Integrated stakeholder analysis for effective urban flood management in a medium-sized city in China: A case study of Zhuji, Zhejiang province

A thesis submitted in fulfilment of the requirements for the award of the degree

Doctor of Philosophy

From

Encheng Zhou
Water Engineering Development Centre

School of Civil and Building Engineering

Loughborough University
January 2018

Abstract

Over recent decades, the stakeholder arena for urban flood management has become well recognised as being complex and dynamic. Various stakeholders are involved

before, during and after a flooding event, all of which have different interests and demands. Therefore, an initial stakeholder identification and analysis stage is required before detailed stakeholder engagement strategies can be developed and employed.

Drawing on urban flood management in Zhuji, a typical medium-sized city that has suffered urban flooding in China, this research project used a mixed-method research methodology within a single case-study approach to explore the current stakeholder arena for urban flood management in a medium-sized Chinese city. By combining stakeholder salience analysis with social network analysis, this study tries to create a more nuanced insight into the stakeholder arena, so that stakeholder participation in urban flood management can be improved.

This thesis produces several findings. First, it provides empirical evidence to show that traditional one-dimensional stakeholder analysis methods – such as the level of interest and influence; cooperation and competition; cooperation and threat; and stakeholder interest and power – cannot provide an in-depth understanding of a complex and dynamic stakeholder arena, as exists for urban flood management. By way of contrast, the proposed stakeholder analysis approach, which combines both stakeholder salience and network analyses, can create a multi-dimensional understanding of urban flood management stakeholders and allows the initial problem space to be recast into a more detailed or nuanced understanding of the problems presented. This improved understanding of the stakeholder arena and the related problem space provides a more solid information foundation upon which new stakeholder and community engagement practices can be developed.

Second, this thesis argues that the Mitchell et al. (1997) salience model experiences limitations in practice. Only five of the seven salience groups were identified in the present research project, with both the Dangerous and Demanding stakeholder groups missing. This indicates that the identification of urban flood management stakeholders in a medium-sized Chinese city is highly dependent on their legitimate claims.

Third, the social network analysis used in this project not only explores the relationships between stakeholders, but also provides an opportunity to present other one-dimensional stakeholder attitudes. This enhancement of the data beyond one-dimensional visual representations to dynamic and interactive processes not only better assists policy-makers in developing new and improved engagement practices, it also allows engagement practitioners to educate stakeholders and interactively improve understanding of the situation among those stakeholders. This understanding, in turn, is assumed to facilitate collaborative problem solving.

Acknowledgements

世有伯乐，然后有千里马。千里马常有，而伯乐不常有。（韩愈，768-824）

"Without the horse master, Bole, there would be no horses of one thousand miles. A horse which can run one thousand miles in one stroke is not at all rare. However, a master like Bole, who can tell which horse has such ability, is rare." (Han Yu, 768-824 A.D.)

I thank Dr Sam Kayaga, who is the "master of horses" and who saw my potential and has been helping, assisting and advising me throughout my entire PhD. No other words can better describe his contribution to my personal academic development than the story of the horse master, Bole.

I am indebted to my other two supervisors, Dr Kevin Sansom and Mr Brian Reed. Thank you to both of you for continually encouraging me and providing unlimited advice.

I would also like to express sincere thanks to the different participants of my study, especially the ones from the Municipal Flood Control and Drought Relief Headquarters Office and the Municipal Water Resources and Hydropower Bureau in Zhuji. Without their help, I would not have been able to conduct the case study.

In addition, I am very much indebted to my parents, for their love, support and patience.

Lastly, my friends, both from China and the UK, who have helped me through all these years: I would also like to express my appreciation to them.

