large public facilities which change function in the event of a disaster and serve as temporary hospitals. Urban planning should support, in the case of large-scale health disasters, the construction of these emergency facilities, in particular hospital facilities. This allows a city to respond to various emergency situations. Similarly, in conjunction with urban hospital facilities, large public buildings should be considered as temporary emergency facilities (Chen and Yu, 2016). Urban planning should not only consider the potential use of existing facilities, but also the possible location of temporary new facilities, such as, in this case, the Huoshen Mountain and Leishen Mountain hospitals specifically built to treat COVID-19 patients. Wuhan's Fangcang mobile cabin hospital is another example of this approach (CGTN, 2020 a). This demonstrates the important role of vacant land in urban planning (Zhu, 2020). In traditional planning, the delineation of empty or available land is

often too arbitrary (Morphet, Comedia and Demos, 1994). When dealing with public-health concerns and other issues, these spaces can effectively be used to serve new functions and thus speed up emergency response. Vacant-land designations should be considered carefully, and a comprehensive zoning layout carried out.

2.3 Reflections on future urban spatial planning and design influence of COVID-19

2.3.1 The influence of urbanisation

Chinese cities have undergone rapid development in recent years and China has achieved a high degree of urbanisation (see Figure 3); 60.6% of China's permanent population now lives in urban areas (NBS, 2020). As a result of this development, the number of migrant workers in cities has increased rapidly. The considerable inter-provincial flow of people has resulted in dense seasonal patterns of worker migration and activities (Murphy, 2009). This also results in increased environmental pollution (Shen, 1996). According to 2019 data from the National Bureau of Statistics (Figure 4), China has a floating population of 236 million people, which contributes to extremely high passenger traffic during the Spring Festival. This high passenger traffic is likely to continue and grow given the rapid development of public transportation and the large capacity of high-speed rail and civil air transportation (Figure 5). Intercity transportation facilitates the ease and speed of travel and this, in turn, promotes the development of urbanisation and, at least indirectly, the increased concentration and mobility of the population (Wey, 2019).

Increased globalisation has also meant that countries are more closely connected than ever before. The development of international transportation has led to the faster and more dispersed movement of people (White, 2017). This factor has made the pandemic's rapid spread more difficult to control. The reliance on international trade has also made it more difficult to completely cut off the traffic of people and block transmission paths between different areas.

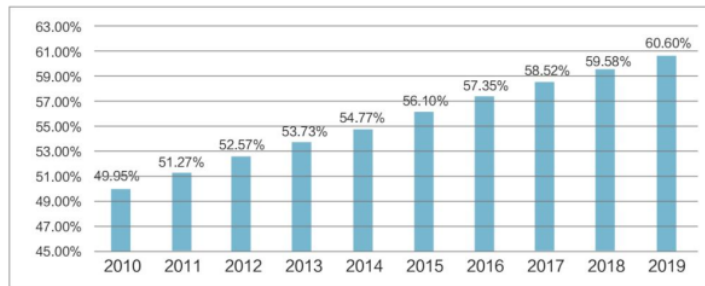


Figure 3 Statistics on China's Urbanization Rate From 2010 to 2019
(Source: Author, adapted from NBS, 2020)

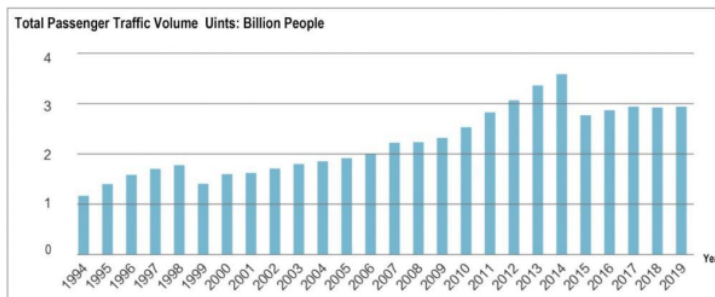


Figure 4 Passenger Volume of Spring Festival Transportation from 1994 to 2019
(Source: Author, adapted from NBS, 2020)

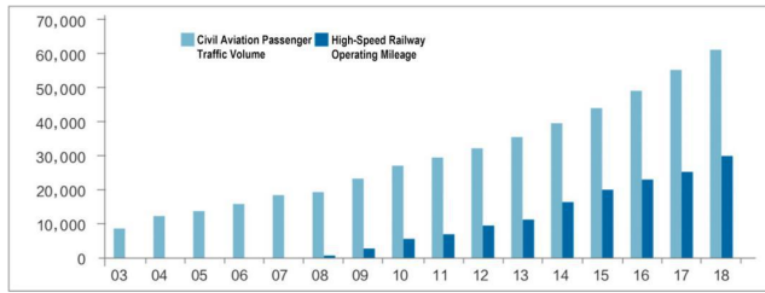


Figure 5 Civil Aviation Passenger Traffic Volume (10,000 passengers) 2003-2018
(Source: Author, adapted from NBS, 2020)

The COVID-19 outbreak occurred in large cities before spreading elsewhere. In global cities, the high mobility of populations brings high risks, making pandemic prevention difficult (Jia et al., 2020). Many major cities in China quickly established a command system for pandemic prevention and control. During the pandemic prevention period the resources and data from different regions and departments were integrated into a top-level design. This established the foundation for the mapping of pandemic prevention and control (CGTN, 2020 b). The cities which were able to do this effectively had already implemented ‘smart-city’ planning. These cities were already well-equipped to make use of advanced technologies such as big data, artificial intelligence and cloud computing to build an efficient, automated system for the provision of city services and operations (Bai et al., 2020; Li, 2020).

2.3.2 Thoughts on progressive city

Smart cities are part of the ‘Healthy City’ strategy, which aims to change the concept of urban living, and build a healthy city-oriented spatial structure (Wu, et al., 2020). In 1984, the World Health Organization (WHO) held the Healthy Toronto 2000 conference where the concept of a ‘Healthy City’ was proposed (Hancock, 1988). Around 1994, developing countries started

their own programs based on the experience resources and implementation strategies that developed countries had initially achieved success (WHO,1998). In 1989, China started to create a National Health City. In 2007, the Chinese government started to incorporate principles of healthy cities, with Shanghai, Beijing and Dalian among the first batch of pilot cities (NHC, 2014). In 2016, the Healthy China 2030 plan was issued and implemented by the State Council, which proposed the use of indicators such as human health level, government health governance, urban health industry and environment (Chen, Li and Harmer, 2019; WHO, 2016). In 2017, the report of the 19th National Congress of the Communist Party of China (CPC) formally proposed the "Implementation of Healthy China Strategy" (CPC, 2017). This shows that the construction of healthy cities has long been one of the main goals of modern urban planning. Building a healthy city can reduce the negative effects brought by high density and mixed purposes of the space. According to Barton and Grant (2012), during Phase IV of the evaluation of the WHO's Healthy Cities Planning (2003-2008), most European countries pay more attention to transportation, urban form, urban design and environmental quality. However, the importance of spatial planning for health equity is not fully recognized, and the policy is relatively vague on the issue. Furthermore, it focuses on the management of 'Urban Disease', and in China there has been little incorporation of healthy city principles into the planning of second and third-tier towns (Wang, et al., 2016).

2.3.3 Building a resilient city

In 2008, the United States put forward the Climate Action Plan to deal with meteorological disasters with the concept of 'Resilient City' (Coffee, 2010). Modern cities are faced with

more and more uncertainties, which may have a profound impact on the future of these places and their populations, and the concept of resilient cities has gradually become an important component in urban planning (Holt, 2014; Watson, 2014). In 2011, Greater London Authority (GLA) put forward the plan of Managing Risks and Increasing Resilience, with the intention of reducing flooding in the city by increasing the number of urban parks and green land (2011). In 2017, Singapore promoted its Cities of Tomorrow Programme, describing its aim to build resilient cities to cope with the uncertainty of challenges in the future (Jamal, 2017). In recent years, China has accelerated the construction and promotion of resilient cities. For example, Shanghai has strengthened its urban resilience from the perspectives of space defence, engineering technology and social governance (Shi, 2016). This demonstrates its preparation for future possible problems. Similarly, some cities have completed their urban planning with consideration of blank spaces and emergency response systems. However, the resilient city needs to be studied more systematically and reflected in urban development, disaster prevention, long-term functional layout and other aspects.

