The changes of intergovernmental collaboration dynamic in post-disaster destination management: Network analysis

Abstract

Employing network analysis, this study explores the changing dynamics of intergovernmental collaboration throughout the whole process of post-disaster destination management. Jiuzhaigou National Park after the Jiuzhaigou earthquake forms the subject of the case study. Our empirical analysis indicates the following findings: first, intergovernmental collaboration is developed both hierarchically and horizontally at the emergency, intermediate and long-term recovery stages of post-disaster destination management, but it is largely dominated by hierarchical interactions; second, local government increasingly acts as a lubricant role in facilitating the functioning of intergovernmental collaboration during the whole process of post-disaster destination management. These findings contribute to greater insights into the changes of intergovernmental collaboration dynamic in comprehensive post-disaster destination management. This study also provides implications for governments and tourism destinations to improve intergovernmental collaboration for more effective destination management in the context of post-disaster.

Keywords

Intergovernmental collaboration; Post-disaster; Destination management; Network analysis; Jiuzhaigou National Park

1 Introduction

Destination management has been widely discussed in tourism research (Beritelli et al., 2007; Gelter et al., 2020; Granville et al., 2016). In light of the rapid increase in the number of disasters that have occurred over the past 30 years (Schulz & Blecken, 2010), it is particularly significant to achieve post-disaster destination management effectively. Destination management is defined as a "proactive, visitor-centred approach to the economic and cultural development of a destination" (Wang, 2011:2). Destination management in the post-disaster context focuses much on developing strategies and actions to return the destination to a normal (pre-event) state or an improved state (Mair et al., 2016), which often incorporates a range of stakeholders to collaborate in response to post-disaster challenges (Jiang & Ritchie, 2017). Among those stakeholder collaboration, intergovernmental collaboration has recently received growing attention in post-disaster destination management, as it offers a way of mobilising substantial resources that are needed for post-disaster destination management (Amore & Hall, 2016). Intergovernmental collaboration occurs between the national, state and local governments to achieve common goals (Cameron, 2001; Kapucu et al., 2010). On the basis of their respective advantages, multi-level government sectors can collaborate with one other to engage in post-disaster destination management, including from saving lives and protecting properties, to addressing short-term needs of victims, and to developing and implementing post-disaster destination recovery projects (Becken & Hughey, 2013; Faulkner & Vikulov, 2001). As intergovernmental collaboration plays an important role in promoting post-disaster recovery, destination management can increase the extent of intergovernmental collaboration to respond to post-disaster challenges.

Past research has further explored post-disaster destination management from the lifecycle perspective (Chan et al., 2019) and linked it to the varying focus of intergovernmental collaboration. Faulkner (2001) suggests a six-phase disaster process of destination management, and post-disaster phase focuses primarily on emergency, intermediate and long-term recovery. Ritchie (2004: 672) gives anatomy of the three sages: emergency (the crisis has just hit and the effects of the disaster have been felt); intermediate (the short-term needs of the people must be dealt with--restoring utilities and essential services); and long-term recovery (continuation of the previous phase, but aspects that could not be addressed quickly are attended to at this point). The focus of intergovernmental collaboration at the three post disaster stages is often different according to the changing of time pressure, control intensity and post-disaster management goals (Cioccio & Michael, 2007; Maldonado et al., 2009; Paraskevas & Arendell, 2007): at the emergency stage, the main aim of

intergovernmental collaboration is to rescue people and property (Kusumasari et al., 2010); at the intermediate stage, collaborative government efforts address restoring tourism-related services and help affected communities rebound to normal (He & Zhuang, 2016); at the long-term recovery stage, intergovernmental collaboration seeks to rebuild tourism-related infrastructure and stimulate destination marketing (Faulkner & Vikulov, 2001; Ritchie, 2004). The varying focus of intergovernmental collaboration at the emergency, intermediate and long-term recovery stages may lead to different ways in which multi-level government sectors interplay, configure and collaborate (Amore & Hall, 2016). Nevertheless, prior research has given little attention to the changing dynamics of intergovernmental collaboration throughout the whole process of post-disaster destination management. The engagement of government sectors and the interplay they have at different stages could affect the foci, directions, and the effectiveness of collaboration, which thus plays a significant role in undermining or facilitating the success of post-disaster destination management (Deen, 2015; Espia & Fernandez, 2015).

Methodologically, most post-disaster destination management studies have adopted a qualitative approach to describe intergovernmental collaboration (Cioccio & Michael, 2007; Hystad & Keller, 2008). A few studies have employed extensive case-study methodologies to conduct a detailed analysis of government roles and interventions in post-disaster contexts (Amore & Hall, 2016; Calgaro, 2010). The existing research on post-disaster destination management, rooted in qualitative methods, provides a descriptive analysis of interactions between multiple government sectors. However, several important aspects of intergovernmental collaboration remain unclear, including which government departments are interconnected, how they are interconnected, and what kind of relationship they maintain. Such facets can reveal the functioning of intergovernmental collaboration in promoting post-disaster destination management (Kapucu & Demiroz, 2011). Network analysis is one of the major methods to systematically assess intergovernmental collaboration in other disciplines (Caruson & Macmanus, 2012; Jung & Song, 2014). Network analysis can provide more methodological insights into the interface of which government sectors form a collaborative structure, and collaborative interactions among those government sectors in post-disaster destination management. Therefore, this study, drawing on the case of Jiuzhiagou National Park, uses network analysis to explore the changing dynamics of intergovernmental collaboration at the emergency, intermediate and long-term recovery stages of post-disaster destination management.

Jiuzhaigou National Park is one of the most famous national parks in China. It is managed by the local government, but higher level of governments are also involved in its tourism destination management mainly in the form of supervision. The 2017 Jiuzhaigou earthquake seriously destroyed local natural landscape, which led to the collapse of local tourism industry. It was subsequently announced that Jiuzhaigou National Park would have to close for post-disaster recovery. Government sectors at national, provincial, and local levels collaborated to reconstructed natural landscape and tourism-related facilities, and restored local tourism industry. The successful post-disaster destination management, dominated by intergovernmental collaboration, enables Jiuzhaigou National Park to recover swiftly and reopen to the public after two years that the earthquake occurred. Since Jiuzhaigou National Park has developed an intergovernmental collaboration framework in post-disaster destination management, this case can provide more insights for other tourism destinations.

The contributions of this study are two-fold. In theory, to the best of our knowledge, quantitative research on intergovernmental collaboration is scarce in post-disaster destination management (Amore & Hall, 2016; Calgaro, 2010; Cioccio & Michael, 2007; Hystad & Keller, 2008). This research could be the first detailed analysis to systematically explore the structure of intergovernmental collaboration in post-disaster destination management. Based on this, the study, building on the complexity of destination management in the post-disaster context, can contribute to greater understanding of the changing dynamics of intergovernmental collaboration that occur throughout the whole process of post-disaster tourism destination. In practice, attention to the changes of intergovernmental collaboration dynamic can help multi-level governments and tourism destinations to improve collaborative strategies at different stages of post-disaster destination management.

2 Literature review

2.1 Post-disaster destination management and intergovernmental collaboration

With a growing interest in minimising negative disaster impacts on tourist destinations, scholars have given critical standpoints concerning destination management in the post-disaster context (Gurtner, 2016; Seraphin, 2019). Post-disaster destination management consists of overcoming adverse effects of a disaster, as well as keeping destinations competitive and attractive as before (Amujo & Otubanjo, 2012; Lee & Hyun, 2016). That is, successful post-disaster destination management should involve swift emergency rescue, well-organised intermediate strategies, and implementing long-term recovery projects (Faulkner, 2001). As such, post-disaster destination management often requires a substantial

input of resources, capital and technology. Many studies increasingly highlight the necessity of considering government support as an effective strategy for post-disaster destination management (Kato, 2018; Seraphin et al., 2020).

Previous studies have paid considerable attention to the significant role of multi-level government sectors in post-disaster destination management (Beaumont & Dredge, 2010; Dredge, 2006; Pavlovich, 2001). Many scholars have shown how national and provincial governments often provide disaster response assistance through emergency management training, providing information about potential post-disaster events, and giving local governments funding to facilitate long-term recovery, such as compensation loans and tax exemptions (Zurita et al., 2015). Higher level governments are not only responsible for providing extensive resources to help local governments restore affected areas, but also take steps to work out the next stage of post-disaster recovery (Ghaderi et al., 2015). Local governments are geographically situated at the lowest level and closest to affected communities (Baker & Refsgaard, 2007). Responsibilities of local governments concerning post-disaster destination management can be divided into three categories: 1) taking the initiative in protecting their citizens and tourists (Col, 2007); 2) mobilising local initiatives to engage in the decision-making process; and 3) ensuring greater administrative discretion and flexibility to implement post-disaster planning (Cretney, 2016). Different types of government sectors with distinct roles and functions and their participation underline the significance of these bodies in implementing post-disaster destination management.