Table of contents

Abstract 0

Acknowledgements 3

List of tables 13

List of figures 16

List of network maps 18

Acronyms and Abbreviation 21

1. Introduction 23

1.1 Background to the research 24

1.1.1 Challenges for medium-sized cities in China 25

1.1.2 Importance of stakeholder analysis 26

1.2 Research problem and research questions 27

1.3 Research aim and research objectives 29

1.4 Delimitations of scope 31

1.5 Format of this thesis 32

2. Literature review 33

2.1 Chapter introduction 33

2.2 An integrated urban flood management 33

2.2.1 Integrated urban flood management concept 34

2.2.2 Structural and non-structural measures 37

2.2.3 Stakeholders' involvement in urban flood management 38

2.3 Urban flood management of medium-sized cities in China 40

2.3.1 Urban flood management in China 40

2.3.2 Medium-sized cities 41

2.4 Stakeholder involvement in urban flood management in China 44

2.4.1 Common institutional arrangements 44

2.4.2 Benefits and drawbacks 46

2.5 Stakeholder theory 47

2.5.1 The development of stakeholder concepts 48

2.5.2 Stakeholder definition and identification 50

2.6 Stakeholder engagement 52

2.6.1 Stakeholder engagement definition 52

2.6.2 Stakeholder engagement strategies 53

2.7 Stakeholder analysis 58

2.7.1 Stakeholder differentiation and categorisation 59

2.7.2 Stakeholder salience model 61

2.7.3 Investigating stakeholder relationships 65

2.7.4 Social network analysis 66

2.8 Summary and gaps in literature 67

3. Methodology 71

3.1 Introduction 71

3.2 Approach 72

3.3 Research design 73

3.3.1 Case study selection process 74

3.3.2 Case-study preparation 75

3.4 Scoping study 77

3.5 Data collection 79

3.5.1 Key document analysis (qualitative) 80

3.5.2 Key informant interviews (qualitative and quantitative) 80

3.5.3 Questionnaire survey (qualitative and quantitative) 83

3.5.4 Observation role as a researcher 86

3.5.5 Instrument pre-testing 86

3.5.5 Pilot study 87

3.5.6 Database summary 88

3.6 Data analysis 89

3.6.1 Qualitative data analysis – stakeholder identification 89

3.6.2 Quantitative data analysis – stakeholder salience 90

3.6.3 Quantitative data analysis – social network 91

3.7 Ethical considerations 94

3.8 Conclusion 94

4. Case context 96

4.1 Urban flood management in ZJ 96

4.2 Factors that shape urban flooding in ZJ 97

4.3 History of urban flood management in Zhuji 100

4.4 Institutional arrangements for urban flood management in Zhuji 107

4.5 Summary 113

4.6 Conclusion 113

5. Data Analysis – Flood Preparedness 114

5.1 Chapter structure 114

5.2 Background context 114

5.3 Stakeholder identification 115

5.4 Salience of stakeholders 124

5.4.1 Reflection on stakeholder salience 125

5.5 Urban flood preparedness network analysis 129

5.5.1 The stakeholder network examined 130

5.5.2 Integrated discussion of the components and issues 138

5.6 Conclusion 141

6. Data Analysis – Flood Response 145

6.1 Chapter structure 145

6.2 Background context 145

6.3 Stakeholder identification 146

6.4 Salience of stakeholders 151

6.4.1 Reflection on stakeholder salience 152

6.5 Urban flood emergency response network analysis 154

6.5.1 The stakeholder network examined 155

6.5.2 Integrated discussion of the components and issues 162

6.6. Conclusion 165

7. Data Analysis – Flood Recovery 169

7.1 Chapter structure 169

7.2 Background context 169

7.3 Stakeholder identification 170

7.4 Salience of stakeholder 173

7.4.1 Reflection on stakeholder salience 174

7.5 Urban flood recovery network analysis 175

7.5.1 The stakeholder network examined 176

7.5.2 Integrated discussion of the components and issues 183

7.6 Conclusion 185

8. Cross-period analysis 189

8.1 Stakeholder identification across the flood periods 189

8.2 Stakeholder salience across the periods 193

8.3 Network analysis across the periods 198

8.4 Integration of the stakeholder analysis 201

8.5 Summary 205

9. Discussion of findings 208

9.1 Introduction 208

9.2 Stakeholder analysis methods in urban flood management 208

9.3 The focus of stakeholder identification 210

9.4 Stakeholder differentiate and categorisation – stakeholder salience model 212

9.5 Investigation stakeholder relations – network analysis 215

9.6 The combination of stakeholder salience and social network analysis 217

9.7 Conclusion 219

10. Conclusions and applications 222

10.1 Introduction 222

10.2 Conclusions about the research questions 222

10.3 Conclusions to knowledge 226

10.3.1 Contributions to theory 226

10.3.2 Contributions to practice 227

10.3.3 Contributions to policy 229

10.4 Limitations of the research 230

10.5 Future directions for the research 231

References and Bibliography 232

Appendixes 262

A. Stakeholder roles 264

B. Scoping phase interviews questions 271

C. Key informant interview questions 272

C1. List of people that were interviewed – key informant interviews 278

D. Stakeholder survey 279

E. Stakeholder groups of flood emergency management in Zhuji 289

F. Network maps-Gephi 292

F.1 Urban flood Preparedness (information exchange quality) 293

F.2 Urban flood Preparedness (interaction frequency) 294

F.3 Urban flood emergency response (information exchange) 295

F.4 Urban flood emergency response (interaction frequency) 296

F.5 Urban flood emergency response (information exchange) 297

F.6 Urban flood emergency response (interaction frequency)..... 298

List of tables

Table 1-1 The relationship between research questions and research objectives…….....29

