

# The Experiences for Post-disaster Reconstruction in Rural China

## The Implications from Data Mining

Yi Peng, Fan Xue and Haijun Bao

**Abstract** With rapid economic development and increasing devastation of natural hazards, rural China has, and would still have, large amount of post-disaster reconstruction. Many reconstruction cases were reported, especially after the 5.12 Sichuan Earthquake. However, there is a lack of systematic studies on the experiences for post-disaster reconstruction in Rural China. Therefore, the precious experiences gained from one reported case are difficult to deliver to other cases facing natural disasters in future. In order to mitigate this deficiency, this study adopts data mining to systematically investigate post-disaster reconstruction in rural China. Considering news reports have a broader audience than that of academic papers, the source of reconstruction cases is reliable online news reports. The time period for consideration is from 12 May 2008 to 31 May 2015. The keywords for identifying possible news reports are “post-disaster reconstruction” and “rural areas”. Preliminary refinement is conducted to exclude the news reports introducing policies rather than reconstruction cases. The similarities and differences of the selected reconstruction cases is mined in terms of manpower, organization, financial source, reconstruction approach (concentration versus in situ), identified experiences, and identified problems. Based on the results, the experience and problem checklist is developed for better experience sharing of post-disaster reconstruction in rural China. The results can also facilitates the government and NGOs to find suitable measures to promote sustainable development in post-disaster reconstruction.

**Keywords** Post-disaster reconstruction · Rural China · Data mining · Experience sharing

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# 1 Introduction

China is a country with a highly frequency of natural disasters. According to the database of EM-DAT [1], from 1900 to 2011, there were 681 natural disasters, which resulted in about 12 million deaths, 63 million homelessness, and damages costing nearly 363.43 billion US dollars. Earthquake is one of the most serious natural disasters in China, which has had 1/3 of the devastating earthquakes worldwide even though the land area of China occupies only 1/4 of the world [2]. China recorded an earthquake of magnitude 6.0 or higher 26 times, including earthquake of magnitude 7.0 or higher 7 times [3]. Moreover, it is found that more than 80 % of the earthquakes above magnitude 5.0 occurred in rural areas and brought huge losses [4]. Natural disasters bring about large number of deaths, make countless others homeless, and cause a huge amount of damage in both rural and urban areas. It is difficult to compare the losses between rural areas and urban areas caused by natural disasters as there is no international database of disaster losses that disaggregates data by urban and rural area [5]. However, it is considered that the rural areas face more disadvantages than the urban areas due to insufficient infrastructure, lack of information about natural disasters, and social inequality. For example, housing damage brought about by the 5.12 Sichuan Earthquake in rural areas was much higher than in urban areas of Sichuan Province. As well, it is found that the housing damage is the main loss for the farmers especially in developing countries, such as China [6].

Recent research has focused on post-disaster reconstruction in rural areas of developing countries. Post-disaster reconstruction is a critical, integral part of recovery. Post-disaster reconstruction stresses rebuilding of the physical structures, such as infrastructure and house destroyed or damaged in a natural disaster [7]. Various models have been developed to investigate the reconstruction process [8–10]. The researchers, especially the social researchers, stress social process is important in the recovery after a disaster [11]. Therefore, the recent research moved beyond physical reconstruction, and laid the concern for the social process and sustainable post-disaster reconstruction [12–14]. However, physical reconstruction provides the basis for settling down the victims, restarting industry production, hence facilitating economic recovery, and restoring the environmental function. As physical reconstruction is performed by people, community restoration or reformation such as community participation, and a decentralized approach can be better implemented through means of physical reconstruction [15]. Physical reconstruction is even important for psychological recovery, as the physical building provides the sense of place, which is critical and helpful in achieving psychological recovery [16]. As a result, an increasing number of studies have been conducted on post-disaster reconstruction, particularly in housing reconstruction and relevant aspects.

However, research on an effective mechanism and system to identify, store, and distribute the experiences of housing reconstruction is few. As Hegel criticized that “what experience and history teach is this,-that peoples and governments never have learned anything from history, or acted on principles deduced from it”, there is a lack of systematic studies on the experiences for post-disaster reconstruction in Rural China.

