

The Analysis of Key Problems of the Land Use Planning during the Post-Disaster Reconstruction

Xiaoqing XING Shantong LIU, China

Key words: post-disaster reconstruction, land use planning, response mechanism, exploration.

SUMMARY

Along with the urbanized and industrialized advancement, the land use planning is also developing and reforming, the formulation and execution of land use planning have become important contents of governmental public decision and administration, and have been considered a crucial tool in the guidance and controlling of national land using. At present, when preparing the land use planning, in order to develop local economy and maximize the land value, the local government always put the construction land demand as the first factor to consider, but lack the consideration of land carrying capacity and ecological security. The increasing occurrence of the earthquake disaster has forced people to rethink the current land use planning which start changing their attention from simple construction land demand to the security issues of land use. Research at home and abroad imply that people can qualify and adjust human activity behaviours through scientifically reasonable planning methods; thereby, the scientific planning methods can decrease damage and loss of human beings caused by the disasters to a minimum extent. This article is from the perspective of land use planning, through enhancing the recognition of the resources and environment factors which restrict the post-disaster land use actuality, highlighting the study of land use planning preliminary investigation, land use security evaluation, the land reconstruction arrangement and layout suitability and so on to conduct the research. Establishing rapid response mechanism of land use planning to provide the land use planning with strong guidance, and then improve the scientificity and adaptability of land use planning in order to play a better role for national guidance and control of the land.

随着工业化和城市化的推进，土地利用规划也随之不断发展和改革，土地利用规划的制定和执行已成为政府公共决策和公共管理的重要内容，其作为国家对土地利用进行引导和控制的重要手段也日益加强。然而目前各地在编制土地利用规划时，为了地方经济发展，实现土地价值最大化，往往将建设用地需求列为首要考虑因素，从而忽视了对于土地承载力以及生态安全方面的考虑。随着近些年来发生的越来越多的地震灾害，迫使人们对现行土地利用规划进行反思，关注点也从单纯的建设用地需求转向了土地利用的安全性问题。国内外相关研究表明，人类可以通过科学合理的规划手段来规范和调整人类活动行为，从而使自然灾害对人类造成的伤害及损失降到最低限度。本文就是从土地利用规划角度出发，通过对加强灾后土

The Analysis of Key Problems of the Land Use Planning During the Post-Disaster Reconstruction (8427)
Xiao Qin-Xing and Shan Tong-Liu (China, PR)

FIG Working Week 2016
Recovery from Disaster
Christchurch, New Zealand, May 2–6, 2016

地利用现状资源环境制约因素识别，突出土地利用规划编制前期调查和土地利用安全性评价、注重重建用地安排和适宜性布局等关键性问题进行研究。探索建立土地利用规划快速反应机制，通过强化土地利用规划对土地利用的引导作用，以逐步提高其科学性和适应性，更好的发挥作用。

The Analysis of Key Problems of the Land Use Planning During the Post-Disaster Reconstruction (8427)

Xiao Qin-Xing and Shan Tong-Liu (China, PR)

FIG Working Week 2016

Recovery from Disaster

Christchurch, New Zealand, May 2–6, 2016

The Analysis of Key Problems of the Land Use Planning during the Post-Disaster Reconstruction

Xiaoqing XING Shantong LIU, China

1. RESEARCH INTRODUCTION

In recent years, the disaster is often happened in global scale; especially the earthquake has huge influence on the human survival and living environment. For instance: ground fracturing, ground depression and ground deformation and so on, which all may lead to the deaths and injuries, destruction of buildings, transportation and the farmland etc. Land use planning, as the important lever of national land macro control, turns out playing a significant role in the disaster prevention and post-disaster reconstruction which is accounted by more and more people nowadays. Along with the urbanized and industrialized advancement, the land use planning is also developing and reforming. Also the formulation and execution of land use planning have become important contents of governmental public decision and administration(Zhang, 2010), and have been considered a crucial tool in the guidance and controlling of national land using.