Table 2-1 The structure of FCDRHs at each administrative level in China (Kobayashi and Porter, 2012) 45

Table 2-2 Stakeholder types (Mitchell et al., 1997)..... 64

Table 3-1 Network boundaries identification approaches (Knoke and Yang, 2008) 85

Table 3-2 Data collection techniques..... 88

Table 3-3 Example of salience data for one stakeholder 91

Table 3-4 Network characteristics 93

Table 4-1 Detailed information on the 14 key urban pumping stations in Zhuji 104

Table 4-2 Current flood-warning levels..... 106

Table 4-3 Stakeholder groups for flood emergency management in Zhuji..... 109

Table 5-1 Flood preparedness stakeholders' classification.....116

Table 5-2 Roles of service operation stakeholders in urban flood preparedness 119

Table 5-3 Salience analysis of urban flood preparedness stakeholders 124

Table 5-4 Network measures and their definitions 129

Table 5-5 Core-periphery analysis for urban flood preparedness networks 133

Table 5-6 Final overview of urban flood preparedness stakeholders in Zhuji. 143

Table 6-1Urban flood response stakeholder classification 146

Table 6-2 Roles of service operation stakeholders in urban flood emergency response 149

Table 6-3 Salience analysis of urban flood emergency rescue and response stakeholders 151

Table 6-4 Network measures and their definitions 154

Table 6-5 Core-periphery analysis of urban flood emergency response networks 158

Table 6-6 Final overview of the urban flood emergency response stakeholders in Zhuji 166

Table 7-1 Urban flood recovery stakeholders' classification..... 170

Table 7-2 Salience analysis of urban flood recovery stakeholders 173

Table 7-3Network measures and their definitions 175

Table 7-4 Core-periphery analysis of the urban flood recovery networks..... 178

Table 7-5 Final overview of urban flood recovery stakeholders in Zhuji..... 186

Table 8-1 Stakeholder identification across the three urban flood periods..... 191

Table 8-2 Cross-period stakeholder salience distribution..... 195

Table 8-3 Results of the network analysis measures during urban flooding ... 199

Table 8-4 Core and periphery stakeholders during the three urban flood periods 200

Table 8-5 General stakeholder classification and salience attitudes for MFPDRHO, WCHB, ZTRS and WCA 202

Table 8-6 Identification of core and periphery stakeholders of MFPDRHO, WCHB, ZTRS and WCA..... 202

Table 8-7 Betweenness centrality of MFPDRHO, WCHB, ZTRS and WCA. 202

List of figures

Figure 2-1 The conceptual framework of an integrated urban flood management (WMO, 2008)..... 35

Figure 2-2 Total water-cycle management (WMO, 2008)..... 36

Figure 2-3 Urban population of major cities in China (2000) (Cheng, 2014)... 42

Figure 2-4 The average annual rainfall in China (2000) (Cheng, 2014) 42

Figure 2-5 The 24-hour rainfall for a 100-year flood (2000) (Cheng, 2014) 42

Figure 2-6 Levels of stakeholder engagement (WMO, 2006)..... 56

Figure 2-7 Topology and methods of an integrated stakeholder analysis (Reed et al., 2009) 59

Figure 2-8 Stakeholder salience model (Mitchell et al., 1997)..... 62

Figure 3-1 Basic types of designs for case studies (Yin, 2003)..... 73

Figure 3-2 Integrated stakeholder analysis framework for each period of urban flood management..... 76