Due to the complexity of post-disaster destination management, the engagement of government sectors, often taking the form of intergovernmental collaboration, can bridge the capacities of multi-level government sectors for management (Ladkin et al., 2008). Many studies in other disciplines, such as political science, have explored the establishment and development of intergovernmental collaboration. There are two main types of intergovernmental collaboration: hierarchical collaboration and horizontal collaboration (Hovil & Stokke, 2007; Pierre & Peters, 2000). Hierarchical collaboration emphasises that multi-level government sectors collaborate to achieve common goals in the centralised way (Moore, 2009). Horizontal collaboration is characterised by local autonomy, devolved power and decentralised problem-solving (Caruson & MacManus, 2012). The two types can be summarised as top-down or bottom-up collaboration (Kapucu & Garayev, 2014). Based on that, scholars have subsequently re-contextualised the two modes discussed above. Instead of separating hierarchical collaboration from horizontal collaboration, Scharpf (1994: 40) focuses on their interdependencies, as hierarchical power can be realised by local political

practices and negotiations, and hierarchical structures can also enhance coordination capacity of local political networks. He emphasises the need for interdependence between hierarchical intervention and local political practices. This interdependence can be understood as "the tangled hierarchies or shadow of hierarchical authority" (Amore & Hall, 2016: 116). The combination of hierarchical intervention with horizontal coordination not only includes the hierarchical administrative mode, but adds the engagement of government sectors at the same level (Jessop, 2011).

Different types of intergovernmental collaboration reflect different modes of interaction that can be shaped by political-administrative contexts (Hall, 1999, 2009; Pierre & Peters, 2005). In many western countries, hierarchical collaboration, horizontal collaboration and the combination of the two are widely welcomed in post-disaster tourism destination management (Amore & Hall, 2016). Unlike many Western countries, the centralised Chinese administrative system has been particularly significant in dominating post-disaster destination management (Yang et al., 2011). This essentially means that the central government has the ultimate decision-making power: that is, the central government has absolute authority, while the local government is subordinate to the superior and the central government (Zhong & Lu, 2018). Although local governments start to strengthen horizontal collaboration with other government at the same level, central and local governments in the Chinese centralised political-administrative structure still follow the traditional hierarchical collaboration mode (Shi, 2012).

The above discussion of intergovernmental collaboration has consistently emphasised how different level government sectors interconnect to form collaborative structure, and further reflected different modes of interaction within a specific context. Intergovernmental collaboration can provide a means to address organisational and operational issues that emerge from post-disaster destination management (Amore & Hall, 2016). Post-disaster policy announcements, decisions, and measures for destination management are drawn up and implemented through a wide range of intergovernmental interactions (Ritchie, 2004). This collaborative process involves the sharing of resources between multi-level government sectors in order to address the post-disaster destination management challenges that a single government sector cannot resolve alone. However, little effort has been made to conceptualise the structure of intergovernmental collaboration. It remains unclear how collaboration among government sectors operates across functional, hierarchical and geographical boundaries in post-disaster destination management.

2.2 Network analysis as an approach to understand intergovernmental collaboration in post-disaster destination management

Behind intergovernmental collaboration lie extensive interactions between multi-level government sectors. As the prevailing discussion on intergovernmental collaboration, collaborative activities are likely to interconnect different level government sectors to form the structure. Network analysis is an innovative approach to reveal intergovernmental collaboration (Caruson & Macmanus, 2012; Jung & Song, 2014; Mandell & Keast, 2007). A range of network analysis indicators, including network density, centrality, clique, structural hole, etc., can be used to examine the degree of government sectors engagement, the collaborative links that they form, and their interactions within the structure of intergovernmental collaboration (Burgos & Mertens, 2017). While network analysis approach has been increasingly used to explore tourism destination management, rarely has it been applied to understand intergovernmental collaboration in post-disaster destination management. The foci of network analysis is generally the engagement of actors and their interactions between actors (Mandell & Keast, 2007). Yet related issues of both network foci have been performed to explore intergovernmental collaboration in post-disaster destination management.

With regard to the first foci of network analysis, intergovernmental collaboration often involves multiple government sectors with distinct roles and functions throughout the whole process of post-disaster destination management (Liu-Lastres et al., 2020). Destination management often requires the engagement of higher level of government sectors, which provides substantial budgetary and necessary resources to help local government respond to disasters (Brooks et al., 2013). Examples of the engagement of local governments in the post-disaster destination are common, such as the case of Tahoku-Oki earthquake (Iuchi et al., 2013), or local government contracting policies and practices to help tourism businesses recover in the Palm Beach of Florida (Atkinson & Sapat, 2013). The second foci relates to interactions existing between different government sectors in post-disaster destination management. Existing literature on this theme mainly emphasises hierarchical collaboration between multi-level government sectors for post-disaster destination management. Horizontal interaction also exists within the collaboration, when local governments seek to collaborate with inter-local government sectors for implementing post-disaster projects easily (Kusumasari et al., 2012). Relying on higher level governments and hierarchical interaction that they generate can provide significant formal support for post-disaster destination management. This support cannot be obtained through horizontal collaboration (Bankoff,

2003). But when national or provincial governments exert their power over local governments at the expense of local interests, this can lead to increased fragmentation of the whole intergovernmental collaboration. Horizontal interaction has become increasingly prominent to mobilise local resources and knowledge in response to disasters (Kapucu et al., 2010). However, substantial post-disaster destination management requires a high level of resource input. Resources embedded into horizontal networks are often limited (Kapucu & Garayev, 2014).

As discussed above, the existing studies on post-disaster destination management of intergovernmental collaboration briefly introduce the two foci of network analysis. However, past literature seems to ignore several important factors of collaboration, including the positioning, forwarding and receiving modes of government sectors, and the extent to which a government sector exercises power over other sectors in the collaborative structure. Attention to such elements can reveal how government sectors collaborate with others to function the whole collaborative system for post-disaster destination management (Maldonado et al., 2009). Therefore, employing networks analysis, the study explores the engagement of government sectors and their interactions within the collaborative structure throughout the whole process of post-disaster destination management. Based on the foregoing, the changing dynamics of intergovernmental collaboration in post-disaster destination management are discussed in depth.

3 Methodology

3.1 Case study

Jiuzhaigou National Park, one of the most popular national parks in China, is chosen as the case for this study. It is located in Aba Tibetan and Qiang Autonomous Prefecture of Sichuan Province (See Fig. 1). Jiuzhaigou National Park was declared as a United Nations Educational, Scientific and Cultural Organisation (UNESCO) world heritage site in 1992. Jiuzhaigou National Park received approximately 5,000,000 visitors in 2016. It contributed about 30% of the total tourism income of Aba Prefecture.

On the evening of 8th August of 2017, an earthquake with a magnitude of seven degrees hit Jiuzhaigou. It was reported that that 25 people died, 525 people were injured, and 73,671 houses were damaged. In addition to the loss of life, natural environment, tourism-related infrastructure and asset supporting tourism industry within Jiuzhaigou National Park were destroyed. The tourist complex in Jiuzhaigou National Park, including natural beauty areas

(waterfalls and lakes), hotels and inns, restaurants, shops and transport, was partially destroyed. Direct economic loss caused by the earthquake amounted to about 8 billion yuan, equivalent to one-third of Jiuzhaigou County's GDP county in 2017. After the earthquake, it was announced that Jiuzhaigou National Park would shut down for three years for post-disaster recovery. National, provincial and municipal government sectors collaborated with the administration bureau of Jiuzhaigou for post-disaster destination management.

The post-disaster destination management of Jiuzhaigou National Park basically follows the lifecycle of post-disaster destination management (Calgaro, 2010; Faulkner & Vikulov, 2001; Miller & Ritchie, 2003; Ritchie, 2004). The emergency stage lasted from 8th August to 14th August, 2017, as rescue and damage limitation was the main objective at this stage and rescue activities fundamentally completed within seven days (Shaw, 2006). During this period, the administration bureau of Jiuzhaigou National Park, with the help of Jiuzhaigou county government and Aba Autonomous Prefecture government, took swift actions to rescue local residents, tourists and properties. Tens of thousands of police officers, fire-fighters, and emergency operations officials were recruited to participate in this rescue effort. Certain basic needs, such as water, food and shelter, were provided during the emergency phase.

The intermediate stage took place from 15th August to 7th November, 2017. At this stage, post-disaster destination management tasks carried out by the administration bureau mainly entailed restoring affected communities to normal as quickly as possible. Working in conjunction with other government sectors at different levels, the administration bureau took extensive intermediate actions to fulfil short-term needs of victims, and restore utilities and essential services. Beyond that, destination management efforts also related to prepare for long-term management (Faulkner & Vikulov, 2001; Ritchie, 2004). The Sichuan provincial government began networking with other government sectors at municipal and district levels to draw up the General Plan for the whole post-disaster recovery process.