There are changes which cities can make in their emergency response to protect public health, but this cannot perform the same function as well-designed spatial planning. In Kigali, Rwanda, for example, a temporary hand-washing station was implemented at a bus station and passengers were required to wash their hands prior to boarding (Paravicini, 2020). Similar hand-washing stations can also be used widely in retail stores, banks, and restaurants where this addresses the primary mode of disease transmission (CDC, 2020; Cohut, 2020). There needs to be high availability of hand-washing facilities. Whilst public toilets and other

facilities are becoming more common in certain areas of cities, simple hand-washing basin-type infrastructure needs to be installed in key places, such as public transportation hubs (IFC, 2020). Whilst these changes in infrastructure and user-friendly design are complementary, they are not an alternative to other necessary changes in urban spatial planning, such as quicker response times and faster testing in the event of an outbreak.

Resilient city design can mitigate the harms from common natural and biological disasters, and it is crucial to formulate plans and designs in advance to enable better handling of events in urban spaces (Pearson, Newton and Roberts, 2014). Importantly, this enables the avoidance of risks within a reasonable range of predictability, such as pandemics.

2.4 Research gap

Chinese cities have tended to be passive in their management of change where there is a high degree of uncertainty. First, the rapid process of urbanisation in China has meant that the construction of supporting facilities has lagged, and urban emergency response systems and social governance mechanisms are absent or underdeveloped (Liu and Yang, 2014). There is little information or policy on urban spatial planning in China particularly in relation to unpredictable disasters and the unknown long-term impacts of those. Secondly, there are great differences in the risks faced by cities of different sizes and with different regional conditions. Most relevant extant data pertain to the response strategies and planning methods of large cities during a disease outbreak. There is no data available for second-tier cities.

Furthermore, as compared to COVID-19 other epidemics such as SARS and the Ebola virus have occurred in relatively smaller endemic areas and for a relatively shorter duration (WHO, 2020). The existing data for the most part provides broad suggestions on spatial planning for the prevention and control of infectious diseases. There is little clear direction in terms of specific guidelines for national-level spatial planning and operations and urban practices. Studying the responses of China's second-tier cities to COVID-19 will be a valuable addition to the literature related to urban resilience, spatial planning and the effectiveness of urban governance. Urban spatial planning has an important public-health role in responding to public-security crises. Analysis in this area will have great significance and hopefully influence future spatial planning approaches.

3. Case study in Changchun

3.1 Brief introduction

Changchun, a second-tier city, is centrally located in the northeast region of the People's Republic of China (see Figure 6). It is the capital of Jilin Province and its political, economic, cultural and transportation centre. Changchun covers an area of approximately 20,594 square kilometres, of which the planned area is 7,293 square kilometres. By the end of 2015, the city's total population was 7.85 million, accounting for 28.5% of the total population of Jilin Province. The planned area has a population of 4.84 million (Kuang et al., 2005). It is also the city with the largest automobile industry in China. A specialised urban industrial development space is forming in the southwest of the city and this centred on the automobile industry and aimed at building a world-class automobile industry (Zhou, Li and Zhang, 2020). It is now the headquarters of the FAW Corporation, the key research and production base for the Chinese automobile industry, with an automobile output accounting for one fifth of the total national output. As part of the declining old industrial base, Changchun's economic growth has significantly slowed in recent years. To compete and attract talented workers to live and work, Changchun has invested significantly in construction and development (Yue and Li, 2020). A new urban district is emerging in the northeast with Changchun as the core of the new strategic and high-end service industries.

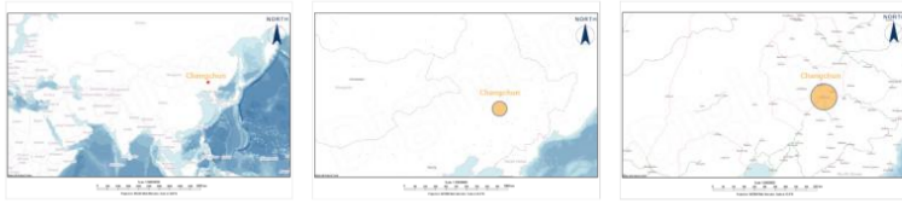


Figure 6 Location of Changchun

(Source: Author, the base map adapted from Digimap, 2020)

3.2 Rationale for the choice of case study

Changchun was chosen as a case study for several reasons. As a developing second-tier city, Changchun has great potential for conducting experiments in new planning approaches. Secondly, the situation and planning directions to transform what is known in this context as the Great Northeast Industrial Base, and the focus on science and technology industries are factors applicable to many cities in the world. This study's practical insights may prove widely applicable. Finally, the COVID-19 pandemic has meant a reduction in the future movement of workers to big cities and planning the development of second-tier cities will be higher on the agenda.

4. Methodology

4.1 Qualitative approach: semi-structured interview

Semi-structured interviews are a flexible and useful means of gathering qualitative data and appropriate to this type of research and to meeting this study's objectives. They create an opening for narrative and analysis to be introduced, through which interview participants can discuss and explore together (Galletta, 2012). The approach allows for in-depth discussion of a nuanced topic but with more structure than a completely free-form interview. This allows for some comparison of responses, but still provides opportunities for follow-up questions and a deeper discussion. This deeper discussion provides researchers with a space to think about the new meanings of the research content (Galletta, 2012; Punch, 2005). This study will present analysis of the changes in urban planning caused by the COVID-19 pandemic. It will explore people's views on future spatial planning and other development directions and on the prevention, control and planning for unexpected disasters in cities. Participant views will be summarised and analysed and suggestions drawn out. This approach requires greater emphasis on text and descriptive analysis, rather than quantitative statistics or data (Bryman, 2008; Rose, 1994).

4.2 Sampling

Referring to relevant studies with similar research aims, a sample size of approximately 20–30 was identified as appropriate (Tinsley and Tinsley, 1987; Comrey, 1988; Wu and Tu, 2011). A snowball sampling method was adopted. Participants are asked to identify other

people who may also be interested in participating in the research (Cohen and Arieli, 2011; Naderifar, Goli and Ghaljaie, 2017). This is a convenient sampling method, although it does have the drawback of recruiting from a narrow pool. Respondents often suggest other like-minded people, who are often just a small part of the subgroup the researcher wants to study (McKenzie, Mistiaen, 2009). To mitigate this risk, this study actively aimed to interview people from different industries and fields, which expanded and diversified the pool of potential participants. A best-effort attempt was made to find a representative sample and 23 interviewees were finally recruited. They represent various groups in Changchun, with different ages, genders, occupations and professional degrees. These data are summarised in Table 1.

Table 1 Profiles of Participants 1

Code	Gender	Age Group	Participant Career	Whether live in Changchun now
1	Female	21-25	Primary water conservancy project planner	No (Beijing)
2	Female	21-25	College student	Yes
3	Female	21-25	Graduate student	Yes
4	Male	21-25	College student	Yes
5	Female	26-30	E-commerce practitioners	Yes
6	Female	26-30	Real estate sales	Yes
7	Female	31-35	University professor	Yes
8	Female	31-35	Golf course manager	Yes
9	Male	36-40	Highway engineer (Associate constructor)	Yes
10	Male	36-40	Construction finance staff	Yes
11	Male	36-40	Government urban planner	No (Beijing)
12	Male	41-45	Highway engineer and manager (A construction division)	Yes
13	Male	41-45	Changchun municipal government transportation department planner	No (Sanya)
14	Male	41-45	Civil engineering budget engineer	No (Shenyang)
15	Female	45-50	Primary school teacher	Yes
16	Male	45-50	High school teacher	Yes
17	Male	45-50	Doctor	Yes
18	Female	45-50	Planning department planner	Yes
19	Male	51-55	Policeman	Yes
20	Female	51-55	Housewife	Yes
21	Female	51-55	Nurse	Yes
22	Male	56-60	Gardener	Yes
23	Female	65-70	Retired worker	Yes

4.3 Pilot study

Prior to the interviews a pilot study was carried out with two participants to ensure that the questions accessed the appropriate information and to identify whether any ambiguities arose from the wording of the questions. This exercise also helped in estimating the time required to complete an interview and this information was then given in the invitations to future participants. It also allowed the interviewer to gain experience and confidence in using the set of questions (Bryman, 2008).

4.4 Interviews

To reduce the risks from COVID-19, online video conferencing and telephone interviews were used. This allows for greater flexibility in terms of when interviews can take place (Salmons, 2016; Drabble et al., 2016). Due to the diversity of interviewees' careers, and the focus in the interview on their individual occupations, only one participant was interviewed at a time. Where relevant, the interviewees were asked questions such as 'why' and 'how' to obtain greater detail on interesting points (Cohen and Crabtree, 2006). Participants were asked a mixture of closed and open questions. The interviews were limited to between 40 and 60 minutes to reduce the fatigue of interviewees and interviewees (Adams, 2015).