Figure 3-3Municipal government postal system in Zhuji..... 86

Figure 4-1 Urban floods in Zhuji..... 97

Figure 4-2 Zhuji central urban area plan 2005 and 2006-2020 98

Figure 4-3 Average, maximum and minimum rainfall each month from 1979 to 2016 99

Figure 4-4 Water-logging disaster during typhoon ‘Can-hom’ in 2015..... 101

Figure 4-5 Urban flood control facilities (central urban area) 2006-2020 102

Figure 4-6 Flood consultation during typhoon Can-hom in 2015 105

Figure 5-1 Zhuji flood-fighting exercise in 2007 114

Figure 5-2 Stakeholder groups of urban flood preparedness in Zhuji 117

Figure 5-3 Logistics stakeholder group for urban flood preparedness in Zhuji 123

Figure 5-4 Legend for the network maps as used in Network Maps 5.1 and 5.2 131

Figure 6-1 Stakeholder groups for urban flood response in Zhuji..... 148

Figure 6-2 Logistics stakeholder group for urban flood response in Zhuji 150

Figure 6-3 Legend for network maps as used in Network Maps 6.1a and 6.1b 156

Figure 6-4 Legend for the network maps as used in this chapter, showing salience attitudes..... 162

Figure 7-1 Stakeholder groups for urban flood recovery in Zhuji..... 172

Figure7-2 Legend for the network maps as used in this chapter, showing salience attitudes..... 183

Figure 8-1 Stakeholder groups during the urban flood management in Zhuji. 190

Figure 8-2 Distribution of stakeholder salience types identified for each urban flood period..... 194

Figure 9-1 Urban flood management stakeholder types in this research project 214

List of network maps

Network Map 5-1 Stakeholder information exchange quality for urban flood preparedness..... 132

Network Map 5-2 Stakeholder interaction frequency for urban flood preparednes 132

Network Map 5-3 Information exchange network for urban flood preparedness, showing network centrality in node size..... 135

Network Map 5-4 Stakeholder interaction network for urban flood preparedness, showing network centrality in node size..... 135

Network Map 5-5 Information exchange network during urban flood preparedness, showing weak ties 137

Network Map 5-6 Stakeholder interaction network during urban flood preparedness, showing weak ties 137

Network Map 6-1 Stakeholder information exchange quality for urban flood response 157

Network Map 6-2 Stakeholder interaction frequency for urban flood response 157

Network Map 6-3 Information exchange network for urban flood response, showing network centrality in node size..... 159

Network Map 6-4 Stakeholder interaction network for urban flood response, showing network centrality in node size..... 160

Network Map 6-5 Information exchange network during urban flood response, showing weak ties 161

Network Map 6-6 Stakeholder interaction network during urban flood response, showing weak ties 161

Network Map 6-7 Information exchange network during an urban flood response, showing stakeholder salience attitudes 163

Network Map 6-8 Stakeholder interaction network during an urban flood response, showing stakeholder salience attitudes 163

Network Map 7-1 Stakeholder information exchange quality for urban flood recovery 177

Network Map 7-2 Stakeholder interaction frequency for urban flood recovery 178

Network Map 7-3 Information exchange network for urban flood recovery, showing network centrality in node size 180

Network Map 7-4 Stakeholder interaction network for urban flood recovery, showing network centrality in node size 180

Network Map 7-5 Information exchange network during urban flood recovery, showing weak ties 182

Network Map 7-6 Stakeholder interaction network during urban flood recovery, showing weak ties 182

Network Map 7-7 Information exchange network during urban flood recovery, showing stakeholder salience attitudes 183

Network Map 7-8 Stakeholder interaction network during urban flood recovery, showing stakeholder salience attitudes 184

Network Map 8-1 Filtered preparedness networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency) 203

Network Map 8-2 Filtered response networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency)... 203

Network Map 8-3 Filtered recovery networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency 203

Acronyms and Abbreviation

AB	Agricultural Bureau
BIA	Building Industry Authority
BPBC	Zhuji Branch of the People's Bank of China
CBO	community-based organisation
CAB	Civil Affairs Bureau
CF	Zhuji Charity Federation
CLPCIC	Zhuji Branch of the China Life Property and Casualty Insurance Company Limited
CMMC	Commerce Mall Management Committee
CO	The City Office
DRB	Development and Reform Bureau
EMO	Emergency Management Office
EPB	Environmental Protection Bureau
ETB	Economic and Trade Bureau
FB	Fire Brigade
HCB	Housing and Construction Bureau
IWRM	integrated water resource management
HSGO	Huandoing Sub-District Government Office
IFM	integrated flood management
JSGO	Jiyang Sub-District Government office
LRB	Land Resource Bureau
MAB	Municipal Auditing Bureau
MAO	Municipal Agricultural Office
MB	Meteorology Bureau
MBLC	Municipal Bureau for Letters and Calls
MDC	Municipal Development Committee
MEB	Municipal Education Bureau
MFB	Municipal Finance Bureau
MFMB	Municipal Forestry Bureau
MFPDRHs	Municipal Flood Prevention and Drought Resistance Headquarters
MFPDRHO	Municipal Flood Prevention and Drought Resistance Headquarters Office (Routine office of MFPDRHs)
MFSB	Municipal Food Supply Bureau
MJB	Municipal Justice Bureau
MPD	Municipal Publicity Department
MPSB	Public Security Bureau
MSB	Municipal Statistical Bureau
MTB	Municipal Transportation Bureau
MTCB	Municipal Telecommunication Bureau
MUMB	Municipal Urban Management Bureau