The announcement of the General Planning for Post-disaster Reconstruction of Jiuzhaigou on 8th November, 2017 signalled the end of the intermediate stage and the beginning of the long-term recovery stage. At this point, the main focus of the post-disaster destination management switched to implement the General Plan for long-term recovery and rehabilitation (Miller & Ritchie, 2003). The General Planning for Post-disaster Reconstruction of Jiuzhaigou consisted of five anchor projects: 1) the restoration and protection of the ecological environment project; 2) the prevention and control of geological disasters project; 3) the restoration and improvement of the tourism destination and industry; 4) the

reconstruction of public services; 5) the restoration and reconstruction of urban and rural housing. The General Planning for Post-disaster Reconstruction played a significant role in determining the scale and the development direction of post-disaster reconstruction, and achieving the economic and social development goals of the disaster-stricken areas. The five anchor projects provided a basis for planning, and design for the next level of construction projects. These projects need to complete to a basic level within two years.

Due to the various elements involved in rehabilitation, a coordinated approach was required to effectively implement these projects. Following the General Planning guidelines, the administration bureau of Jiuzhaigou National Park was designated as the main government sector with full responsibility for implementing the five anchor projects. National, provincial and municipal government sectors played a supportive and supervisory role in this process. Within the following two years, the administration bureau of Jiuzhaigou National Park made arrangements with multi-level authorities to expedite measures for the restoration and reconstruction of natural environment, wildlife, infrastructure, tourist facilities, collapsed buildings, and livelihoods. Following the General Planning requirement, the five anchor projects need to fundamentally complete in two years. On 8th August 2019, the administration bureau of Jiuzhaigou announced that this target was basically achieved. The fulfilment of these projects marked the end of the long-term recovery stage, and paved the way for Jiuzhaigou National Park to reopen to the public step-by-step.

3.2 Data collection and analysis

In this study, network analysis is employed to assess the structure of intergovernmental collaboration in post-disaster management of Jiuzhaigou National Park by using UCINET 6 software. Government sectors are represented as nodes. The data was derived from a content analysis of news reports from the websites of Jiuzhaigou Administration Bureau, Jiuzhaigou County Government, Aba Autonomous Prefecture, Sichuan Province Government, and the Chinese central Government. 989 reports relating to the post-disaster management of Jiuzhaigou National Park from 8th August 2017 to 8th August 2019 were collected. After eliminating those reports that did not relate to interactions between government sectors for post-disaster destination management, or were duplicate reports, or only contained photos, 68 reports were selected for this study: 8 reports related to the emergency stage (from 8th to 14th August 2017); 12 reports associated with the intermediate stage (from 15th August to 7th November 2017); 48 reports related to the long-term recovery stage (from 8th November 2017

to 8th August 2019). Table 1 illustrates the three stages of post-disaster destination management and the data collected.

The data analysis can be divided into two phases. In the first phase, to evaluate the intergovernmental response to the earthquake, we carefully reviewed the reports to identify interactions between different government sectors, and each interaction was recorded. The purpose of content analysis here was to understand interactions between different government sectors involved in post-disaster management of Jiuzhaigou National Park. 49 government sectors actively participated in the intergovernmental collaboration throughout the whole process of post-disaster destination management (see Table 2): 11 government sectors engaged in the emergency stage; 21 government sectors were involved in the intermediate stage and; 33 government sectors in the long-term recovery stage. We then constructed four adjacency matrixes in the form of government sector × government matrix (49×49 adjacency matrix for the whole network of post-disaster destination management, 11×11 adjacency matrix for the emergency stage, 21×21 adjacency matrix for the intermediate stage, and 33×33 adjacency matrix for the long-term recovery stage). Interaction between government sectors was valued at either 0 or 1. 0 indicates no interaction between two government actors; 1 means that interaction existing between two actors. The structured data obtained from the content analysis was used as an input for network analysis.

In the second phase, network analysis is employed to identify the structure of intergovernmental collaboration in the post-disaster management of Jiuzhaigou National Park. Four principal foci of network analysis are listed by Haythornthwaite (1996: 330), namely cohesion, structural equivalence, prominence, and range. This study aims to examine actors and interactions between government sectors in post-disaster management of Jiuzhaigou National Park. Accordingly, the measurements of density, average distance, centrality, clique and structural holes are used to examine the structure of intergovernmental collaboration.

4 Results

4.1 Government sector profiles and visualisation

Table 3 shows descriptive statistics relating to government sectors that participated in post-disaster management of Jiuzhaigou National Park. Regarding their types, we found that almost half of the engaged government sectors were at the municipal or district level; over one third operated at the provincial level; less than one fifth operated at the national level. The descriptive statistics indicate that a wide range of government sectors, ranging from

national to provincial and municipal to district levels, engaged in post-disaster management of Jiuzhaigou National Park. The active participation of higher level government sectors represents a point of difference with the Western model of intergovernmental collaboration that depends heavily on local government bodies to facilitate post-disaster destination management (Becken & Hughey, 2013). This can be explained by the fact that hierarchical intervention is vital to ensure the effective functioning of intergovernmental collaboration in the Chinese centralised political-administrative structure (Ge et al., 2010).

Employing a graphical approach, we produced four visual network diagrams of intergovernmental collaboration in post-disaster destination management of Jiuzhaigou National Park. Network visualisation can identify the different components of the network, discover network patterns and features, and gain insights into the underlying dynamics of the network (Trias et al., 2019).

Figure 2 illustrates the entire network of intergovernmental collaboration in post-disaster management of Jiuzhaigou National Park. Figure 2 shows that government sectors at national, provincial and local levels collaborate for post-disaster destination management. Intergovernmental collaboration is structured hierarchically and horizontally to facilitate destination management.

Figure 3 shows the network of intergovernmental collaboration at the emergency stage. ABJ is the central government sector at this stage. Government sectors at the national, provincial and municipal levels are coordinated, and intergovernmental collaboration mainly developed hierarchically to promote the response activities. Most government sectors, such as ABJ, GA, GS and SCC, play important roles at this stage. This can be explained by the fact that these principal sectors are mainly responsible for the whole emergency management, including rescue activities, provision of shelters and producing disaster impact reports.

Figure 4 shows the network of intergovernmental collaboration at the intermediate stage. ABJ plays a leading role in facilitating relief activities, and government sectors at the national level are strongly interconnected with each other at this stage. Compared with intergovernmental collaboration at the emergency stage, horizontal connections between government sectors become more significant at this stage. However, intergovernmental collaboration primarily operates in a hierarchical way. Figure 4 demonstrates that the number of functional government sectors increases rapidly during this stage. Functional sectors, such as TPBA, GEBS, NTD and NFB, are mainly grouped for drawing up the rebuilding planning of tourism-related infrastructure and ecological environment.

Figure 5 displays the network of intergovernmental collaboration at the long-term recovery stage. ABJ remains the central sector and has the most connections with other sectors. GJ, DRCA and GA act as the secondary central locations within the network. The long-term recovery activities rely heavily on hierarchical collaboration, but horizontal collaboration becomes much more significant in functioning the whole collaboration. Figure 5 illustrates that the long-term recovery is heavily dependent on government sectors at municipal and district levels. The focus of this stage is to implement the General Plan and the five anchored projects. Thus, many functional government sectors at the municipal and district levels, such as EMOA, CEITA, TPBA, and ICBA, are delegated to implement the anchored projects at this stage.

4.2 Network density and average distance

Density measurement is carried out to gauge connectivity level of within a network (Hanneman & Riddle, 2005). Table 4 displays descriptive statistics for network density and average distance of intergovernmental collaboration at the emergency, intermediate and long-term recovery stages. Network density refers to the portion of potential ties in a network that are actual ties. A potential tie is the tie that could potentially exist between two actors, while an actual tie is one that actually exists. Network density is not only determined by the sum of ties between actors, but by the sum of actors in the network (Lian et al., 2012; Wise, 2014). The equation 1 shows the calculation of the network density D as following (Alsamadani et al., 2013):

$$D = \frac{T}{n(n-1)} \quad (1)$$

Where T is the actual number of ties, n is the number of government sectors in the network. In Table 4, the intermediate stage has the highest density value with 21 actors and 184 ties; the emergency stage ranks the second, and has 11 actors and 37 ties; the long-term recovery stage has the lowest density value, with 33 actors and 147 ties. Although there are 147 ties at the long-term stage, the number of actors engaged at this point is considerably higher than that of the emergency stage. Thus, network density at the long-term stage is the lowest. The above results demonstrate that the most frequent interactions between government sectors occurred at the intermediate stage. One explanation may be that measures for post-disaster destination management at the intermediate stage often relate to the continuing rescue efforts, the provision of facilities or mental health support to affected locals (Faulkner & Vikulov, 2001). Post-disaster destination management at this stage involves

a combination of ongoing emergency protection and pre- long-term recovery. The combination requires a broad range of specific government sectors to engage in this complex management process.