4.5 Question design

The purpose of the interview was to learn about people of different backgrounds and in different occupations whose lifestyles and working conditions were forcibly changed by the COVID-19 pandemic. Interesting points of discussion concerned their views on changes to

their lifestyle and to urban spaces, and the development potential of second-tier cities. This provided information both for the prevention and control of unexpected disasters, and for thinking about suitability of Changchun for developing the resilient city.

Intelligent question design is important to this form of research and can gradually guide participants to consider the variables of interest in the research (Galletta, 2012). These questions were developed based on the three research aims and objectives mentioned in Section 1.3. Early on in the interview, interviewees were asked to clarify basic details about their normal living conditions and lifestyles. Next, information was gathered on their conditions and views on home-based work. Finally, citizens were asked their opinions and suggestions for the improvement of communities and cities during COVID-19. Most of the interviewees were living and working in Changchun at the time of the interview, meaning they had an immediate and up-to-date experience of conditions in the city. The participant narratives provided information that could then be explored in the remainder of the interview (de Jonckheere and Vaughn, 2019). In some cases, a discussion developed on the nature of improvements in urban space planning and on the goals of resilient cities.

4.6 Research ethics

All research conducted as part of this study followed the ethics guidelines of University College London. Participants were given interview information documents (see Appendix) so they could give informed consent prior to the interview (Byrne, 2016). They provided contact information, expressed their understanding of the research purpose, and gave oral consent at

the beginning of the interview. Participants were informed that the content of the interview would be recorded, and that they could ask to stop the interview at any time.

5. Findings and discussion

5.1 Current situation

When China started urban planning, it initially followed the concept of functional zoning (Wu, 2015). As a developing country, there were some weaknesses in urban governance and spatial planning (Qiu, 2018). A group of colonial cities such as Qingdao, Harbin and Changchun, and concession cities such as Shanghai, Tianjin and Wuhan, have only recently started to carry out modern urban planning. Furthermore, urban planning disciplines have been relatively slow to develop in China (Zhuang and Zhang, 2002). Having experienced two large-scale pandemics, it is increasingly urgent for government departments in China to understand fully the shortcomings of their urban planning. This should take account of national conditions and development needs, and serious consideration should be given in urban spatial planning to the prevention and treatment of public-health incidents.

5.2 Interview findings

5.2.1 Home working

In December 2019, Wuhan was undertaking surveillance of influenza and related diseases, and multiple cases of viral pneumonia were detected (WHO, 2020). The pandemic spread widely during the celebration of the Chinese New Year. Most internal migrant workers returned to their hometowns to celebrate the Spring Festival, and the movement of workers in and out of Wuhan resulted in the virus spreading widely. After the outbreak of the COVID-19 pandemic was declared, 31 provinces, municipalities and autonomous regions in China

successively initiated first-level responses to this public-health emergency (General Office of the State Council, 2020). All provinces and cities developed a focus on prevention, control and treatment. Spatial isolation was implemented through regional blockades and human control, and relevant policies for home isolation were used to reduce virus transmission (NHC, 2020). As worker movement is a significant proportion of people's movement within and between cities, requiring people to work from home was an important component of reducing transmission.

Most of the 23 participants interviewed for this article had worked from home; those who did not were front-line workers, such as medical and police personnel. People in different industries expressed various attitudes and solutions to working from home. However, most indicated the discomfort of working at home in their current urban context. Respondents' at-home work arrangement lasted between one month and three months, with most reporting at least some at-home work during the period from January to March 2020.

'As a primary school teacher, I worked at home for a long time. During my work at home, the school implemented online teaching, but the source of teaching materials was limited, and students are prone to burnout. In exchanges with students, I could also experience when living at home that children desire enough space for free movement, and parents also hope to have a relatively independent space from their children'.

(Interviewee 15, Female, 7/7/2020)

'Due to the closed management of the community, large public places are closed, and the purchase of daily necessities has become a problem. Because there are fewer large supermarkets in the walkable area, people are relatively concentrated, and the effect of the supermarket's ventilation system and the disinfection status are unknown, although online shopping can alleviate the problem. However, logistics, time and quality are sometimes not guaranteed'.

(Interviewee 20, Female, 8/7/2020)

Maintaining social distancing and home control methods greatly reduced the spread of the virus in early to mid-2020 (General Office of the State Council, 2020). However, these measures also had other impacts on residents' lives. In the north-eastern cities which have a less developed economy, many community plans in Changchun place emphasis on high density development to save costs (Chen, 2006). This means that there is a tendency towards building many properties on small pieces of land (see Figures 7 and 8). There are not many open spaces in residential areas nor are there planned open spaces in the main urban centre and there are few community-gathering spaces. There are, however, many large green spaces and mountain forests on the

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Figure 7 High Density Residential Area in Changchun Buildings (Source: Author, 2020)



Figure 8 Old Residential Buildings (Source: Author, 2020)



Figure 9 Lianhua Mountain Shimao Real Estate (Source: Author, 2020)



Figure 10 Lianhua Mountain Shimao Real Estate (Source: Author, 2020)

'I live in the old city centre, the planned area of green space in the community is very small, and the inaction of the community property makes the community not have enough areas for activities'.

(Interviewee 21, Female, 9/7/2020)

'It takes 40 minutes to drive from my home (Jingyuetan District) to the old city where I work, but the surrounding facilities are very good, especially the Jingyuetan Park which is about 10 minutes' walk away from my home. Outdoor activities are very convenient'.

(Interviewee 16, Male, 9/7/2020)

'Changchun is expanding its city from the west to Daling, developing real estate companies to the south, Beihu Wetland Park to the north, and the Lianhua Mountain Group block to the east'.

(Interviewee 9, Male, 7/7/2020)

'The development of different districts in Changchun is different, and now houses that are far away from the main urban area are becoming more popular choices for citizens, and housing prices keep increasing because of the lower plot ratio and beautiful natural environment such as Jingyue Lake, Lianhua Mountain, Beihu Wetland Park and other places, and most of the villas are located here'.

(Interviewee 6, Female, 8/7/2020)

The disparate and unequal living conditions of citizens become exacerbated when they are restricted to their local area, as was the case of the COVID-19 lockdown. The lack of public space and the inconvenience of accessing community resources are points of concern. Public open space is important for maintaining urban public health (Thompson and Travlou, 2007).

Such open public space is also an important reserve that can be used to address space shortages in the urban emergency system (Feuerstein, 2013). In the current spatial planning and construction of Changchun, the quality of the human settlement environment is generally not high. This is primarily because of a lack of public spaces such as leisure and ecological green spaces. This has particularly negative consequences for quality of life and logistical support in the context of a pandemic.

Wang et al. (2019) lay out the appropriate features of urban green spaces which can support emergency responses. They state that there should be enough multi-functional open space to ensure that town parks, squares, communities and fitness spots of different scales can be effectively combined with, or turned into, emergency shelters. Secondly, the layout of engineering infrastructure and public spaces should be taken into account to increase the usability of public space for the distribution of energy, water and other infrastructure (Francis, 2003). Urban green spaces should support the creation of temporary or permanent facilities for public-health monitoring and emergency use (Paul, 2020). Finally, existing public spaces should be maintained and updated regularly, and resources should be invested in health supervision and management. The planning department can work with relevant departments such as public-health and public safety to formulate guidelines and management rules for the use of public space during both normal and extraordinary periods (Carmona, Hammond and Magalhães, 2008). This will allow for more precise design and future maintenance and will increase the public's understanding of the available facilities.

In addition to the creation of open spaces, the 15-minute community life circle (Figures 11 and 12) has been an important part of planning discussions in recent years. This refers to the number and quality of community resources that people can access in a 15-minute walk from their residence. Shanghai has put forward relevant planning and construction guidelines, advocating for community life units categorised as innovation, coordination, green, open and sharing (Sun et al., 2018). In their recommendations for reducing the spread of COVID-19, the World Health Organisation stipulates that people should consider cycling or walking to travel outside, and should keep their distance from others (WHO, 2020). This emphasis on walking and cycling as a means of transport significantly increases the relevance of the 15-minute community life circle.