PAFD	People's Armed Forces Department
PB	Planning Bureau
PHB	Public Health Bureau
NGO	non-governmental organisation
PSB	Power Supply Bureau
RC	Red Cross Society of China
SB	Supervisory Bureau
SIB	Safety Inspection Bureau
SIDO	Service Industry Development Office
TB	Tourism Bureau
TCYLC	The Communist Youth League Committee
TSGO	Taozhu Sub-District Government Office
TWCM	total water-cycle management
WAGL	Zhuji Water Affairs Group Limited
WCA	Water Conservancy Association
WCHB	Water Conservancy and Hydropower Bureau
ZD	Zhuji Daily
ZTRS	Zhuji TV and Radio Station

1. Introduction

Over the last few decades, climate change has increased both the frequency and severity of flooding. In urban areas, rapid urbanisation and population growth have dramatically increased the value of urban assets and the numbers of citizens at risk (APFM, 2004). These issues are forcing many countries to rethink how their governments manage their urban flood control systems (Rijke et al., 2012). In China, decision-makers have recognised the importance of implementing an integrated urban flood management approach, one which considers all surrounding issues, such as drinking water supply, wastewater management, surface water control and urban land-use planning (Jha et al., 2012). However, such an approach highlights the many intertwined social and economic interactions between management activities, and the complexity of the multi-stakeholder environment during the flood preparedness, response and recovery periods. Analysing the relevant stakeholders and effectively involving them in the various management activities, therefore, becomes a priority before implementing an integrated urban flood management approach in China.

It is now well recognised that stakeholder analysis is a vital first step in the stakeholder engagement process. Since it can potentially 'make or break' the engagement, various researchers have investigated developing stakeholder analysis methods in detail. However, most of these practices are applied to a simplified environment. Yet the stakeholder environment for urban flood management is usually considered to be a complex and dynamic one. No existing stakeholder practice has been able to develop a robust methodology that is applicable in urban flood management – either in China or in other countries around the world. Therefore, the main goal of this research project is to develop an empirically valid stakeholder analysis methodology that can be generalised for use in urban flood management.

The development of this methodology will advance the knowledge of stakeholder analysis in urban flood management and improve the practices that are available in medium-sized Chinese cities. In this chapter, a brief introduction to the research background is provided. It points out the current challenges for urban flood management in a medium-sized Chinese city, and highlights the importance of

stakeholder analysis. The main discussions on stakeholder analyses will be outlined in the literature review chapter. Following this research background, the research scope is introduced and the main assumptions made in this project are presented. In addition, the chapter also provides a brief outline of this thesis.

First, then, an insight into the research background is presented in the next section.

1.1 Background to the research

Flooding in an urban area is usually managed by multiple stakeholders, such as various types of government departments and agencies, research institutions, non-governmental organisations (NGOs), community-based organisations (CBOs), private companies and local communities. Decision-making for traditional urban flood management has largely been a top-down driven, engineering-oriented process. During that process, the tiers in relevant stakeholder engagement are deeply established. Stakeholders' roles are formed by their responsibilities and multiple interests during urban flooding. In a tiered system, however, this is done on an individualistic basis, shaped by each stakeholder's own narrow objectives (DEFRA, 2005). This kind of management process does not easily allow for adaptive planning, nor for new creative partnership opportunities to be discussed and accommodated. In fact, it can be prone to 'lock in' unsustainable behaviours, because timely and relevant information flow up and across the tiers is limited.