At present, when preparing the land use planning, in order to develop local economy and maximize the land value, the local government always put the construction land demand as the first factor to consider, but lack the consideration of land carrying capacity and Ecological security. The increasing occurrence of the earthquake disaster has forced people to rethink the current land use planning which start changing their attention from simple construction land demand to the security issues of land use. During the land use planning, all kinds of the layouts of land use should be based on respecting nature, insist sustainable development and protecting ecological environment. In terms of the ecological safety, the combination of planning formation, geological disaster management and ecological construction can defence earthquake disaster effectively; in addition, setting up and perfecting the management system to minimize the damage and influence. This article is based on the background of earthquake post-construction, emphasising on the study of the key problems of land use planning in the post-construction area, and aiming to provide beneficial explore and reference basis for the future post-disaster reconstruction land use planning.

2. KEY PROBLEMS ANALYSIS

Earthquake is kind of andogenic process, it occurs in a short period of time and the disastrous earthquake only occupy milli of all the global earthquake(Foundation of Geology, 1994); however, the seismic wave and ground destruct raised by it have huge damage on the human survival and living in disaster areas. Even if it does not reach to a disastrous extent, the earthquake also brings about certain influence on the regional development. The earthquake and its secondary disaster bring severe challenge to sustainable development of regional land: serious damage of farmland and construction land, more limited exploitable and usable resources, increasing conflicts of land supply

The Analysis of Key Problems of the Land Use Planning During the Post-Disaster Reconstruction (8427)
Xiao Qin-Xing and Shan Tong-Liu (China, PR)

FIG Working Week 2016
Recovery from Disaster
Christchurch, New Zealand, May 2–6, 2016

and demand; frequent secondary disaster and hidden danger, severely environmental security situation of land use planning, imperious demands of the adjustment of the land use layout; some lands with importantly ecological functions have been destroyed seriously, such as: forest land, pastureland, arduous repair of land ecological functions and so on.

After getting through the Wenchuan earthquake disaster, China has adequately learned about the post-disaster reconstruction experience and lessons domestically and overseas, at the same time, China has enacted a series of policies and measures and also enhanced the study of post-disaster reconstruction land use planning, compiled the book ‘Wenchuan earthquake disaster restoration and reconstruction land use planning’, ‘Yushu earthquake disaster in Qinghai province restoration and reconstruction land use specialized planning’ etc. , which provides strong policy basis and land use directions for the earthquake disaster reconstruction areas. Research at home and abroad imply that people can qualify and adjust human activity behaviours through scientifically reasonable planning methods; thereby, the scientific planning methods can decrease damage and loss of human beings caused by the disasters to a minimum extent(Zhang, 2010).

Therefore, the following aspects should be focused during the post-disaster reconstruction land use planning:

2.1 Resources and environment factors identification

Investigation and status analysis is not only the basis but also a crucial link when compiling land use planning. At this stage, it includes the collection and investigation of nature resources, social economy condition, land use data and related documents of the industry and so on; more importantly, it also make accurate analysis of land use situation, utilization potential, land use demand and land supply ability within the scope of planning, which can define the main problems of land use and the related improvement approaches. The compiling of the post-disaster reconstruction land use planning has intercommunity with general land use planning but it also has its specificity. Therefore, besides the traditionally basic investigation and evaluation, the post-disaster reconstruction land use planning should also focus on recognizing the resource environment factors. First of all, adequately collecting the specific distribution of geological disasters after earthquake, specific data of land destroy and extent of land damage within the scope of planning and so on. For example: farm land (plowland) losses and damages caused by the secondary disaster , plough layer destroyed by ground depression and fracturing, agricultural infrastructure damage and the changes of regional agricultural production conditions raised by the disaster. Damaged and collapsed urban and rural housing aroused by ground depression and landslide and so on, functional damage or some loss of construction land; land ecological environment is destroyed, regional land scope vegetation has been changed in earthquake and its secondary area, soil eroding speed up, impaired eco-function, fallen carrying capacity and so on. Secondly, according to the regional geological conditions, for the incident area of earthquake disaster, the focus should be put on analysing and investigating the natural environmental conditions, emphasis on identification of resources and environment factors, and adequately investigate, evaluate about the earthquake and geological disaster, consider the influence of geological disaster and earthquake rupture belt on land

use spatial arrangement, combining the demand of post- destruction reconstruction on all industries and so on, so that it can offer strong evidence for the planning and spatial arrangements.