In order to mitigate this deficiency, this study aims to systematically investigate experiences of post-disaster reconstruction in rural China through data mining. Section 2 introduces the research methods used in this study. Section 3 presents the findings from data mining. Thorough discussions have been conducted in this section. Section 4 concludes this research with presenting future studies.

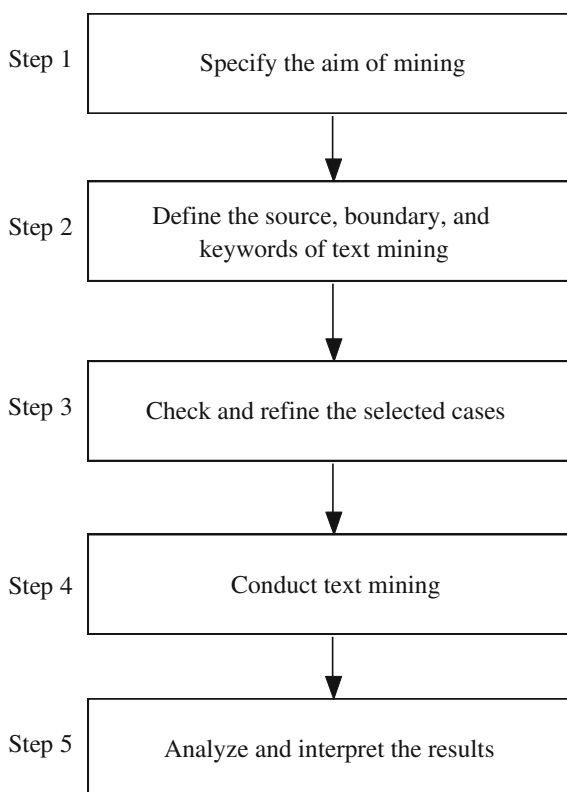
## 2 Research Methods

In order to achieve the research aim, the research flow as shown in Fig. 1 has been developed.

The established mining aim would guide the whole mining process from defining the source, boundary, and keywords. In addition, the established aim also confines the results interpretation. The aim of the data mining in this study is to systematically investigate the experiences of post-disaster reconstruction in rural China.

There are various types of media recording the experience, such as electronic, paper, audio and video recording. Considering electronic recording is easily

**Fig. 1** The research flow of this study



accessed for analysis, this paper confines the analysis to electronic recording. In addition, as news reports have a broader audience than that of academic papers, the source of reconstruction cases is therefore chosen as reliable online news reports. The online website of news reports was chosen from the rank of credible websites, which includes popular websites such as Xinhua Net, Tencent News [17]. Moreover, the time boundary for searching in such sources should be defined otherwise, there would be unexpected ineffective work. This study defines the time period for consideration is from 12 May 2008 to 31 May 2015. Keywords is useful to find the possible cases in the defined sources. The keywords for identifying possible news reports in this study are “post-disaster reconstruction (or post-disaster recovery)” and “rural areas”.

By following the first two steps, it is easy to find the possible news reports through searching. Preliminary refinement will be conducted to exclude the news reports introducing policies rather than reconstruction cases. This step is necessary as there are usually some news reports just delivering the formulated policies of post-disaster reconstruction. In addition, the exactly same news reports occurred in different websites was only consider once. It should be noticed that different news reports of the same village is considered as different news reports as different information would be provided in such condition.

After confirming the news reports, data mining would be conducted to select the concerned information in the large pool of news reports. As usually text was used to introduce the reconstruction cases in the electronic news reports, text mining would be used in this study. Text mining, or text data mining, refers to the process of deriving high-quality information from text. Typical text mining tasks include text categorization, text clustering, concept/entity extraction, production of granular taxonomies, sentiment analysis, document summarization, and entity relation modeling [18]. Python was used to develop special programs to mine the reconstruction cases.

Special concerns were paid to the similarities and differences of these cases in terms of manpower, organization, financial source, reconstruction approach (concentration versus in situ), identified experiences, and identified problems. Interpretation of the findings can help to understand what are emphasized in recording such experiences of post-disaster reconstruction in rural China. The understanding of similarities and differences in different reconstruction cases is useful for experience sharing.