Average distance AD is to measure network cohesion. The equation 2 of average distance AD is shown below (Fujihara et al., 2009):

$$AD = \frac{\sum_j^n d_{ij}}{2n}; i \neq j \quad (2)$$

Where d_{ij} denotes as the length of the shortest path between government sector i and j. n is the number of government sectors. The bigger average distance is, the less network cohesion is. The average distance of collaborative network is the smallest, suggesting its network cohesion is the biggest at the emergency stage; the average distance increases at the intermediate stage; the average distance becomes the greatest at the long-term recovery stage with the smallest network cohesion. All of average distance at the three stages are greater than one, indicating that each government sector at the three stages can connect with other government sectors within the collaboration structure by virtue of a sector.

4.3 Centrality

Centrality is a significant quantitative characteristic in network analysis, and refers to the power that an actor gains within the structure, rather than power obtained by individual attributes. Centrality has been widely used to examine the power of actors within the network structure (Wasserman & Faust, 1994). Degree, closeness and betweenness are three main centrality measurements which are used to analyse the position and power of government sectors in intergovernmental collaboration. The rationale for measuring degree centrality is that actors with more ties are less dependent on other sectors, and thus they are more powerful within the network (Hanneman & Riddle, 2005). The equation 3 of degree centrality $C_D(i)$ is shown below (Freeman, 1978):

$$C_D(i) = \sum_j^n I_{ij}; \ i \neq j \quad (3)$$

Where I_{ij} is the value of the tie from government sector i to government sector j (the value is either 0 or 1: $I_{ij} = 1$ means a tie existing between government sector i and government sector j, $I_{ij} = 0$ means no tie between them). n is the number of government sectors.

Closeness centrality indicates the shortest path between an actor and one other actor, and is used to analyse the communication process between actors (Comfort & Haase, 2006). The equation 4 of closeness centrality $C_c(i)$ is shown below (Freeman, 1978):

$$C_c(i) = \frac{1}{\sum_j^n d_{ij}};\ i \neq j \tag{4}$$

Where d_{ij} denotes as the length of the shortest path between government i and j, and n is the number of government sectors.

Betweenness centrality of a government sector discloses the extent to which this sector is in an advantageous position and could make significant links with other sectors (Comfort and Haase, 2006). The equation 5 of betweenness centrality $C_B(i)$ is shown below (Freeman, 1978):

$$C_B(i) = \sum_j^n \sum_k^n \frac{g_{jk}(i)}{g_{jk}};\ j \neq k \neq i \tag{5}$$

Where g_{jk} is the number of the shortest path for government actor *j* to reach actor *k*; $g_{jk}(i)$ is the number of shortcuts from government actor j and government actor k, which also crosses point i; n is the number of government sectors.

Table 5 displays the results of centrality measures of intergovernmental collaboration during the emergency stage. ABJ ranks the highest in degree centrality, followed by GA. Being the most connected actor in the network is not always an advantageous position, but dependent on the context. In this study, the assumption is that government sectors with more links are in relatively advantageous positions, as they have access to alternative ways to satisfy their needs. Thus, at the emergency stage of post-disaster destination management, ABJ and GA are the most connected, and both therefore have more resources to tap into other government sectors. ABJ and GA also have the most closeness centrality, indicating that they have more frequent interactions with other government sectors at this post-disaster destination management stage. One explanation may be that local government sectors play an important role in actively protecting local residents and tourists (Col, 2007). In terms of betweenness centrality, ABJ, GA and DFS have the maximum amounts. This indicates that these three government sectors play the most critical role in functioning intergovernmental collaboration, and their power is highly concentrated. ABJ tops the list and this is perhaps linked to its role in controlling resource allocation, deciding where to direct efforts, and establishing and facilitating coordination between government sectors at the emergency stage.

Table 6 shows the results of the centrality measures of intergovernmental collaboration at the intermediate stage. ABJ and DRCS have the highest degree and closeness centrality. These results indicate that ABJ and DRCS are more closely connected than others, and have the most frequent interactions in the collaboration. One possible explanation for the highest ranking of ABJ in degree and closeness centrality is that ABJ may make greater efforts than other sectors to maintain ties with other government sectors, as it is closest to the affected region (Baker & Refsgaard, 2007). The foci of the intermediate stage is to restore utilities and essential services that are essential for the long-term recovery of tourism destination, which requires much financial support (Ritchie, 2004). It is not surprising that DRCS ranks highly and plays an influential role at this stage. ABJ is the highest in terms of betweenness centrality during the intermediate stage, indicating that it heavily involves in implementing intermediate activities for destination management. This could be because the principal government sectors often play a bridging role in implementing destination management through collaborating with other functional government sectors.

Table 7 shows the results of network centrality of intergovernmental collaboration at the long-term recovery stage. ABJ and GA rank the highest in degree, closeness and betweenness centrality. These results suggest that ABJ and GA have the most extensive web of links, making it relatively easy to influence the other. Both also have the most structural advantages in bargaining for and exchanging resources required for long-term recovery activities. This is because long-term recovery work focuses on reconstructing tourism-related infrastructure, rehabilitating environmentally-damaged areas, restoring tourist business, and boosting tourism-market confidence (Faulkner & Vikulov, 2001). The implementation of long-term recovery projects often relies heavily on local government due to its geographical and institutional proximity to the region (Çakar, 2018).

4.4 Clique analysis

Clique analysis is used to identify the sub-networks of government sectors within the network (Hanneman & Riddle, 2011). In this study, clique analysis was undertaken to show the preferred types of cliques and subgroups operating in intergovernmental collaboration.

Table 8 shows the clique analysis results of intergovernmental collaboration at the emergency, intermediate and long-term recovery stages. At the emergency stage, four cliques are identified in the network: the cliques 1, 3 and 4 develop hierarchically, and involve government sectors at national, provincial and municipal levels; the clique 2 develops horizontally, and all the government sectors in this clique are at the municipal level. All the

cliques have links with ABJ. At the intermediate stage, six cliques are identified in the intergovernmental collaboration network: the cliques 1, 2, 3 and 5 develop in a hierarchical way, while the clique 4 and 6 develop horizontally. Hierarchical collaboration involves government sectors at the national, provincial and municipal levels in the clique 1 and 5, while the clique 2 and 3 only involve government sectors at the provincial and municipal levels. Horizontal collaboration within the clique 4 relates to provincial government sectors, while the clique 6 involves government sectors at the municipal level. At the long-term recovery stage, there are fourteen cliques identified within the collaboration structure. Eleven hierarchical cliques involve national, provincial and local government sectors, while three local cliques are involved in the horizontal collaboration.

In Table 8, intergovernmental collaboration developed hierarchically throughout post-disaster destination management process, but horizontal collaboration between provincial or local government sectors also plays an increasingly important role. Even if hierarchical influence remains apparent within intergovernmental collaboration under the Chinses centralised system (Xu & Lu, 2013), horizontal collaboration becomes progressively more significant in post-disaster destination management. This phenomenon has also been observed in many western countries, such as New Zealand (Amore & Hall, 2016). The interdependencies between hierarchical intervention and horizontal coordination within the post-disaster destination management could be explained by the fact that "the hierarchical power is realised in or through local political practices or negotiations, so too is the effective collaboration of local political networks or clans enhanced by virtue of their embeddedness within hierarchical structures" (Scharph, 1994: 40).

4.5 Structural holes

Structural holes represent the non-redundancy ties between two actors and indicate whether an actor is in an advantageous position to control the flow of information and resources within the network as a whole (Scott, 2013). Burt (1992) identifies three indicators of structural holes, namely: effective size, efficiency and constraint. We use these measures to test structural holes of intergovernmental collaboration in this study.

Effective network size is to measure the redundancy of certain ties of nodes (Burt, 1992). The equation 6 of network effective size ES_i is shown below (Burt, 1992):

$$ES_i = n - \frac{1}{n}\sum_{j}^{n}\sum_{q}^{n} m_{jq}\,; q \neq i, j \qquad (6)$$

Where m_{jq} equals the strength of direct ties from government sector j to government q, and n is the number of government sectors.

Efficiency is the ratio of the effective scale of the network nodes to the actual scale (Burt, 1992). The equation 7 of network efficiency EC_i is shown below (Burt, 1992):

$$EC_i = \frac{ES_i}{l} \quad (7)$$

Where ES_i is the network effective size, and l is the number of actors that connect to government sector i.

Constraint measures the extent to which node is directly and indirectly dependent on other nodes, via crisscrossing connections and the absence of structural holes (Burt, 1992). The equation 8 of network constraint C_{ij} is shown below (Burt, 1992):

$$C_{ij} = (p_{ij} + \sum_q^n p_{iq}\, p_{jq})^2 ; q \neq i, j \quad (8)$$

Where p_{ij} equals the strength of direct ties from government sector i to government j; $p_{iq}\, p_{jq}$ is the sum of the indirect tie strength from i to j via q; n is the number of government sectors.

Table 9 shows the measurement results of structural holes at the emergency stage of post-disaster destination management. ABJ and GA have the largest effective size but the fewest constraints, revealing that they are the most non-substitutable government sectors and are situated in a bridging position. This may be linked to the significant role they play at the emergency stage: both ABJ and GA are situated at the local level, and they thus are responsible for rescue and relief activities to protect affected locals and tourists (Cretney, 2016). LRBS and TBA rank the highest in efficiency, demonstrating that they are in the most advantageous positions in exchanging information and resources. This could be due to their positions within the collaborative structure as a whole, in that both government sectors are only connected with ABJ.