In the past century, many countries have recognised the importance of effective stakeholder engagement in urban flood management. Several legislations and guidelines have been developed. In the European Union (EU), both the Water Framework Directive (2000) and Flood Directive (2007) have encouraged its member states to have flood management plans that incorporate stakeholder cooperation and public consultation. In the UK, the Flood Risk Regulation (2009) and Flood and Water Management Act (2010) have required decision-makers to search for a more sustainable management approach, and increase capacities and skills of local stakeholders and communities (DEFRA, 2010). For developing countries, the World Bank developed guidelines on integrated urban flood management in 2012 (Jha et al., 2012). These guidelines outlined that integrated urban flood management should

sufficiently involve the relevant stakeholders, and encourage their cooperation to raise awareness and reinforce preparedness. As a result, these directives, regulations, guidelines and practices have pointed out the importance of stakeholder analysis, stakeholder engagement and stakeholder management in urban flood management.

The next sub-section provides a short overview of how current complex and inherently problematic situations have arisen in medium-sized Chinese cities. It also outlines why stakeholder engagement is important for municipal governments in China to achieve more effective urban flood management.

1.1.1 Challenges for medium-sized cities in China

Over the last 35 years, China has witnessed rapid development in its urban areas. More than 40,000km^2 of land has been urbanised, with the number of cities increasing from 193 to 653 and the urban population rising from 170 million to 750 million (Woods-Ballard et al., 2017). This kind of rapid urbanisation and population growth, without adequate planning and risk management, has made urban flooding an urgent issue in China. Annually more than 100 cities in the country are affected by urban flooding, with most being the small and medium-sized ones (CORFU, 2014).

Since the significant milestone ‘from flood control to flood management’ in 2004, decision-makers have recognised the importance of implementing integrated urban flood management in China (Cheng, 2006). However, the deep-rooted top-down management culture and clear-cut functional separation between different departments of municipal government critically affect the successful implementation of integrated measures (Meng & Dabrowski, 2016). This kind of situation is particularly prevalent in medium-sized cities.

First, most existing research seems to focus significantly on large cities, with less emphasis on small and medium-sized ones. This has caused the municipal government of these medium-sized cities to more easily overlook the development of integrated urban flood measures, especially non-structural measures. Second, existing practices have shown that most medium-sized Chinese cites lack financial and technical support. Following the traditional engineering-oriented management

process, most of these municipal governments have preferred structural measures, which provide more 'significant' results. Non-structural measures are usually considered to be time consuming and require long-term commitment. Third, clear-cut functional separation between different municipal departments has caused several disconnections in urban flood management. For example, in most medium-sized Chinese cities, the urban drainage system is managed by the Municipal Housing and Construction Department, while the Municipal Water Conservancy Department undertakes general flood management. The insufficient cooperation that typically exists between these two departments leads to a disconnection between urban drainage management and river flood management.

Detailed information about the current challenges of urban flood management in medium-sized Chinese cities is presented in the literature review chapter. Consequently, these challenges highlight effective stakeholder engagement to be a critical step before implementing any integrated urban flood management measures.

1.1.2 Importance of stakeholder analysis

It is now commonly accepted that stakeholder analysis is a priority for effective stakeholder engagement in urban flood management in China (Hu et al., 2008). First, the large scale of impacts of urban floods and the empowered social media have attracted a wide range of stakeholders to participate in urban flood management (Cheng & Chen, 2011). Identifying the relevant stakeholders, and determining when and how they should be involved during the decision-making process, remains an essential element of successful urban flood management. Second, most medium-sized Chinese cities fail to clearly define stakeholder responsibilities during urban flooding events (Meng & Dabrowski, 2016). Identifying stakeholder roles, and understanding their needs and requirements during urban flooding, is therefore becoming increasingly important to achieve effective stakeholder engagement in these cities. Third, during urban flood management, relationships between stakeholders always vary – from hostile to conciliatory, and from obstructive to collaborative (Crocker, 2007). Managing these relationships requires a flexible approach and indeed a stakeholder analysis if it is to assist in designing stakeholder

engagement strategies. Finally, although several policies and projects have emphasised the importance of effective stakeholder involvement in urban flood management – such as the Five Water Treatments Project and the Constitution of the Grass-roots Flood Management System Project (Department of Water Resources of Zhejiang Province, 2008) none has provided a detailed stakeholder engagement mechanism nor analysed the complex stakeholder arena.

1.2 Research problem and research questions

The previous section introduced the background to this research project and the concept that stakeholder engagement in urban flood management in a medium-sized Chinese city could achieve more significant results through an integrated stakeholder analysis process. However, there is no commonly accepted stakeholder analysis practice available in the literature. In fact, previous researchers have developed various types of stakeholder analysis methods, all of which have created many different variables that can be used to examine stakeholders. These include, for example, cooperation and competition (Freeman, 1984); cooperation and threat (Savage et al., 1991); stakeholder predictability and power (Mendelow, 1991); stakeholder interest and power (Eden and Ackerman, 1998; De Lopez, 2001); power, legitimacy and urgency (Mitchell et al., 1997); and social network analysis (Jonker and Foster, 2002).