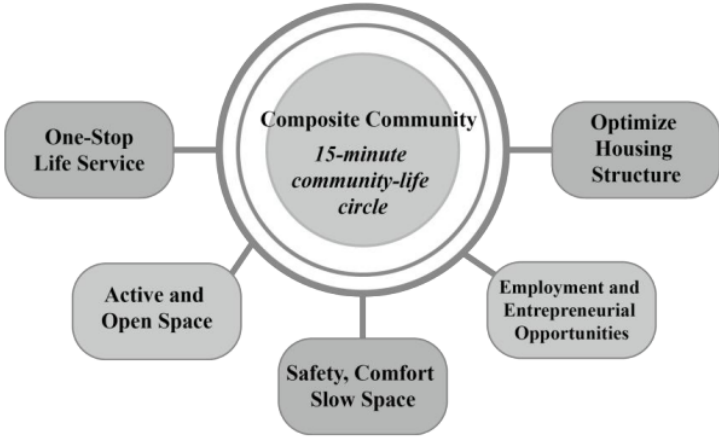


Figure 11 Composite Community (Source: Author, 2020)

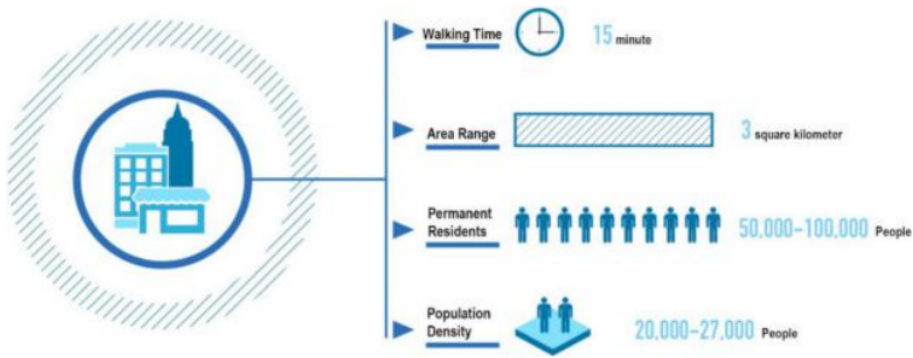


Figure 12 Basic Mode of 15-minute Community Life Circle (Source: Author, 2020)

'Building a 15-minute community life circle, you can enjoy the convenience of life, which is suitable for the current pandemic prevention situation'.

(Interviewee 16, Male, 10/7/2020)

'If people want to have a good living environment, they will go far away from the city, but the distance to work has increased. In the later stages of the pandemic, people still try not to take public transportation, but private cars will cause congestion. Even if the government builds more expressways and overpasses around the city, people still waste time and energy on the road'.

(Interviewee 10, Male, 7/7/2020)

'If it is constructed in the current Changchun plan, it is estimated that will be a little bit difficult to implement because the existing old city block has not yet put forward restoration proposals and needs to be renovated slowly, but the community centre is under construction which on the outer ring line might completely achieve this goal'.

(Interviewee 11, Male, 7/7/2020)

The construction of large-scale closed residential areas should support the formation of open sharing life blocks (Larson, Bush and Barry, 2015). At the same time, the government should ensure effective use of land and of nearby employment spaces and opportunities; public transportation hubs and public activity centres should form the core of their plans (Deng, 2018). In Changchun, the close vicinity of the FAW Automobile factory and high-tech industrial park should be exploited and community spaces developed nearby. Resources such as existing urban landscape and historical buildings, including the buildings left over from the period of the city's Manchukuo government, can also provide cultural and creative employment opportunities that are integrated with the surrounding communities (Sivam, Karuppanan and Mobbs, 2012). Space should also be reserved for bike lanes in road planning. These alterations would support both Changchun's emergency response and the quality of life for its residents outside of emergency contexts.

5.2.2 Harm of unanticipated disasters

According to data released by the Ministry of National Emergency Management, direct economic losses to China caused by natural disasters in 2019 amounted to about 327.09 billion yuan (General Office of the State Council, 2020). Man-made disturbances, such as disease transmission, environmental pollution, and terrorist attacks, have real economic consequences that cannot be ignored (Orzall and Platt, 2008). These negative effects are amplified by the need for cities to accommodate high population densities and economic activity. Urban space planning can play an important role in mitigating the consequences of infectious diseases and other disasters (Wang, 2008).

'I haven't paid serious attention to hidden or man-made disasters before. Besides, Changchun is located in the plain, so there are few natural disasters and I have low vigilance'.

(Interviewee 22, Female, 8/7/2020)

'We usually learn about local disasters in the news, and the seriousness of this pandemic is also known through relevant reports'.

(Interviewee 3, Female, 8/7/2020)

'There is little education and knowledge dissemination of man-made disasters, but the school had earthquake defence drills'.

(Interviewee 4, Female, 7/7/2020)

Despite the potential costs, the national comprehensive disaster prevention and mitigation planning of the General Office of the State Council (2016) does not provide for a specific response to pandemics. The plan for disaster prevention and mitigation provides for a response to earthquakes, floods, meteorological disasters, geological disasters, fire and other major safety events. It takes into account the role of the urban system, land layout, and municipal facilities construction. More detailed and practical preventive measures are provided here for the prevention of nature and the man-made disasters (see Figure 13). These disaster prevention and mitigation strategies demonstrate a 'spatial planning for disaster management' approach that is relevant to various types of disasters, and that recommends

facilities construction, land layout and other methods for pre-disaster warning and in-disaster control.

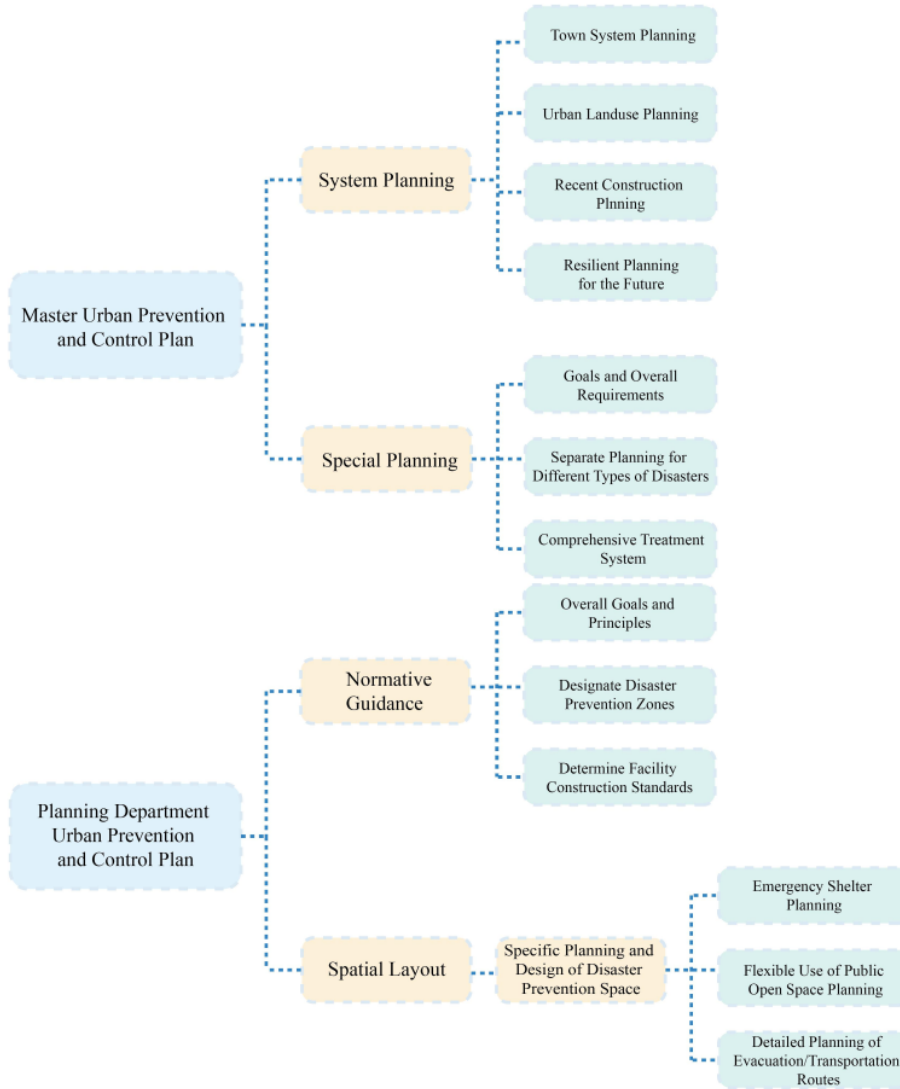


Figure 13 Flexible Disaster Prevention and Control Planning (Source: Author, 2020)

To mitigate the impact of infectious diseases the government should add an infectious-disease prevention and control plan to their urban planning. First, plans should be developed for

isolation facilities since the isolation of infection sources is one of the most effective means to control disease spread (HSC, 2020). Preparation of these facilities will have a significant impact on the control of virus transmission. Secondly, transport facilities should be established and existing ones improved for people suffering from infectious diseases. Transport of patients with an infectious disease to isolated places such as hospitals is a common means of virus transmission (NHS, 2020). In the planning of urban road systems, a special channel should be established for transporting patients with infectious diseases to minimise contact with non-infected people. This will reduce virus transmission by interrupting the transmission route (Schilling et al., 2009). Thirdly, plans for infectious disease treatment facilities should be developed. Taking Xiaotangshan Hospital and Wuhan LeiShen Mountain Hospital as examples, the treatment of infectious diseases requires a professional and isolated environment and proper planning for the establishment of these is an important link in the prevention and mitigation of infectious diseases (Sims and Kasprzyk, 2020).