Table 10 shows the results of structural holes of intergovernmental collaboration at the intermediate stage of post-disaster destination management. ABJ and DRCS are the top two in effective size ranking as well as having the lowest constraint values, which suggests that both ABJ and DRCS play the non-substitutable roles at this stage. It is also the easiest for them to link with other sectors. DRCS is an emerging sector within the collaborative structure at this stage. Its prominent role is partly in accordance with the focus on tourism planning during this

stage of the post-disaster destination development. GEBS and SMBS have the highest efficiency scores, meaning that they can mostly impact other government sectors at this destination management stage. One of the main tasks at the intermediate stage is to assess and monitor the damaged environment (Ritchie, 2004). Thus, these two government sectors that are responsible for environmental protection and monitoring are the most influential within the collaboration.

Table 11 shows the structural holes results of intergovernmental collaboration at the long-term recovery stage. ABJ and GA are the two highest in effective size ranking, denoting that both have more non-redundancy ties, enabling them to span across other government sectors. ABJ and DRCA have the lowest constraint values, and hence are in the most advantageous position in information flow from multiple channels. Most resources required for the long-term recovery have to pass through these government sectors. NCD, EMOA, DFA, OLRS, BGMRS, and ABS have the highest efficiency values, showing that these government sectors have the most ties with other government sectors. However, they are also the most constrained sectors within the collaboration structure and so are likely to face hierarchical obstacles. These results indicate that government sectors cross functional, geographical and hierarchical boundaries are inclusively situated within the collaboration through political agreement, concessions and compromise. The results also show that the collaboration develops hierarchically at this stage, as government sectors at the provincial and local levels are driven by hierarchical power to operate long-term recovery activities for destination management.

5 Discussions and conclusion

The study, taking Jiuzhaigou National Park as the case, employed network analysis to explore the changing dynamics of intergovernmental collaboration that occur throughout the whole process of post-disaster destination management. Intergovernmental collaboration is a joint response that extends across the national, provincial and local government levels in post-disaster management of Jiuzhaigou National Park. At the emergency stage of post-disaster destination management, intergovernmental collaboration relies heavily on hierarchical collaboration. Higher level government sectors, featured with stronger supportive capabilities, provide diversified resources for local government to implement rescue activities and protect locals and tourists. At the intermediate and long-term recovery stages of post-disaster destination management, intergovernmental collaboration is dominated by hierarchical collaboration. However, horizontal interactions play a significant

583 role in mobilising resources and coordinating post-disaster destination management activities
584 at the intermediate and long-term recovery stages.

585 Throughout the whole process of post-disaster destination management,
586 intergovernmental collaboration develops both hierarchically and horizontally to promote the
587 post-disaster management of Jiuzhaigou National Park, but it is largely dominated by
588 hierarchical collaboration. As mentioned in the network visualisation and clique analysis
589 sections, higher level governments use their central position to facilitate connectivity across
590 the collaboration and dominate the collaborative mode at all the three stages. Our results also
591 suggest that intergovernmental collaboration is primarily based on intergovernmental
592 hierarchies established and maintained in post-disaster destination management. This is in
593 line with the argument advanced by Tang et al. (2017) which claims that, in the context of
594 Chinese centralised political-administrative structure, hierarchical collaboration is the
595 traditional approach employed in response to post-disaster destination management
596 challenges. During the emergency, intermediate and long-term recovery stages, the
597 participation of local government bodies is required, but working together with higher level
598 government sectors in the intergovernmental collaboration. Such hierarchical intervention
599 can prevent the fragmentation of local authorities and facilitate wider collaboration that goes
600 beyond functional and institutional boundaries in post-disaster destination management (Liu-
601 Lastres et al., 2020).

602 As the post-disaster destination management develops, especially during the
603 intermediate and long-term recovery stages, local government sectors progressively play a
604 lubricating role in the intergovernmental collaboration, and horizontal collaboration becomes
605 increasingly significant. Our findings obtained from the analysis of centrality and structural
606 holes reveal that municipal and district government sectors are the dominant actors in
607 facilitating the functioning of intergovernmental collaboration. The principal government
608 sectors at the local level, such as ABJ, GJ and GA, establish collaborative relationships with
609 other government sectors at the same level to integrate their resources and capabilities for
610 more effective destination management after disasters. The central position of local
611 government sectors affects the flow of information/resources, the direction and speed, and
612 the functioning of intergovernmental collaboration in achieving post-disaster management
613 goals. In particular, intergovernmental collaboration mainly functions through the
614 interconnections between the administration bureau of Jiuzhaigou National Park and other
615 actors. ABJ is situated in the most advantageous position in controlling resource allocation,
616 deciding where to direct efforts, and facilitating coordination between government sectors.

In addition, as discussed in the clique section, horizontal collaboration becomes more dominant as post-disaster destination management develops. Building on the existing literature that emphasises the functions of higher-level government sectors in the Chinese context in post-disaster destination management (Ge et al., 2010; Guo, 2012; Xu & Lu, 2013), our findings provide a greater understanding of the bridging role played by local government sectors and the significance of horizontal collaboration to destination management activities in response to post-disaster challenges.

These findings provide more insights into intergovernmental collaboration in comprehensive post-disaster destination management. Building on the lifecycle model of post-disaster destination management (Chan et al., 2019; Faulkner, 2001; Ritchie, 2004), this study expands the understanding of the changing dynamics of intergovernmental collaboration in response to disaster challenges. Findings showed in the case of Jiuzhaigou National Park contribute to post-disaster destination management knowledge. This can be regarded as a reference for other tourist destination management. Results derived from this study highlight the changing dynamics intergovernmental collaboration throughout the whole process of post-disaster destination management. In the whole process of post-disaster tourism destination management, due to the focus change of tourism destination management at different stages, government sectors at all levels interact with each other in different ways. These findings add more insights into past studies that only concentrate on static characteristics of intergovernmental collaboration in all stages of post-disaster destination management (Amore & Hall, 2016; Hall, 2009; Jiang & Ritchie, 2017). Besides that, intergovernmental collaboration in post-disaster management of Jiuzhaigou National Park is hybrid in the Chinese centralised political-administrative structure, with an interdependence between hierarchical collaboration and horizontal interactions. This hybrid is not mutually exclusive, but complementary throughout the whole process of post-disaster destination management. This outcome contributes to the existing studies on hierarchical or horizontal collaboration in post-disaster destination management (Larsen et al., 2011; Whitehead, 2003). In the case of Jiuzhaigou National Park, due to the different time pressure, control degree and event intensity in different management stages, post-disaster destination management has a strong complexity. This complexity leads to more demanding strategic management responses of post-disaster destination management, which thus requires the combination of both types of intergovernmental collaboration. Understanding post-disaster destination management, their lifecycle and potential impacts and actions can help us to develop

collaborative strategies by multi-level government sectors, as well as coping with destination management incidents after disasters.

6 Limitation and implications

This study has some limitations. Firstly, the study only discusses the intergovernmental collaboration between government sectors. As other participating actors such as NGOs, local entrepreneurs, etc., have the potential to engage in post-disaster destination management (Ireni, 2014), future research could focus on the collaboration among these stakeholders and Secondly, given that horizontal collaboration is inevitable in the Chinese context, future research could examine the benefits and drawbacks of the horizontal governmental approach to post-disaster destination management in China. Despite the establishment of a hierarchical order, more discussion regarding unconventional and non-horizontal approaches can be conducted. Thirdly, this study only presents the network landscape of intergovernmental collaboration in the post-disaster management based on the text data collected from official government websites. To a certain extent, there is a lack of detailed analysis of internal data at multi-level government sectors in post-disaster destination management. Thus, future research can adopt a mixed-methods approach, such as integrating the data generated by interviewing with different level governments into network analysis, to have more insights into the internal working structure of intergovernmental collaboration.

Despite the limitations outlined above, intergovernmental collaboration was extremely important throughout the process of the post-disaster management of Jiuzhaigou National Park, and hence it can clearly be seen to play a fundamental role in post-disaster destination management. Thus, intergovernmental collaboration should be established and developed to promote post-disaster destination management, and could take one of two forms. In the first, higher-level government sectors can be incorporated into intergovernmental collaboration in order to resolve post-disaster destination management issues. More specifically, higher level government sectors can engage in post-disaster destination management by providing more supportive resources for local government bodies. In the second, as local governments play an increasingly important role in coordinating post disaster response activities, national and provincial governments can decentralise power and give more power to local governments, especially in the context of Chinese centralised political and administrative structure. Thus, local governments with extensive local knowledge are in a favourable position in terms of intergovernmental cooperation, and hence could enable post-disaster destination management to operate more effectively.