Since there are so many variables, each of these identified methods only examines a small and different subset of what constitutes ‘the stakeholder’. In other words, only a partial analysis of the stakeholder is established. The major problem created by such a partial analysis is that detailed stakeholder engagement strategies would be developed based on limited knowledge, and hence would lead to mismanagement of stakeholders. For example, without considering the preferred outcomes and the relationship variables of the stakeholders, a high-interest and low-power stakeholder could – following De Lopez (2001)’s model – be identified as being less important. However, as introduced by Jonker and Foster (2002), this stakeholder may have a completely different preferred outcome to that of the other key actors, and own a strong ally outside the existing stakeholder arena. Compared with the problem owner

itself, this stakeholder may become far more important while developing some long-term solutions. Such an oversight, stemming from an inadequate analysis, can have far-reaching consequences. Therefore, it is important to develop a more holistic stakeholder analysis method to avoid such an oversight from occurring.

Furthermore, most existing stakeholder analysis methods are designed for a more simplistic stakeholder arena. No single variable can capture the complexity of the multiplicity of stakeholders involved in the Chinese urban flood management system. In the literature, many researchers have suggested investigating the potential of combining existing methods to derive more useful results in stakeholder analysis, and consequently allowing for a better-refined differentiation between stakeholders. Little research, however, *has thus far been undertaken* to prove this suggestion. Following the introduction, the main research question and five sub-questions are formulated below:

Main research question: *How can a multi-dimensional stakeholder analysis approach inform the stakeholder analysis of urban flood management in a typical medium-sized Chinese city, so that stakeholders can be effectively categorised?*

Sub-research questions:

1) *What existing stakeholder analysis methods worldwide can be adapted to the urban flood management of a medium-sized Chinese city?*
2) *What is the focus of stakeholder identification during the urban flood management of a medium-sized Chinese city?*
3) *How can the stakeholders of urban flood management in a medium-sized Chinese city be differentiated and categorised?*
4) *How can the structural relations between the stakeholders of urban flood management in a typical medium-sized Chinese city be explored?*
5) *To what extent can a multi-dimensional stakeholder analysis framework explore the current stakeholder arena of urban flood management in a medium-sized Chinese city?*

1.3 Research aim and research objectives

This research aims to improve stakeholder participation in urban flood management. The specific research objectives are presented in this section and are as follows:

- To identify the existing one-dimensional stakeholder analysis methods in the literature and to identify their advantages and limitations.
- To explore their use and effects in the urban flood management of a medium-sized Chinese city.
- To explore how a commonly accepted stakeholder analysis framework can be implemented in the urban flood management of a medium-sized Chinese city.
- To identify the key stakeholders during the urban flood management of a medium-sized Chinese city.
- To explore the differences between the descriptive, instrumental and normative stakeholder analysis approaches.
- To explore which of these three stakeholder analysis approaches can be applied to fit into the stakeholder arena of urban flood management in a medium-sized Chinese city.
- To identify the current stakeholder differentiation and categorisation methods existing in the literature and to ascertain their advantages and limitations.
- To differentiate the stakeholders by using the stakeholder salience model.
- To determine the different combinations of stakeholder power, legitimacy and urgency, and to explore their attributions to stakeholders of urban flood management in a medium-sized Chinese city.
- To identify how current stakeholder analysis methods can be used to explore the structural relations in the literature and to identify their advantages and limitations.
- By using social network analysis, to explore structural relations between the stakeholders of urban flood management in a typical medium-sized Chinese city.
- To explore the current stakeholder arena of urban flood management in a medium-sized Chinese city, by using a combination of the stakeholder

salience model and social network analysis.

- To determine the potential relationships between the stakeholders' salience attitudes and their structural relations.