## **3 Findings and Discussions**

### ***3.1 Findings***

By following the steps introduced in the Section of research methods, this study found 835 news reports with the keywords “post-disaster reconstruction

**Table 1** Statistical results of the data mining

Concerns	Number of cases	Key points
Manpower	124	Insufficiency of reconstruction professionals, education after disasters, number of rural victims
Organization	80	Governmental organization improves the reconstruction results, discussion of organization modes suitable for reconstruction, contributions of NGOs, organization process in post-disaster reconstruction
Finance	88	Investment on reconstruction, financial audit, financial support from brother provinces
Reconstruction approach	56 (concentration) 27 (relocation) 11 (in situ)	Benefits of concentrated reconstruction, how to determine the reconstruction approaches, urban-rural coordinated development
Introducing experiences	34	Experiences in terms of organization, site selection, financial sources, housing allocation
Introducing problems	75	Problems in terms of organization, site selection, financial sources, housing allocation

(or post-disaster recovery)” and “rural areas”. After excluding the news reports introducing policies rather than experiences and occurring in different websites, there were only 532 useful news reports for analysis. As shown in Table 1, not

**Table 2** Top 10 experiences and problems

Rank	Experience	Problems
1	Transparent and consistent policies	Undetermined property rights of cultivated land generated from consolidating former rural residential land
2	Many matched policies to support post-disaster reconstruction	Incapability of completing project application before reconstruction
3	Sufficient promotions of relevant policies	Insufficient financial support on daily management for CRS
4	Establishing special village affairs board and special supervision board to monitor reconstruction	Little attention to psychological recovery
5	Coordination of governments at different levels	No pre-disaster planning
6	Assessment on degree of damage rather than the economic values of the houses	Little supervision on the housing quality
7	Using local or nearby materials and construction teams	Few risk-coping mechanisms
8	Following rural victims’ willingness	Inadequate assessment due to rush of progress
9	Suiting local production and lifestyles	Inadequate infrastructure
10	Adjustable housing and infrastructure planning	Weak basis for future development

all news reports cover our research concerns. Various concerns have been paid in the reconstruction news reports. This is naturally and logically as different journalists usually use different views to investigate the post-disaster reconstruction. In order to refine the useful information, the information of the first three high frequency was considered as key points in relevant concerns, as shown in the last column of Table 1.

This study further analyzes the experiences and problems found in the mined cases. Table 2 lists the top 10 experiences and problems respectively.

### **3.2 Discussions**

The identified different problems and experiences were useful for experience sharing. The most important experiences mainly lie in available matched policies, successful organization, involving rural victims in decision making, and satisfying rural victims' needs. These issues are valuable considerations and should be considered in future reconstruction. The typical problems include no pre-disaster planning, little supervision on the housing quality, insufficient financial support on daily management for CRS, little attention to psychological recovery [18].

Diversified reasons result in the identified problems above. Typically, some critical activities of developing CRS in post-disaster reconstruction are missing. For example, although there were some emergency measures for responding to natural disasters, no pre-disaster planning was available. As a result, no specific guidelines can be provided to instruct post-disaster reconstruction. In addition, some activities are not so well-designed due to the rush of the project. For example, there is little supervision on the quality of housing and very little assessment on the reconstruction process. This may lead to critical issues if another disaster occurs [19–22].

## **4 Conclusion**

This study adopts data mining to systematically investigate post-disaster reconstruction in rural China. Credible news websites were accessed to select the reconstruction cases for analysis. Python was used to develop special programs to mine the reconstruction cases. It was found that various concerns have been paid in the reconstruction news reports. The most important experiences and problems have also been identified for sharing. The results can also facilitate the government and NGOs to find suitable measures to promote sustainable development in post-disaster reconstruction. However, it should be noticed that detailed text analysis has not been conducted due to limit of time. Typical text mining, such as text categorization and text clustering should be conducted in future studies. In addition, the mining source merely includes online news reports, which may also present some bias of the results. Future studies may include the academic papers for mining.

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