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886 Table 1. Post-disaster destination management stages and the data collected

Phase	Duration	Total number of secondary reports collected
Emergency stage	From 08/08/2017 to 14/08/2017	8
Intermediate stage	From 15/08/2017 to 07/11/2017	12
Long-term recovery stage	From 08/11/2017 to 08/08/2019	48

Data sources:
Jiuzhaigou Administration Bureau website (https://www.jiuzhai.com/)
Jiuzhaigou County Government website (http://www.jzg.gov.cn/)
Aba Autonomous Prefecture website (http://www.abazhou.gov.cn/)
Sichuan Province Government website (https://www.sc.gov.cn/)
Chinese Government website (http://www.gov.cn/)

887

888 Table 2. 49 government sectors that participated in the post-disaster destination management of
889 Jiuzhaigou National Park

No.	Government sector	Full title
1	ABJ	Administration Bureau of Jiuzhaigou National Park
2	GJ	Jiuzhaigou County government
3	DCJ	Department of Construction of Jiuzhaigou County
4	DFJ	Department of Finance of Jiuzhaigou
5	DRCJ	Development and Reform Commission of Jiuzhaigou county
6	FGBJ	Forestry and Grass Bureau of Jiuzhaigou County
7	SFJ	South Forestry Bureau of Jiuzhaigou County
8	TBA	Tourism Bureau of Aba Autonomous Prefecture
9	DCA	Department of Construction of Aba Autonomous Prefecture
10	GA	Aba Autonomous Prefecture government
11	DRCA	Development and Reform Commission of Aba Autonomous Prefecture
12	EMOA	Emergency Management Office of Aba Autonomous Prefecture
13	DFA	Department of Finance of Aba Autonomous Prefecture
14	CSOA	Comprehensive Supervision Office of Aba Autonomous Prefecture
15	CEITA	Committee of Economic and Information Technology of Aba Autonomous Prefecture
16	EPCURA	Environmental Protection Committee for Urban and Rural Construction of Aba Autonomous Prefecture
17	ROA	Reconstruction Office of Aba Autonomous Prefecture
18	FGBA	Forestry and Grass Bureau of Aba Autonomous Prefecture
19	WBA	Water Bureau of Aba Autonomous Prefecture
20	TPBA	Transport Bureau of Aba Autonomous Prefecture
21	FBA	Finance Bureau of Aba Autonomous Prefecture
22	ICBA	Industrial and Commercial Bureau of Aba Autonomous Prefecture
23	MG	Mianyang City government
24	EPCURS	Environmental Protection Committee for Urban and Rural Construction of Sichuan Province
25	GEBS	Earth and Environment Bureau of Sichuan Province
26	DRS	Department of Construction of Sichuan Province
27	DRCS	Development and Reform Commission of Sichuan province
28	GS	Government of Sichuan Province
29	DCS	Department of Construction of Sichuan Province

30	DFS	Department of Finance of Sichuan Province
31	LRBS	Land and Resource Bureau of Sichuan Province
32	TBS	Tourism Bureau of Sichuan Province
33	OLRS	Land and Resources Office of Sichuan Province
34	GAQSS	General Administration of Quality Supervision of Sichuan province
35	BGMRS	Bureau of Geology and Mineral Resources of Sichuan province
36	EBS	Energy Bureau of Sichuan Province
37	ABS	Auditing Bureau of Sichuan Province
38	FGBS	Forestry and Grass Bureau of Sichuan Province
39	SMBS	Surveying and Mapping Bureau of Sichuan Province
40	PCSS	Protection Central Station of Sichuan Province
41	NCD	National Construction Department
42	NCAD	National Civil Affairs Department
43	NDRC	National Development and Reform Commission
44	NEB	National Earthquake Bureau
45	NFB	National Finance Bureau
46	NFD	National Finance Department
47	NTB	National Tourism Bureau
48	NTD	National Transport Department
49	SCC	State Council of China

890

891 Table 3 Descriptive statistics of government sectors involved in the post-disaster management of
892 Jiuzhaigou National Park

Types	Number	Percentage
National	9	18.3%
Provincial	17	34.6%
Municipal/district	23	46.9%

893

894 Table 4. Network density and cohesion of intergovernmental collaboration networks at the emergency,
895 intermediate and long-term recovery stages

Indexes	Emergency stage	Intermediate stage	Long-term recovery stage
Density	0.3364	0.4381	0.1392
Ties	37	184	147
Actors	11	21	33
Average distance	1.664	1.733	1.861

896

897 Table 5 Centrality measures of the intergovernmental collaboration network at the emergency stage

Government sectors	Degree	Closeness	Betweenness
SCC	40.000	62.500	0.000
GS	40.000	62.500	0.000
GA	50.000	66.667	3.333
GJ	40.000	62.500	0.000
ABJ	100.000	100.000	75.556
NDRC	20.000	55.556	0.000
DFS	30.000	58.824	1.111

DFJ	20.000	55.556	0.000
WBA	20.000	55.556	0.000
LRBS	10.000	52.632	0.000
TBA	10.000	52.632	0.000

898

899 Table 6. Centrality measures of the intergovernmental collaboration network at the intermediate stage

Government sectors	Degree	Closeness	Betweenness
ABJ	70.000	76.923	41.404
GJ	65.000	66.667	2.480
GEBS	10.000	42.553	0.000
SMBS	10.000	42.553	0.000
GS	65.000	66.667	2.480
GA	55.000	54.054	0.000
NDRC	60.000	64.516	0.287
NCAD	60.000	64.516	0.287
NFD	60.000	64.516	0.287
NCD	60.000	64.516	0.287
NTD	60.000	64.516	0.287
NFB	60.000	64.516	0.287
NTB	60.000	64.516	0.287
NEB	60.000	64.516	0.287
DRCS	70.000	68.966	19.234
DRS	15.000	47.619	0.000
TBA	25.000	52.632	26.842
TPBA	15.000	36.364	0.000
FBA	15.000	36.364	0.000
ICBA	15.000	36.364	0.000
TBS	10.000	48.780	0.000

900

901 Table 7. Centrality measures of the intergovernmental collaboration network at the long-term recovery

902 stage

Government sectors	Degree	Closeness	Betweenness
ABJ	100.000	100.000	86.492
DRCS	12.500	53.333	0.067
GS	15.625	54.237	0.202
DCS	9.375	52.459	0.000
NCD	3.125	50.794	0.000
DFS	6.250	51.613	0.000
TBS	15.625	54.237	0.134
TBA	15.625	54.237	0.134
DCA	15.625	54.237	0.403
GJ	21.875	56.140	1.310
GA	25.000	57.143	1.579
DRCA	21.875	56.140	1.210
EMOA	3.125	50.794	0.000
DFA	3.125	50.794	0.000
CSOA	6.250	51.613	0.000
NFD	9.375	52.459	0.000
DCJ	9.375	52.459	0.000
CEITA	9.375	52.459	0.000

EPCURS	12.500	53.333	0.000
EPCURA	12.500	53.333	0.000
OLRS	3.125	50.794	0.000
ROA	9.375	52.459	0.000
GAQSS	9.375	52.459	0.000
BGMRS	3.125	50.794	0.000
MG	9.375	52.459	0.000
DRCJ	9.375	52.459	0.000
EBS	9.375	52.459	0.000
ABS	3.125	50.794	0.000
FGBS	15.625	54.237	0.000
PCSS	15.625	54.237	0.000
FGBA	15.625	54.237	0.000
FGBJ	15.625	54.237	0.000
SFJ	15.625	54.237	0.000

903

904 Table 8. Clique analysis results for the intergovernmental collaboration network at the emergency,
905 intermediate and long-term recovery stages

Stage	Clique	Government sector	Size
Emergency stage	1	SCC GS GA GJ ABJ	5
	2	GA ABJ WBA	3
	3	ABJ NDRC DFS	3
	4	ABJ DFS DFJ	3
Intermediate stage	1	ABJ GJ GS NDRC NCAD NFD NCD NTD NFB NTB NEB DRCS	12
	2	ABJ GJ GS DRS	4
	3	ABJ TBA TBS	3
	4	GEBS SMBS DRCS	3
	5	GJ GS GA NDRC NCAD NFD NCD NTD NFB NTB NEB DRCS	12
	6	TBA TPBA FBA ICBA	4
Long-term recovery stage	1	ABJ, DRCS, GS, GA	4
	2	ABJ, GS, GA, ROA	4
	3	ABJ, GS, GA, MG	4
	4	ABJ, DFS, GA	3
	5	ABJ, GJ,GA	3
	6	ABJ, DRCS, GA, DRCA	4
	7	ABJ, DCS, DCA, ROA	4
	8	ABJ, TBS, TBA, EPCURS, EPCURA	5
	9	ABJ, TBS, TBA, GJ	4
	10	ABJ, DCA,DRCA,CEITA	4
	11	ABJ, GJ,CSOA	3
	12	ABJ, GJ, NFD,DCJ	4
	13	ABJ, DRCA, DRCJ, EBS	4
	14	ABJ, FGBS, PCSS, FGBA, FGBJ, SFJ	6