5.2.3 Combination of public disease control and spatial planning

China's urbanisation process has been the largest and fastest-growing in human history (Yang, et al., 2020). However, the current urban economic, social and ecological problems can entail complications, particularly in the context of responding to natural disasters (Zhang, Zhao and Chen, 2013). High-density population areas can cause a high degree of competition for employment, consumption and services (Urry, 2010), leading to crowds and resource limitations which can aggravate the spread of infectious diseases.

'Since the reform and opening up, China has divided into several large economic circles for regional development, the most famous of which are the Yangtze River Delta economic circle, the Pearl River Delta economic circle, and the Bohai Sea economic circle. Wuhan is located in the central economic circle. Relatively speaking, it has a bigger and wider impact'.

(Interviewee 18, Female, 8/7/2020)

In terms of infectious diseases, the degree of urban infection is closely related to the social nature of local economic activities and population mobility. The Yangtze River Delta and Pearl River Delta, China's most economically developed regions, contain more than half of the country's economically strong towns. Other than the Hubei province where the virus originated, they are among the regions most affected by COVID-19.

'Due to the top-down control policy of the government, the prevention and control work of all levels of cities and towns during the pandemic is relatively consistent, with less regional differences. However, compared with the rapidly developing cities, Changchun has a certain gap in terms of economic development and technological level'.

(Interviewee 10, Male, 8/7/2020)

'Changchun is working hard to improve its competitiveness and build itself into a central city in northeast Asia. Before the outbreak, Changchun was actively expanding its city,

building infrastructure, bringing in talents, and increasing its visibility and influence in the northeast’.

(Interviewee 12, Male, 7/7/2020)

‘Changchun jumped to the third place in China in the number of land purchases in 2019’.

(Interviewee 18, Female, 7/7/2020)

Compared with first-tier or more economically developed cities, Changchun is striving for progress and development. The tension between economic development and sustainable development should be addressed in post-pandemic urban spatial development. Changchun has included some marginal green spaces and natural landscape into its expansion planning, such as the Lianhua Mountain scenic spot (Jaung et al., 2020). The protection of Three-River systems (Yitong River, Yinma River and Songhua River) is also planned. The expansion of Changchun serves both city and national development needs. For example, the China-South Korea Cooperation demonstration zone will promote external cooperation in northeast Asia; the Changchun Lin Kong demonstration zone will support the revitalisation of northeast China (Lu, 2020); and the Changchun new economic development zone will have a key role in national scientific and technological development (see Figure 14).

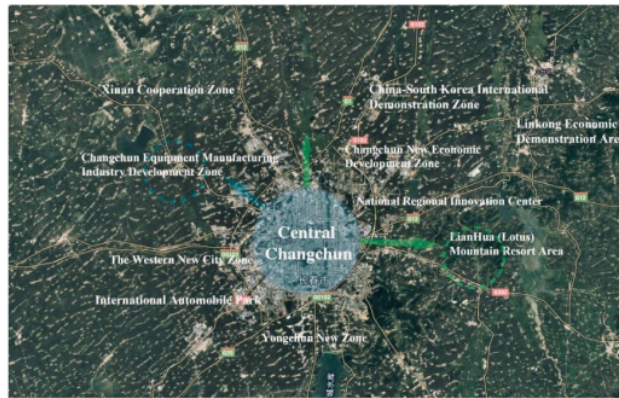


Figure 14 Changchun Regional Expansion Plan
(Source: Author, 2020)

Urban expansion should be organised carefully being mindful of environmental impacts and the need to control population density. In addition, the floor-area ratio of buildings and the proportion of people living in dense population clusters should be reduced. These approaches will all help to block infectious-disease transmission, reduce the incidence of disease, and improve the quality of life for residents outside times of emergency. In addition, urban development should be based on the long term, and planning should try to strategically delimit vacant land for flexibility in dealing with uncertain situations. Wuhan, particularly the metropole, and its neighbouring cities of Huanggang, Xiaogan and Suizhou were the most severely affected by the pandemic. This indicates that the pandemic spread in a manner consistent with existing social and economic activities being concentrated in densely populated cities. National public-health goals, rather than the individual goals of each city, should be the backdrop to all metropolitan health planning. The connection between the community and surrounding ecological features should also be considered. There should be rational use of the area's natural resources in designing a community green-space system that

includes public open spaces, a traffic-calming system and well-designed ventilation. All of these features will help the municipality to maintain sanitation and cleanliness of the air, water and soil environment.

5.2.4 Construction of resilient city

Resilient cities emerged in the early 21st century as a popular topic in urban planning research. Discussions on resilient cities in developed countries such as the United Kingdom and the United States of America are often localised and specific. Studies on resilience also tend to intersect with concepts and technologies such as social equity, public participation and big data analysis (Davoudi et al., 2012). Chinese cities are quite different from Western cities in terms of their natural conditions, social structures, economic systems and administrative governance background. The foundations of urban resilience in this context are thus quite different (Vale and Campanella, 2005).

'Changchun can play to its strengths because it has a small population density and a large and sparsely populated area. A resilient city can experiment successfully'.

(Interviewee 13, Female, 8/7/2020)

'There are large areas of green land, wetlands and water sources around Changchun. Rich in natural resources, and there are great opportunities for development'.

(Interviewee 1, Female, 8/7/2020)

'For second-tier cities that are developing economies, new attempts require government support and national approval. Xi Jinping recently came to Changchun to give further instructions on the development direction of Changchun and to promote economic and environmentally friendly development. Then vigorously support research in the direction of science and technology'.

(Interviewee 13, Male, 25/7/2020)

Urban development, to deal with the uncertainties facing cities, should be based on long-term, flexible thinking. Reserving strategic vacant areas in spatial planning leaves flexibility for urban development (Godschalk, 2003). The value of open space has become clear during the pandemic, as these spaces have been used for the construction of temporary medical facilities. Guidelines for the construction of facilities should provide for the emergency conversion of public facilities (Campanella, 2006). The COVID-19 pandemic has shown the importance of the flexible use of urban space. For example, facilities such as community activity centres and elderly activity centres were used as pandemic prevention and control centres. Schools, local radio and television institutions, sanatoriums, and hotels have all been used for COVID-19 emergency response.

Additional features of resilient cities are systems integrity and a high degree of collaboration. Resilient industries have robust link-ups within the supply chain, ensuring self-sufficiency and timely adjustment in emergencies (Malalgoda, Amaratunga and Haigh, 2018). Flexible production can address a business's pain points; key to this is the intelligent and automatic

application of big data (Schneider et al., 2020). The first step in establishing this sort of flexible production is the establishment of a virtual enterprise to realise the combination of production modes. The second step is to establish a flexible production system, establishing, based on customer orders, which products will be produced and at what scale. Third, to allow the full chain of production to be completed in one location, a centralised production space should be created.

Changchun, given its existing stage of industrial development and the development of the FAW auto industry, can learn from the intelligent manufacturing models of Japan and Germany. These models would play to Changchun’s existing manufacturing advantages and would allow the integration of intelligent manufacturing and innovative research into the entire manufacturing process. This would form a more complete industrial system and collaboration chain, and a more resilient system overall (see Figure 15).

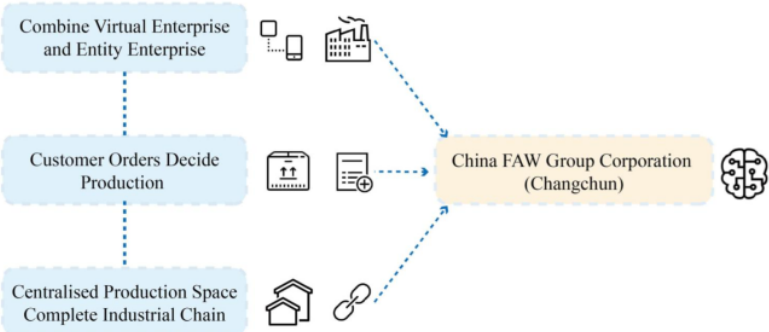


Figure 15 Try to Achieve Resilient Industries (Source: Author, 2020)

Smart data systems are an important component of resilient cities, as they support community governance (Thomas et al., 2017). Smart technology applications should be developed for modern governance – smart data systems can be used to classify and govern communities in a more focused and directed way. During the pandemic, many towns and villages across Changchun adopted a system for monitoring the movement of people. A system of ‘three cards and one certificate’ was set up: permanent residents have a ‘green card,’ floating workers a ‘red card’, and people in areas hard-hit by the virus a ‘yellow card’. This allowed rapid identification and precise management of movement. Intelligent devices such as video surveillance, facial recognition and access control recognition are used to track the trajectory of quarantined persons and confirmed cases. Smart methods have helped to hone community-based governance and played an important role in pandemic prevention and control (Nitoslawski et al., 2019). These methods should be further optimised and promoted. Furthermore, smart-information platforms should be used for enhanced collection of resident information, community-access management and community-security monitoring. This will enhance Changchun’s resilience and allow it respond rapidly to new emergencies.