2.2 Safety evaluation of land use

According to the distribution of the earthquake rupture belt, the resource environmental factor and geological disaster investigation and evaluation, the safety evaluation of land use should be carried out in order to guide all kinds of land layout of post-disaster reconstruction(State Council, 2008). From the angle of safety of recovering reconstruction land, the area should be delimited into the earthquake rupture zone, geological disaster easily occurred district, geological disaster medially occurred district, geological disaster hardly occurred district and other kinds of areas. On the basis of land use safety, and then evaluate these areas, which is beneficial for direct recovery of ecological function and reasonable use of land resources in disasters area, and provide evidence and guarantee for layout optimization.

2.2.1 Earthquake rupture zone

Generally, the earthquake rupture zone indicates the areas which are at a distance within 200 meters (the cities and towns within 500-1000 meters are also regarded as danger zone), also it has relative height difference between 400- 1000 meters, with the topographic slope higher than 25 °, or located in the main flood propagation channel; what is more, within and around the site or place of construction land has geological hazard point with huge perniciousness and high-risk danger. In this area, along the earthquake fault zone, the engineering construction should be strictly controlled, which should strength the earthquake fortification, strictly be in accordance with the technical requirements of geological disaster risk assessment and carry out the suitability evaluation of construction project site.

2.2.2 Geological disaster easily occurred district

Middle-large size scale of geological disaster is mainly happened in this district, the geological environment is weak and the geological disasters are comparatively dense. The mainly point should be put on the ecology protection, and the agricultural land should used as forest land and grassland other than the slope cropland and terraced fields which will cause the disturbance of geotechnical layer. The Urban and rural residential areas in geological disaster easily occurred district can be mostly rebuilt after comprehensive treatment, but still should get away from the geological disaster points and faults and set aside a certain buffer zone; therefore, the scale of construction should be tightly controlled based on strengthening the geological hazard risk assessment and comprehensive treatment; additionally, the government should evacuate and relocate the intensive residential area, the line engineering(like road, railway etc.) should be avoided or take tunnel crossing, abandon the construction of water conservancy works and industry development and improve the aseismic Standard of the housing and infrastructure.

2.2.3 Geological disaster medially occurred district

Small-middle size scale of geological disaster is mainly happened in this district, geological environment is weak. The agricultural land should be mainly used as the forestland and grassland. The construction land should avoid the main geological disaster points; besides carrying out the

geological hazard risk assessment, the construction lands should be located in safe locations, and strictly control the population scale of the residential construction. The aseismic Standard of the line engineering (like road, railway etc.), water conservancy facilities, housing and infrastructure and so on should be improved.

2.2.4 Geological disaster hardly occurred district

The density of geological disasters is relatively low in this area, so the scale of geological disaster is mainly in small size. If other areas the secondary disaster like :ground fracture or sand liquefaction and so on happened, this district can be treated as a crucial location for the residential points and line engineering. The agricultural land should used as farmland as far as possible which depends on the land situation, in moderate way, it can also used as the forest land and grassland.

2.2.5 Other areas

It indicates the areas outside of the danger zone and the geological disaster high occurred district. Generally, this kind of area has more than 500 meters away from earthquake rupture belt with relative height difference smaller than 30 meters and topographic slope is less than 15 degree. Around the sites, there is no serious geological disasters point.