906

907 Table 9. Results for structural holes in the intergovernmental collaboration network at the emergency
908 stage

Government sectors	EffSize	Efficie	Constra
SCC	1.000	0.250	0.766
GS	1.000	0.250	0.766

GA	2.000	0.400	0.667
GJ	1.000	0.250	0.766
ABJ	8.300	0.830	0.240
NDRC	1.000	0.500	1.125
DFS	1.667	0.556	0.840
DFJ	1.000	0.500	1.125
WBA	1.000	0.500	1.235
LRBS	1.000	1.000	1.000
TBA	1.000	1.000	1.000

909

910 Table 10. Results for structural holes within the intergovernmental collaboration network at the
911 intermediate stage

Government sectors	EffSize	Efficie	Constra
GJ	2.692	0.207	0.281
GEBS	1.000	1.000	1.125
SMBS	1.000	1.000	1.125
GS	2.692	0.207	0.281
GA	1.000	0.091	0.331
NDRC	1.167	0.097	0.306
NCAD	1.167	0.097	0.306
NFD	1.167	0.097	0.306
NCD	1.167	0.097	0.306
NTD	1.167	0.097	0.306
NFB	1.167	0.097	0.306
NTB	1.167	0.097	0.306
NEB	1.167	0.097	0.306
DRCS	4.571	0.327	0.248
DRS	1.000	0.333	0.926
TBA	3.400	0.680	0.513
TPBA	1.000	0.333	0.926
FBA	1.000	0.333	0.926
ICBA	1.000	0.333	0.926
TBS	1.000	0.500	1.125

912

913 Table 11. Results for structural holes within the intergovernmental collaboration network at the long-
914 term recovery stage

Government sector	EffSize	Efficie	Constra
ABJ	29.406	0.919	0.087
DRCS	1.500	0.375	0.424
GS	2.200	0.440	0.483
DCS	1.000	0.333	0.637
NCD	1.000	1.000	1.000
DFS	1.000	0.500	0.587
TBS	1.800	0.360	0.487
TBA	1.800	0.360	0.487
DCA	2.600	0.520	0.462
GJ	4.615	0.659	0.356
GA	5.133	0.642	0.351
DRCA	4.429	0.633	0.342

EMOA	1.000	1.000	1.000
DFA	1.000	1.000	1.000
CSOA	1.000	0.500	0.599
NFD	1.000	0.333	0.609
DCJ	1.000	0.333	0.609
CEITA	1.000	0.333	0.522
EPCURS	1.000	0.250	0.572
EPCURA	1.000	0.250	0.572
OLRS	1.000	1.000	1.000
ROA	1.000	0.333	0.517
GAQSS	1.000	0.333	0.637
BGMRS	1.000	1.000	1.000
MG	1.000	0.333	0.517
DRCJ	1.000	0.333	0.602
EBS	1.000	0.333	0.602
ABS	1.000	1.000	1.000
FGBS	1.000	0.200	0.555
PCSS	1.000	0.200	0.555
FGBA	1.000	0.200	0.555
FGBJ	1.000	0.200	0.555
SFJ	1.000	0.200	0.555

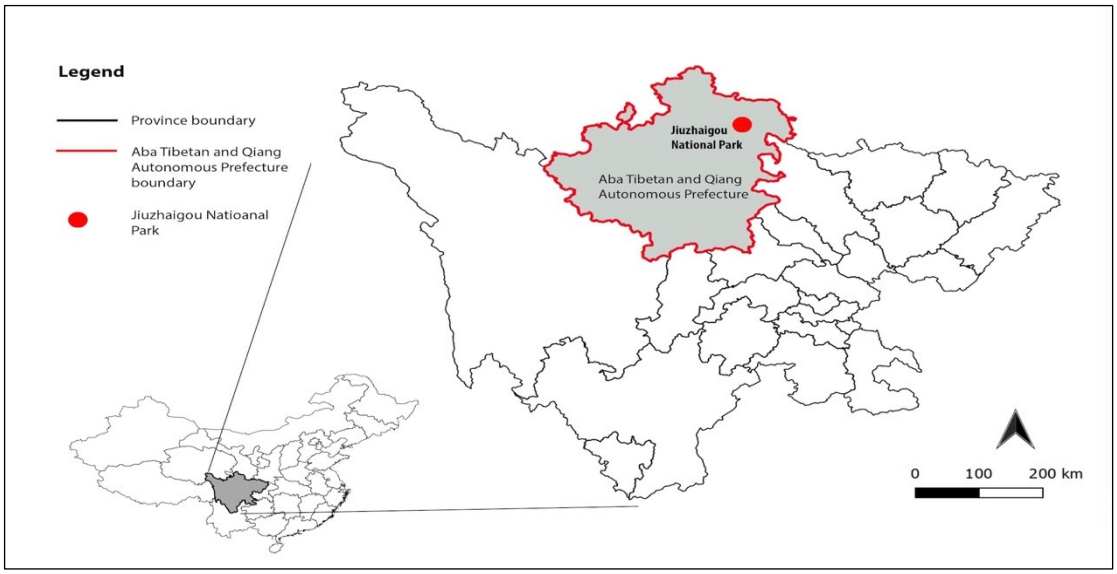
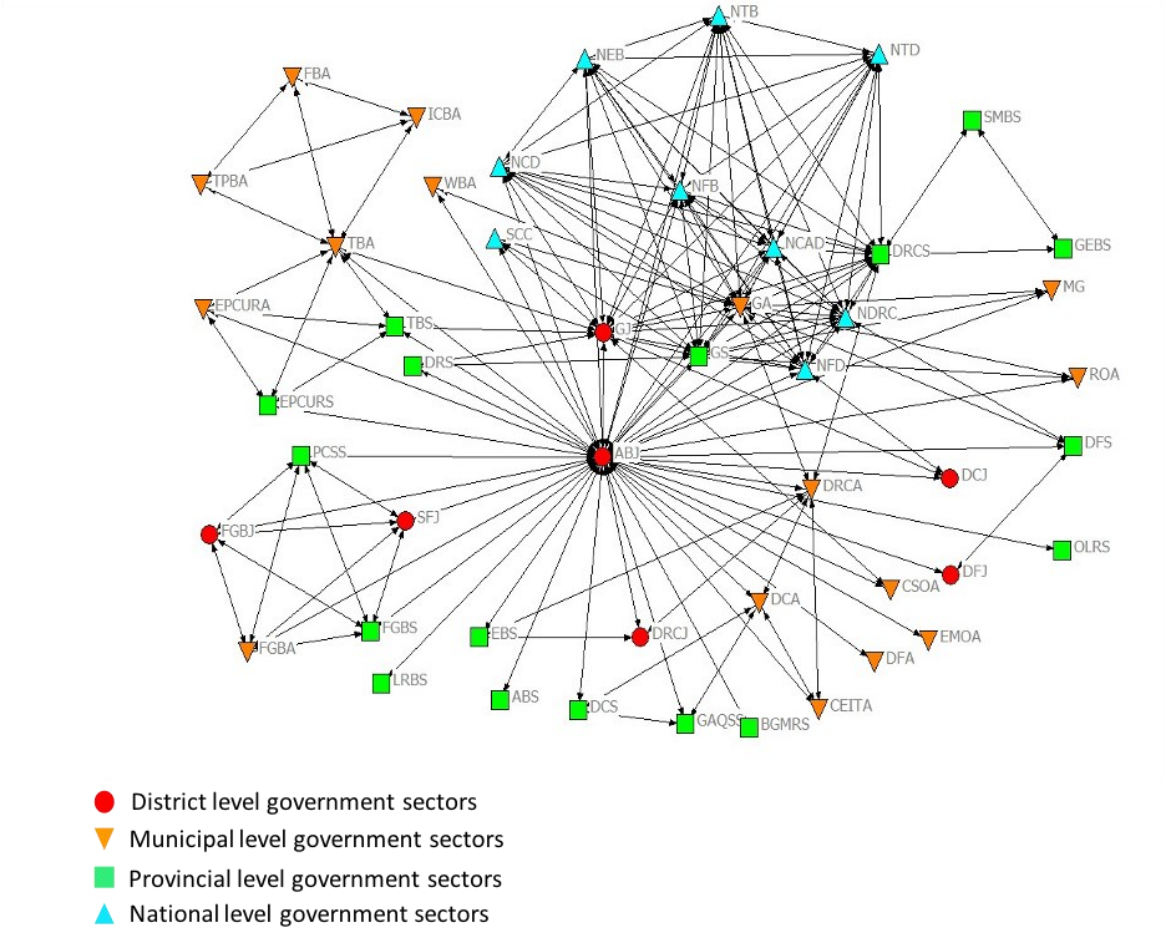


Figure 1. The location of Jiuzhaigou National Park (Source: authors)