6. Conclusion

6.1 Summary

This paper examined the impacts of COVID-19 on spatial planning in Changchun. Twenty-three interviews provided a perspective on the views and concerns of the city's inhabitants and the desire and need for spatial planning in Changchun to include epidemic prevention and control. Spatial optimisation and resilient city were put forward to response the pressures and losses in employment and life caused by the limitation of current spatial planning. Policies and plans taken by the Changchun government during and post COVID-19 are critically analyzed and improved. Finally, responses to three objectives and contributions as well as practical implications of this study are given in conclusions.

6.2 Key findings

6.2.1 Response to Objective 1

Objective 1 was to identify problems living and working in the context of the COVID-19 pandemic and to explore the general impact of at-home work on spatial planning. The interviews showed that the existing architectural design and layout of urban space resulted in poor conditions for at-home work or study and limited people's quality of life. Space planning should be improved to enable residents to adapt to this pattern of life or to appropriately prepare for future disasters (Kamalia, 2017). Zhang, Wen and Chen (2020) suggests distributing employment and residential space to reduce daily long-distance commuting within the city. Zou (2020) suggests that improving the flow of people would reduce infection

spread and make it easier for people to continue to work in circumstances like that presented by COVID-19. The use of public space should be expanded by strengthening the functional transformation capacity of large public venues. Faced with a shortage of hospital beds, some public venues in the city needed to alter their function quickly to cope with the outbreak. This recalls Ye and Luo's (2020) observation that many cities were ill-prepared to rearrange their current resources to meet medical needs, and this should be factored into future planning. Independent transportation channels should be developed to move infected people to treatment facilities (NHS, 2020). In addition, areas should be reserved on the city periphery for the construction of temporary facilities (Zhu, 2020; Campanella, 2006). The plot ratio of the community should be reduced as far as possible, while making provisions for existing communities. In the early stages of urban planning, and to prepare for unforeseen emergencies, particularly those requiring medical and emergency facilities, site inspections should identify resources such as water, electricity and convenient transportation.

6.2.2 Response to Objective 2

The second objective of this study was to consider spatial planning from the perspective of employment demands and life needs. The spread of the pandemic has greatly affected normal patterns of work and home life and has slowed social and economic development. People are not only living with and facing health concerns, but are also facing increasing economic pressures as a result of reduced employment.

Urry (2003) points out the risks associated with high-population areas that should be taken

into account when building cities. There should be a balance between short-term costs and long-term benefits, and special attention should be paid to health and safety concerns. Interviewees indicated a low awareness of the risks of natural disasters, including pandemics, and this is reflected in policy (State Council of the People's Republic of China, 2020). In the context of public-health policy, greater consideration should be given to urban security, including the risk of infectious disease outbreaks. This may mean engaging in countermeasures to prepare for urban emergencies, such as the modifying architectural design specifications in terms of physical-space vector optimisation (Huang et al., 2018).

6.2.3 Response to Objective 3

The third objective of this study was the promotion of resilient cities to transform urban crisis management. Interviewees reported that Changchun, as a result of being a relatively small city, had clear advantages in terms of its flexibility and resilience. They also indicated their appreciation for features of resilient cities such as accessible community spaces and green areas. Resilient cities should be built to include high-quality community service spaces. These create a positive living environment, and prepare cities for emergencies in which people may be restricted to their local area for long periods. Pandemic-prevention Standards for buildings should be raised to include measures for and control, and allow healthy and efficient use of urban space (Wang et al., 2019; Godschalk, 2003).

Technological development is also particularly important for the development of resilient cities. Many cities are already collecting large amounts of data through sensors embedded in

their infrastructure, including instreet lamps and lampposts. This data can be used to learn about everything from air quality to the movement of people and this can support effective emergency response. It can also show, in an intuitive, real-time and dynamic way, changes in patterns of urban life caused by government policy changes. The post-pandemic era provides a rare opportunity for urban policy-makers and managers to upgrade their cities, particularly while the public, as indicated in the interviews, has a heightened appreciation of the importance of spatial planning.

6.3 Contributions of this research

Each major infectious-disease pandemic experienced has sparked new ideas, methods and standards in urban planning and design. These pandemics often provide a clear motivation for authorities to promote the healthy development of cities (Duan, Li and Lu, 2003; Kreimer, Arnold and Carlin, 2003; Long, 2020; Luo, 2013). This study has built on previous literature in the area to identify the prevention and development measures taken by second-tier cities in dealing with disasters. The research not only contributes to the academic literature, but also provides useful information to local authorities. This is particularly so in the case of Changchun, because the government's previous approach of expansive development is no longer applicable in the new people-oriented approaches to urban planning. This paper suggests that the Changchun authorities should aim to create an urban spatial layout based on the city's natural geographical conditions. This study also discusses how the concept of resilient cities can be applied to second-tier Chinese cities and considers the role of big data management and intelligent technology in the planning of urban living (Malalgoda,

Amaratunga and Haigh, 2018; Nitoslawski et al., 2019; Thomas et al., 2017; Schneider et al., 2020).

The results of this research also indicate possible avenues for future research. First, similar research can be applied to other small and medium-sized cities in China to enhance China's overall pandemic-response capacity, and to improve the quality of life of all of its people. Previous urban development approaches have focused on spatial planning that provides for the economic and physical expansion of the city, but does not defend against natural disasters, including pandemics (Cyranski, 2003; Liu and Yang, 2014; Li and Zhang, 2003; Wen, 2003). Being in a growth phase, developing small and medium-sized cities are uniquely well-placed to take a more agile and resilient approach to their future planning. Second-tier cities will bear the brunt when large cities are saturated and unable to absorb further people. These marginal cities must thus be an area of focus for sustainable development.

The results of this study reveal that in establishing a land-use planning system, many cities need to shift their focus to more people-oriented planning and urban renewal. This is an important opportunity to restart community self-organisation and to improve community governance capacities. Government departments must consider how to support community groups, develop rapid early-warning and prediction systems, and systematise public-service systems.

6.4 Practical implications

Resident happiness is affected by urban spatial planning. This is reflected in interviewees' identifying features of the city which positively contribute to their wellbeing. This study finds that the COVID-19 pandemic may prompt changes in urban planning. Government planning departments should consider promoting the establishment of green open spaces. These have benefits both for the general wellbeing of residents and for reducing the spread of infectious diseases. Systems should be built that make it easier for residents to get close to nature. Furthermore, establishing large areas of green open space in towns clustered around the main city would allow city residents to access these spaces and thus improve their well-being. Green open spaces are also useful as places to host disaster-prevention facilities such as emergency hospitals. If these spaces are well-chosen, the sites for these facilities can be identified quickly and scientifically, and construction quickly commenced. At the same time, the application of new intelligent technologies can support the disaster response in cities. Big-data management can allow residents instant access to information on disasters or public-health events and the responses to these (Silva et al., 2018).

6.5 Limitations and future research

The time and space limitations of this study meant that only 23 participants were interviewed. Although efforts were made to have participants from diverse careers and backgrounds (including urban planning) participants views may not be representative of the views of Changchun's broader population or its planning authorities. Most interviews were conducted using video or voice calls, and people with access to such resources are generally

well-educated and economically advantaged. Their experiences and views on urban spatial planning during the pandemic may, as a result, not fully reflect those of all segments of society. Nevertheless, these participants can provide valuable insights from the perspective of city residents.

There was, in addition, not space here to discuss additional issues which arose in the interviews including how to set up pandemic prevention units, and the design of building systems and residential areas. The focus here was on topics which provided insight into the primary research objectives of this paper.

To expand on these findings, future studies should look at how, given existing planning conditions, cities can be transformed into resilient and healthy cities. This may require conducting multi-directional research and including an exploration of the role of new smart technologies in urban planning. As new technologies emerge, they will have a greater impact on government resources and the quality of life for citizens and their role in urban planning should be considered.