2.3 Resource environment carrying capacity evaluation

The regional resources and environmental carrying capacity can be evaluated comprehensively in terms of territorial development intensity, industrial development direction, population aggregation and urban construction suitability. According to these conditions, the planning region of natural land can be divided into three types: suitable for reconstruction, moderate reconstruction and ecological reconstruction(Liu&Li&Shen, 2009).

-Suitable for reconstruction area: It mainly indicates the areas with high resources and environmental carrying capacity, low risk of disaster, also it can gathering large scale population and integrated develop all kinds of industries. The functional orientation is mainly towards propelling industrialization and urbanization, population gathering and economy which is aiming to build a region to boost the economy, load estate and create employment.

-Moderate reconstruction area: It mainly indicates the areas with relatively low resources and environmental carrying capacity, relatively high risk of disaster, also it can gather moderate population and develop specialty industry. The functional orientation mainly towards conservation priority, moderate development, dot development, so the areas with moderate population scale, good ecological environment and industry with distinguishing feature.

-Ecological reconstruction area: It mainly indicates the areas with very low resources and environmental carrying capacity, high risk of disaster, high importance of ecological function and serve shortage of construction land and high cost of building and maintaining the infrastructure like: transportation. This area is not suitable for gathering of large scale population. The functional orientation mainly towards ecological conservation and repair, and building an living area with small scale population to protect natural resources, cultural resources and rare animals and plants.

2.4 Land suitability layout

2.4.1 Overall principle

First of all, according to all kinds of land demand in post-disaster reconstruction, the people basic living conditions and public services infrastructure in disaster areas should be put on a high priority, and necessary guarantee should be provided to the planned reconstruction project based on the resources and environmental factor Identification. Secondly, with the combination of the land use safety zone and resources and environmental carrying capacity evaluation results, befittingly reconstructive land scale should be put on priority, the rural construction land in moderate reconstruction area and ecological reconstruction area should be controlled, and the industrial and mining land rural residential land should be compressed moderately, at the same time, recovering and escalating the ecological land(State Council, 2008). Thirdly, according to the land damage degree and reconstruction land layout adjustment project, also in the light of the requirement of recovering ecology and protecting resources, actively implementing the post-disaster reconstruction land consolidation, and making the cultivated land which destroyed by disasters, temporary ground, displaced urban village and land for mining and industry renovated effectively, in addition, recovering the cultivated land production conditions and agricultural comprehensive production ability.

2.4.2 Main construction land layout

Temporary ground: The temporary ground is used for recovering the construction of transitional resettlement like rescue and relief work, living and supporting infrastructure, public service facility and so on. This area should have easy transportation and also convenient for the people suffered from the disaster to recovering the production and living; on the other hand, it should avoid seismic active fault area, which the flood, landslide, collapse, surface collapse probably happen, also it should try not to take up the farmland, additionally, avoid destroying the nature protection area, drinking water source protection area and ecological vulnerable area.

Urban land: In this area, the main focus should put on the reconstruction on the spot, and strictly control new construction on other place. With the overall principle of trying to use existing construction land, and based on recovering, arranging new urban area, there are four specifying principles should be followed:

Firstly, for minority areas which suffer from serve disaster and not suitable for the further urban development, they should be built wholly in other places. It should be based on the resources and environmental carrying capacity and the land space that suitable for urban construction also adequately consider the geological environment safety and long-term development needs, so that the reconstruction land scale can be arranged reasonably. Secondly, for the areas which suffer from serve disasters, they should carry out the adjustment of partial land use layout and reconstruction of potential geological hazards and environmental safety. Thirdly, for partial urban areas which have cramped former construction, they should carry out the urban reconstruction and moderate extension in order to enhance the disaster prevention, calamity space. Lastly, as the undertaking

place of urban population and industrial layout transfer, the urban areas with relatively location advantages, high resources and environmental carrying capacity should carry out the urban gathering developing construction on the original basis.