951 Figure 2. The entire network of intergovernmental collaboration for the post-disaster destination
952 management of Jiuzhaigou National Park
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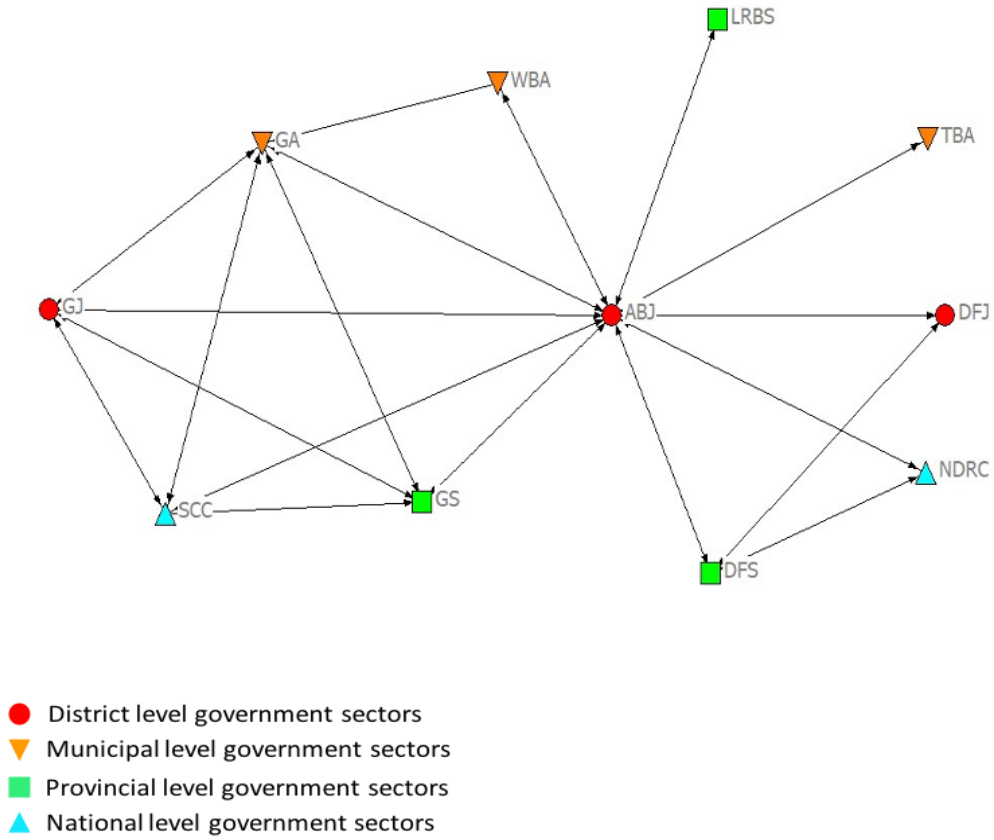

Figure 3. The intergovernmental collaboration network at the emergency stage

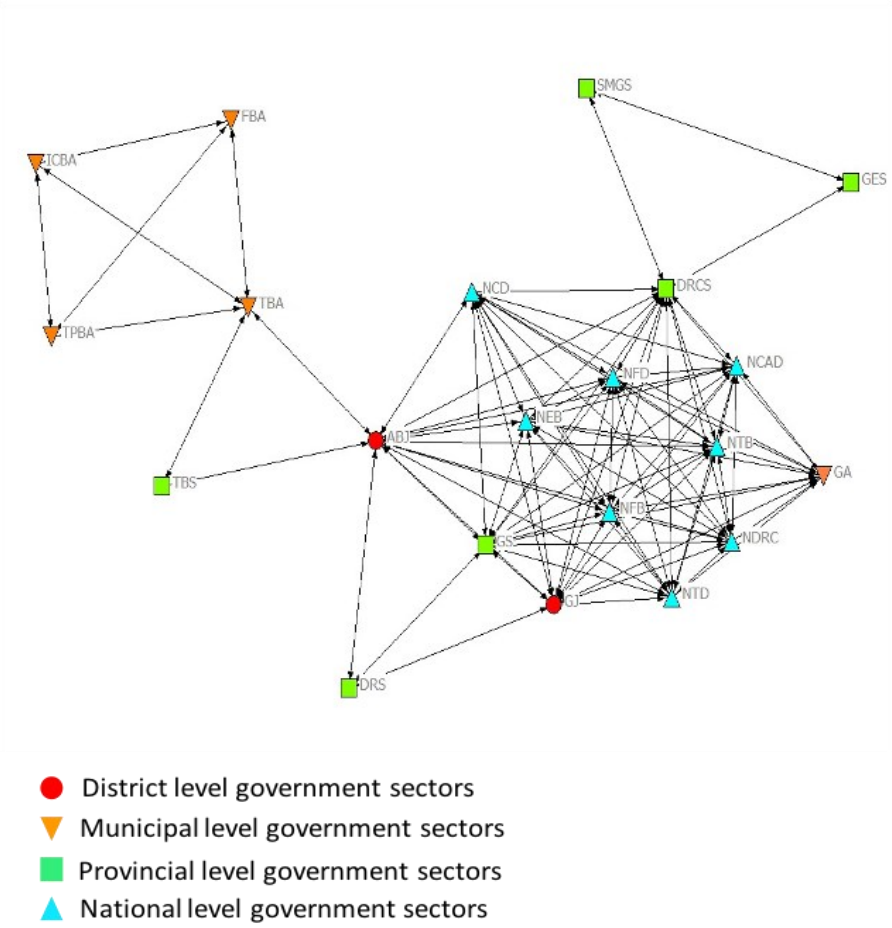

Figure 4. The intergovernmental collaboration network at the intermediate stage

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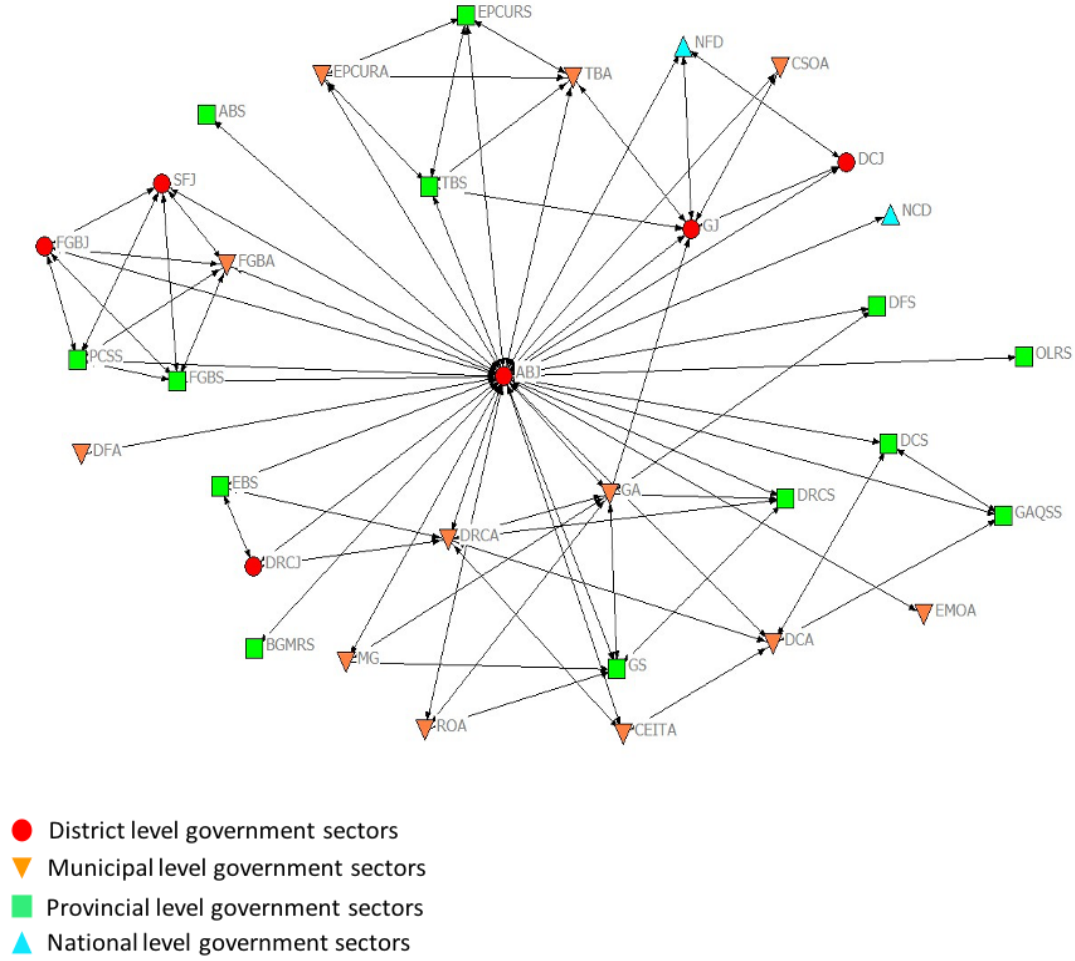

1014 Figure 5. The intergovernmental collaboration network at the long-term recovery stage