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Appendices

Appendix 1 Semi-Structured Interview Question List

Question	Ojectives	Literature support
Did you do home working during the COVID-19, and approximately how long did it last?	1	Hayford and Cheng, 1997 Ibrahim, 2007 Seo, 2019 Xu et al., 2020
Did you encounter any distress or difficulties while home working?	1	gov.cn , 2020 NHC ,2020
During the COVID-19, did you face any problems with your travel mode, neighbor relationship, or related life?	2	Chen, He and Jin, 2006 Kamalia, 2017 Korczak and Kijewska, 2019 Luo, 2014
In the process of staying at home, is there any inconvenient aspect in your neighborhood or city? If so, what would you like to improve?	2	Faludi, 2002 Zhang, Wen and Chen, 2020

<p>During the epidemic, have you observed the changes in the city? (Various channels or methods could be used.)</p>	<p>1, 2</p>	<p>Shi, 2016 Ye and Luo, 2020 Zhu, 2020</p>
<p>If your current working city is not Changchun (a second-tier city), how is your current working city different from Changchun in terms of epidemic control or space management?</p>	<p>2</p>	<p>Chen, 2006 Liu and Lu, 2005 Murphy, 2009 White, 2017</p>
<p>There are many related studies or experts suggesting the construction of a 15-20 minute community living circle. Do you think this kind of spatial planning in the city will facilitate your life, or will it limit your participation in the city?</p>	<p>3</p>	<p>Deng, 2018 Feuerstein, 2013 Thompson and Travlou, 2007 Wang et al., 2019</p>

<h2 style="margin: 0;">RISK ASSESSMENT FORM</h2>																		
<h3 style="margin: 0;">FIELD / LOCATION WORK</h3>																		
<p><i>The Approved Code of Practice - Management of Fieldwork should be referred to when completing this form</i></p> <p>http://www.ucl.ac.uk/estates/safetynet/guidance/fieldwork/acop.pdf</p>																		
DEPARTMENT/SECTION	BARTLETT SCHOOL OF PLANNING																	
LOCATION(S)	CHANGCHUN, CHINA																	
PERSONS COVERED BY THE RISK ASSESSMENT	XINYAO SONG																	
BRIEF DESCRIPTION OF FIELDWORK	Telephone interviews will be conducted.																	
<p>Consider, in turn, each hazard (white on black). If NO hazard exists select NO and move to next hazard section.</p> <p>If a hazard does exist select YES and assess the risks that could arise from that hazard in the risk assessment box.</p> <p>Where risks are identified that are not adequately controlled they must be brought to the attention of your Departmental Management who should put temporary control measures in place or stop the work. Detail such risks in the final section.</p>																		
ENVIRONMENT	<p>The environment always represents a safety hazard. Use space below to identify and assess any risks associated with this hazard</p> <p><i>e.g. location, climate, terrain, neighbourhood, in outside organizations, pollution, animals.</i></p> <p>Examples of risk: adverse weather, illness, hypothermia, assault, getting lost.</p> <p>Is the risk high / medium / low?</p> <p>Low</p>																	
CONTROL MEASURES	<p>Indicate which procedures are in place to control the identified risk</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;"><input checked="" type="checkbox"/></td> <td>work abroad incorporates Foreign Office advice</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>participants have been trained and given all necessary information</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>only accredited centres are used for rural field work</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>participants will wear appropriate clothing and footwear for the specified environment</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>trained leaders accompany the trip</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>refuge is available</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>work in outside organisations is subject to their having satisfactory H&S procedures in place</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>OTHER CONTROL MEASURES: please specify any other control measures you have implemented:</td> </tr> </table>		<input checked="" type="checkbox"/>	work abroad incorporates Foreign Office advice	<input checked="" type="checkbox"/>	participants have been trained and given all necessary information	<input type="checkbox"/>	only accredited centres are used for rural field work	<input type="checkbox"/>	participants will wear appropriate clothing and footwear for the specified environment	<input type="checkbox"/>	trained leaders accompany the trip	<input type="checkbox"/>	refuge is available	<input type="checkbox"/>	work in outside organisations is subject to their having satisfactory H&S procedures in place	<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:
<input checked="" type="checkbox"/>	work abroad incorporates Foreign Office advice																	
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<input type="checkbox"/>	refuge is available																	
<input type="checkbox"/>	work in outside organisations is subject to their having satisfactory H&S procedures in place																	
<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:																	

EMERGENCIES

Where emergencies may arise use space below to identify and assess any risks

e.g. fire, accidents

Examples of risk: loss of property, loss of life

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- participants have registered with LOCATE at <http://www.fco.gov.uk/en/travel-and-living-abroad/>
- fire fighting equipment is carried on the trip and participants know how to use it
- contact numbers for emergency services are known to all participants
- participants have means of contacting emergency services
- participants have been trained and given all necessary information
- a plan for rescue has been formulated, all parties understand the procedure
- the plan for rescue /emergency has a reciprocal element
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

FIELDWORK 1

May 2010

EQUIPMENT

Is equipment used?

NO

If 'No' move to next hazard
If 'Yes' use space below to identify and assess any risks

e.g. clothing, outboard motors.

Examples of risk: inappropriate, failure, insufficient training to use or repair, injury. Is the risk high / medium / low ?

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- the departmental written Arrangement for equipment is followed
- participants have been provided with any necessary equipment appropriate for the work
- all equipment has been inspected, before issue, by a competent person
- all users have been advised of correct use
- special equipment is only issued to persons trained in its use by a competent person
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

LONE WORKING	Is lone working a possibility?	YES	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
	<i>e.g. alone or in isolation lone interviews.</i>	Examples of risk: difficult to summon help. Is the risk high / medium / low? Low	
CONTROL MEASURES Indicate which procedures are in place to control the identified risk			
<input type="checkbox"/>	the departmental written Arrangement for lone/out of hours working for field work is followed		
<input type="checkbox"/>	lone or isolated working is not allowed		
<input checked="" type="checkbox"/>	location, route and expected time of return of lone workers is logged daily before work commences		
<input checked="" type="checkbox"/>	all workers have the means of raising an alarm in the event of an emergency, e.g. phone, flare, whistle		
<input checked="" type="checkbox"/>	all workers are fully familiar with emergency procedures		
<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:		
FIELDWORK	2	May 2010	

ILL HEALTH

The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.

e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.

Examples of risk: injury, asthma, allergies. Is the risk high / medium / low?
Low

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- an appropriate number of trained first-aiders and first aid kits are present on the field trip
- all participants have had the necessary inoculations/ carry appropriate prophylactics
- participants have been advised of the physical demands of the trip and are deemed to be physically suited
- participants have been adequate advice on harmful plants, animals and substances they may encounter
- participants who require medication have advised the leader of this and carry sufficient medication for their needs
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT

Will transport be required

NO	<input checked="" type="checkbox"/>
YES	<input type="checkbox"/>

Move to next hazard

Use space below to identify and assess any risks

e.g. hired vehicles

Examples of risk: accidents arising from lack of maintenance, suitability or training
Is the risk high / medium / low?

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- only public transport will be used
- the vehicle will be hired from a reputable supplier
- transport must be properly maintained in compliance with relevant national regulations
- drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
- drivers have been trained and hold the appropriate licence
- there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
- sufficient spare parts carried to meet foreseeable emergencies
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

ILL HEALTH

e.g. accident, illness, personal attack, special personal considerations or vulnerabilities.

The possibility of ill health always represents a safety hazard. Use space below to identify and assess any risks associated with this Hazard.

Examples of risk: injury, asthma, allergies. Is the risk high / medium / low?
Low

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

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- all participants have had the necessary inoculations/ carry appropriate prophylactics
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- participants who require medication have advised the leader of this and carry sufficient medication for their needs
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

TRANSPORT

Will transport be required

NO	<input checked="" type="checkbox"/>
YES	<input type="checkbox"/>

Move to next hazard

Use space below to identify and assess any risks

e.g. hired vehicles

Examples of risk: accidents arising from lack of maintenance, suitability or training
Is the risk high / medium / low?