In the specific layout of urban land use, the new-built town offsite should try to keep away from the danger zone and geological disaster easy occurrence zone; if it is unable to avoid, the specific production, living facility construction land use should carry out the geological disaster safety evaluation, and then improve the urban ability of preventing and fighting natural adversities through implementing geological disaster engineering reinforcement, appropriately lower the building density, increasing the land use for emergency and disaster prevention, enhancing engineering defence criterion standard and so on.

-Rural residential land: The layout should put safety on the first place, and then through rural population distribution after disaster, infrastructure conditions, earthquake and geological disaster investigation evaluation and resource environment carrying ability evaluation results to confirm the scale and layout of reconstruction on the spot and allopathic new construction. In the reconstruction of montane rural residential land, it should choose the relatively safe areas where have been assessed by the geological safety evaluation, in addition, the geological disasters project precaution should be carried out to decrease the risk of disaster and improve the capacity of preventing and fighting natural adversities. While, the rural residential reconstruction in flatlands should insist on the principles of using land economically and intensively and protecting the cultivated land, it should adjust measures to local conditions, respect public opinions and improve the living and production infrastructure in rural areas, and focus on the construction moderately.

- Independent industrial land: The independent industrial land should be newly arranged based on the disaster situation, industrial policy, adjustment directions of production layout and the employments needs of disaster-affected people of independent industrial organization; also it should go with the land use principles of optimizing the structure, using land economically and intensively, putting recovery on the priority and combining development. Besides the reconstruction of the disaster-affected industrial organizations, the independent industrial land should mainly used to builds a bunch of industrial projects which are suitable for the resources and environmental conditions and have relative advantages and good prospects, in order to enhance the ability of self-reconstruction and development and protecting the Land for industrial clusters.

-Infrastructure and other construction land: The construction of infrastructure and other construction land should based on the distribution of urban and rural residential areas and location of productive forces, follow the requirements of recovering and enhancing the guarantee capability and connect with economic development program and urban and rural planning. In the planning stage, the infrastructure construction should mainly focus on the damaged facilities recovery, arrange the new construction land; at the same time, consider the regional development environment, the requirements of improving the ability of preventing and fighting natural adversities.

3. RESULTS OF RESEARCH

Towards the earthquake disasters, China has issued a series of policies which provide powerful supports for recovering reconstruction, improving land use management level, increasing the adjustment of urban and rural and regional land use structure and layout and effectively improve the regional land use allocation efficiency. In the 18th CPC (The Communist Party of China) National Congress, the new requests have been put forward in terms of the optimizing the development structure of national land space: scientifically and rationally build the urbanization pattern, agricultural pattern, ecological safety pattern, and improve the basic public services and ecological environment protection ability. However, post-disaster planning, as an important part of land use overall planning, is still in the stage of exploration in terms of its organization, compiling, implement and management etc.; its implementation is mainly depended on the promotion of administrative functions of the departments of land and resources at all levels, but they still lack of the rapid and systematic reaction mechanism towards the earthquake.

Therefore, with the policies of Stay firmly rooted in the present while looking ahead to the future, the related department should plan urban and rural land use, resolve the significant problem of land use during the reconstruction, improve the reaction mechanism of planning, and evolve the reaction mechanism: Warnings and Precautions-respond- supervision and safeguard(Zhao, Tian, Jia, 2015), guarantee all the reconstruction tasks implemented in land use, effectively ease and improve the negative effects raised by the earthquake disaster and lay a solid foundation for the local economic construction development.

4. CONCLUSION AND SUGGESTIONS

For the earthquake disaster, prevention is always more important than the recovering and reconstruction. A large number of human, physical and financial resources are needed to be put into the geological disasters evaluation, disasters forecast and Post-disaster reconstruction of governance, so from the angle of land use planning, it should enhance the study of related issues, both in theory and technology, also still need continuous exploration and radical innovation to improve the adaptability of planning. The land use planning in post-disaster reconstruction should pay more attention on the transcendence and improvement, and have further consideration which relates the reconstruction with the human sustainable development. Thereby, based on the land use planning compiling, there are some suggestions should be focus:

4.1 planning environmental impact assessment

Planning environmental impact assessment is a process of carrying out the analysis, forecast and evaluation of the environmental influences which may caused by the layout, structure and resource allocation in the future development activities, and coming up with the solutions and measures of preventing or reducing the negative environmental effects. The environmental assessment of post-disaster reconstruction land use planning emphasis the timeliness, priority-focus and solve the main environmental problems; on the other hand, it also needs the rationality and foresee ability, which can conduct scientific and advanced analysis towards the potentially environmental influences and risks in terms of the land use structure, scale and layout and so on.(Liu&Chen& Liu&Wang, 2009)

Therefore, during the environmental assessment of post-disaster reconstruction land use planning, the highlight should put on the analysis of environmental compatibility of planning scheme based on the resources and environmental factors, also, it should includes the evaluation towards the planning purpose, land use scale and structural adjustment programs, layout program, land consolidation and reclamation; therefore, the suggestions and measures can be put forward to decrease the environmentally negative impacts.

4.2 enlarge public participation

Although the government is play an leading role in the process, the public participation is also crucial for the implementation. Through listening to the requirements and suggestions from all quarters of the society, adequately consider their interests and claims, the government can comprehensively understand and acknowledge the environmental situation of the evaluation object, reveal the potential environmental problems, decrease the blindness and randomness of decisions in most extent, consequently, the scientificity of decision will improved. What is more, after enlarging the public participation, the post-disaster reconstruction efficiency will be enhanced which will help the reconstruction program Successfully completed. Then, via the public participation, the public function of supervision can provides firm support of balancing the various interests.

4.3 Establish the planning enforcement detection and assessing mechanism

The compiling of the post-disaster planning is easily affected by various factors like: difficult land use coordination, changes of project investment situation, changes in national policy and so on.(Zheng, 2009) Therefore, the planning enforcement detection and assessing mechanism should be set up to carry out the evaluation towards the objective conditions, planning implementation situation and the changes of policies towards planning implementation and make timely necessary adjustments and amendments on the planning. The establishment also can improve the elasticity and adaptation of planning, so that play a better role in the post-disaster reconstruction.

REFERENCES

Liu.J, Chen,F, Liu.Y, Wang,QG. (2009). The Analytical and empirical analysis of key contents of environmental assessment in post-disaster reconstruction land use planning. *Urban Environment and Urban Ecology*, 22(2), 44-47.

Liu.YX, Li.HC, Shen.JS. (2009). The thought and methods of compiling the post-disaster reconstruction land use planning, '*CHINA LAND SCIENCE SOCIETY annual meeting papers*'. 1470-1480. Beijing: China land press.

South China Agricultural University .(1994). '*Foundation of geology(2nd edition)*'. 83-85. Beijing: Foundation of geology.

State Council. (2008). '*The special planning of WenChuan earthquake post-disaster reconstruction land use planning*'. 4-6, 11-17 .Beijing.

Zhang.SL.(2010). *'The investigation of post-disaster reconstruction land use planning: consideration and exploration'*. Beijing: RUC.

Zheng.WY. (2009). The thinking of WenChuan earthquake post-disaster reconstruction land use planning. *China Land Science*.23(1). 48-51.

Zhao.YT, Tian.ZQ, JIA, KQ. (2015). The study of earthquake post-disaster reconstruction land use planning emergency mechanism. *Land and Resources Information*.3(:), 51-56.

CONTACTS

Xiaoqing XING

Inner Mongolia Land Surveying and Planning Institute

Address: No11,XueYuan East Street, SaiHan district, Hohhot ,Inner Mongolia, , 010010

COUNTRY: China

Tel. +86 13948818955

Fax + 86 04714302950

Email: 1002033776@qq.com

The Analysis of Key Problems of the Land Use Planning During the Post-Disaster Reconstruction (8427)

Xiao Qin-Xing and Shan Tong-Liu (China, PR)

FIG Working Week 2016

Recovery from Disaster

Christchurch, New Zealand, May 2–6, 2016