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- only public transport will be used
- the vehicle will be hired from a reputable supplier
- transport must be properly maintained in compliance with relevant national regulations
- drivers comply with UCL Policy on Drivers http://www.ucl.ac.uk/hr/docs/college_drivers.php
- drivers have been trained and hold the appropriate licence
- there will be more than one driver to prevent driver/operator fatigue, and there will be adequate rest periods
- sufficient spare parts carried to meet foreseeable emergencies
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

DEALING WITH THE PUBLIC	Will people be dealing with public	<input type="checkbox"/> NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
<i>e.g. interviews, observing</i>	Examples of risk: personal attack, causing offence, being misinterpreted. Is the risk high / medium / low? Low		
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		
<input type="checkbox"/>	all participants are trained in interviewing techniques		
<input type="checkbox"/>	interviews are contracted out to a third party		
<input type="checkbox"/>	advice and support from local groups has been sought		
<input type="checkbox"/>	participants do not wear clothes that might cause offence or attract unwanted attention		
<input type="checkbox"/>	interviews are conducted at neutral locations or where neither party could be at risk		
<input type="checkbox"/>	OTHER CONTROL MEASURES: please specify any other control measures you have implemented:		
FIELDWORK	3	May 2010	

WORKING ON OR NEAR WATER	Will people work on or near water?	<input type="checkbox"/> NO	If 'No' move to next hazard If 'Yes' use space below to identify and assess any risks
<i>e.g. rivers, marshland, sea.</i>	Examples of risk: drowning, malaria, hepatitis A, parasites. Is the risk high / medium / low?		
CONTROL MEASURES	Indicate which procedures are in place to control the identified risk		
<input type="checkbox"/>	lone working on or near water will not be allowed		
<input type="checkbox"/>	coastguard information is understood; all work takes place outside those times when tides could prove a threat		
<input type="checkbox"/>	all participants are competent swimmers		
<input type="checkbox"/>	participants always wear adequate protective equipment, e.g. buoyancy aids, wellingtons		
<input type="checkbox"/>	boat is operated by a competent person		

- all boats are equipped with an alternative means of propulsion e.g. oars
- participants have received any appropriate inoculations
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

MANUAL HANDLING (MH)

Do MH activities take place?

NO

If 'No' move to next hazard
If 'Yes' use space below to identify and assess any risks

e.g. lifting, carrying, moving large or heavy equipment, physical unsuitability for the task.

Examples of risk: strain, cuts, broken bones. Is the risk high / medium / low?

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- the departmental written Arrangement for MH is followed
- the supervisor has attended a MH risk assessment course
- all tasks are within reasonable limits, persons physically unsuited to the MH task are prohibited from such activities
- all persons performing MH tasks are adequately trained
- equipment components will be assembled on site
- any MH task outside the competence of staff will be done by contractors
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

SUBSTANCES

Will participants work with substances

 NO

If 'No' move to next hazard
If 'Yes' use space below to identify and assess any risks

e.g. plants, chemical, biohazard, waste

Examples of risk: ill health - poisoning, infection, illness, burns, cuts. Is the risk high / medium / low?

CONTROL MEASURES

Indicate which procedures are in place to control the identified risk

- the departmental written Arrangements for dealing with hazardous substances and waste are followed
- all participants are given information, training and protective equipment for hazardous substances they may encounter
- participants who have allergies have advised the leader of this and carry sufficient medication for their needs
- waste is disposed of in a responsible manner
- suitable containers are provided for hazardous waste
- OTHER CONTROL MEASURES: please specify any other control measures you have implemented:

OTHER HAZARDS

Have you identified any other hazards?

 NO

If 'No' move to next section
If 'Yes' use space below to identify and assess any risks

i.e. any other hazards must be noted and assessed here.

Hazard:

Risk: is the risk

CONTROL MEASURES

Give details of control measures in place to control the identified risks

Have you identified any risks that are not adequately controlled?

NO	<input checked="" type="checkbox"/>
YES	<input type="checkbox"/>

Move to Declaration
Use space below to identify the risk and what action was taken

Is this project subject to the UCL requirements on the ethics of Non-NHS Human Research?

 No

If yes, please state your Project ID Number

For more information, please refer to: <http://ethics.grad.ucl.ac.uk/>

DECLARATION

The work will be reassessed whenever there is a significant change and at least annually. Those participating in the work have read the assessment.

Select the appropriate statement:

- I the undersigned have assessed the activity and associated risks and declare that there is no significant residual risk
- I the undersigned have assessed the activity and associated risks and declare that the risk will be controlled by the method(s) listed above

NAME OF SUPERVISOR **Mengqiu Cao**

FIELDWORK 5

May 2010

Information and consent form

Project Title Spatial planning during and after the COVID-19 pandemic in Changchun, China: Effects of working from home, social distancing behaviour and resilient city

Researcher Xinyao Song

Introduction

You are being invited to take part in a research project being undertaken by a Master student from the Bartlett School of Planning, University College London (UCL).

Before you decide whether or not to participate it is important for you to understand why the research is being conducted and what participation will involve. Please read the following information carefully, feel free to discuss it with others if you wish, or ask the research team for clarification or further information. Please take time to decide whether or not you wish to take part.

Why is this research being conducted?

The aim of this research is to reduce the impact on the normal operation of the city and the normal life of the people from the perspective of urban spatial planning, when When an

unforeseen public health event such as serious epidemic occur. And how the second- tier city develop after the epidemic.

Why am I being invited to take part?

We are looking for people aged 18 or over in various occupations, generally wishing who live in. Changchun or hometown in Changchun. I would like to know about your changes in lifestyle during the epidemic and your thoughts on Changchun spatial planning. If this applies to you, we would be very grateful if you would participate.

Do I have to participate?

Participation is entirely voluntary. 'It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form). You can withdraw at any time without giving a reason and without it affecting any benefits that you are entitled to.' if you decide to withdraw you will be asked what you wish to happen to the data you have provided up that point.

What will happen if I choose to take part?If you do choose to participate, you will be invited to face-to-face interview explore the issues highlighted above. The interview will be conducted at a mutually agreed location. The interview will last approximately 45-60 minutes and will be audio recorded (and transcribed at a later date). You will have the opportunity to see the interview transcript and agree any amendments with the researcher after the interview

is concluded. Travel and subsistence expenses are not offered for participation.

What are the advantages of taking part?

There are no immediate benefits for participating in this project and no financial incentive or reward is offered, however it is hoped that this project will to shape future research and gain more information about the city development.

What are the possible disadvantages of taking part?

We anticipate no significant disadvantages associated with taking part in this project. If you experience any unexpected adverse consequences as a result of taking part in the project you are encouraged to contact the researcher as soon as possible using the contact details of this information and consent sheet.

If I choose to take part, what will happen to the data?

The interview data will be anonymised at the point of transcription and identified by a general identifier (e.g. 'Planning officer A' or 'Planning consultant B' or a suitable pseudonym). A record of participant identities and any notes will be kept separately and securely from the anonymised data. All data and information affiliated with this project will be securely stored on an encrypted computer drive and physical documents will be stored securely on University property.

The data will be only used for the purposes of this research and relevant outputs and will not be shared with any third party. The anonymised data may be utilised in the written dissertation produced at the end of this project, and this dissertation may then be made publicly available via the University Library's Open Access Portal, however no identifiable or commercial sensitive information will be accessible in this way.

What will happen to the results of the research project?

It is anticipated that the data collected in this project will be included in the dissertation produced at the end of this project, submitted for the award of a Masters degree at University College London (UCL). You will not be personally identified in any of the outputs from this work, and attributions and quotations will be anonymised. If you would like to receive an electronic copy of any outputs stemming from this project please ask the contact below who will be happy to provide this.

Contact Details

If you would like more information or have any questions or concerns about the project or your participation please use the contact details below:

Primary contact	Xinyao Song
Role	MSc student
Email	ucbqxso@ucl.ac.uk

Supervisor	Mengqiu Cao
Role	MSc dissertation supervisor Dr
Email	mengqiu.cao.13@ucl.ac.uk

Concerns and / or Complaints

If you have concerns about any aspect of this research project please contact the MSc student
contact the student in the first instance, then escalate to the supervisor.

Appendix 4 Informed Consent Form

Informed Consent Form [MSc Spatial Planning] dissertation research

If you are happy to participate, please complete this consent form

Title of project: Spatial planning during and after the COVID-19 pandemic in Changchun, China: Effects of working from home, social distancing behaviour and resilient city

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or the explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Participant's Statement

1	I have read and understood the information sheet.	√
2	I agree to participate in the above research by attending a face-to- face interview as described on the Information Sheet.	√
3	I understand that my participation is entirely voluntary.	√
4	I understand that I may withdraw at any time without giving a reason and with	√

	no consequences.	
5	I agree for the interview to be audio recorded.	√
6	I understand that I may see a copy of the interview transcript after it has been transcribed and agree any amendments with the	√
7	I understand that the intention is that interviews are anonymised and that if any of my words are used in a research output that they will not be directly attributed to me unless otherwise agreed by all parties.	√
8	I understand the data from this project will be considered for repository in the UCL Open Access repository as described on the Information Sheet but that this will be anonymised data only.	√
9	I understand that I can contact the student who interviewed me at any time using the email address they contacted me on to arrange the interview, or the dissertation supervisor using the contact details provided on page X of the information sheet.	√

Researcher name: Xinyao Song Signature: XINYAO SONG Date: 01/09/2020

MSC FINAL DISSERTATION 19056044

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

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Instructor

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