Table 1.1 The relationship between the research questions and objectives

Research questions	Research objectives
1) *What existing stakeholder analysis methods worldwide can be adapted to the urban flood management of a medium-sized Chinese city?*	• To identify the existing one-dimensional stakeholder analysis methods in the literature and to identify their advantages and limitations. • To explore their use and effects in the urban flood management of a medium-sized Chinese city. • To explore how a commonly accepted stakeholder analysis framework can be implemented in the urban flood management of a medium-sized Chinese city.
2) *What is the focus of stakeholder identification during the urban flood management of a medium-sized Chinese city?*	• To identify the key stakeholders during the urban flood management of a medium-sized Chinese city. • To explore the differences between the descriptive, instrumental and normative stakeholder analysis approaches. • To explore which of these three stakeholder analysis approaches can be applied to fit into the stakeholder arena of urban flood management in a medium-sized Chinese city.
3) *How can the stakeholders of urban flood management in a medium-sized Chinese city be differentiated and categorised?*	• To identify the current stakeholder differentiation and categorisation methods existing in the literature and to ascertain their advantages and limitations. • To differentiate the stakeholders by using the stakeholder salience model. • To determine the different combinations of stakeholder power, legitimacy and urgency, and to explore their attributions to stakeholders of urban flood management in a medium-sized Chinese city.
4) *How can the structural relations between the stakeholders of urban flood management in a typical medium-sized Chinese city be explored?*	• To identify how current stakeholder analysis methods can be used to explore the structural relations in the literature and to identify their advantages and limitations. • By using social network analysis, to explore structural relations between the stakeholders of urban flood management in a typical medium-sized Chinese city.

5) *To what extent can a multi-dimensional stakeholder analysis framework explore the current stakeholder arena of urban flood management in a medium-sized Chinese city?*	• To explore the current stakeholder arena of urban flood management in a medium-sized Chinese city, by using a combination of the stakeholder salience model and social network analysis. • To determine the potential relationships between the stakeholders' salience attitudes and their structural relations.

1.4 Delimitations of scope

This research is limited to the stakeholder analysis of urban flood management in a Chinese medium-sized city. The study limited itself to stakeholder analysis; the design of detailed stakeholder engagement strategies is beyond its scope. Furthermore, the decision to impose this limitation was based on current evidence that urban flood management in medium-sized cities has achieved more attention than that in mega cities in China. Currently, many urban flood management projects have been applied in medium-size cities, with the majority of these mentioning the importance of stakeholder involvement. As a result, it was possible to collect more reliable data and get in touch with the key respondents.

The target population in this research is municipal stakeholders. Although there are other stakeholders included in urban flood management, such as national, river basin, provincial, sub-administration, sub-district and community-level stakeholders, most stakeholders that participate in the current decision-making process of urban flood management in Chinese medium-sized cities are at the municipal level. Various texts have highlighted the importance of community involvement in urban flood management; yet, in China, a lack of flood-risk maps and the related application of flood insurance have resulted in low public awareness in those medium-sized cities. The conclusions from this study are therefore limited to municipal stakeholders, especially municipal government organisations and agencies, as they are the main stakeholder groups that undertake urban flood prevention and mitigation activities in the medium-sized Chinese cities.

The author does not make generalisations beyond the above scope, although implications of the findings beyond these boundaries are laid out in Chapter 10.

Other limitations that became apparent during the progress of this research are acknowledged in section 10.4.

1.5 Format of this thesis

This thesis comprises nine chapters. Chapter 1 introduces the thesis topic. Chapter 2 presents the literature supporting the thesis and discusses the stakeholder paradigm of urban flood management in China in eight sections. Chapter 3 provides the research methodology by detailing the case-study approach and the proposed integrated stakeholder analysis framework. This framework shapes the core of the research. From here, Chapters 4 to 8 articulate the in-depth case study. Chapter 4 presents the context to the issues surrounding urban flood management in Zhuji, Zhejiang Province, China, and how these issues are integrated as part of the analysis. These issues form the backbone of the case study, with the findings being related back to these issues. Chapters 5, 6 and 7 present the three urban flooding periods: flood preparedness, flood response and flood recovery. Chapter 8 provides a synthesis of the findings and demonstrates the effectiveness of applying the multi-dimensional stakeholder analysis framework to urban flood management.

Finally, Chapter 9 presents the discussion and conclusions by drawing upon the findings from Chapter 8; it also provides answers to the research questions. It highlights the advances to knowledge that have been made and identifies the contribution of this research to the practice of stakeholder analysis. Chapter 9 concludes by identifying limitations and recommending avenues for future research.

2. Literature review

2.1 Chapter introduction

This chapter provides a review of the relevant literature on key issues of stakeholder analysis, stakeholder engagement and stakeholder management of urban flood management in medium-sized Chinese cites. The whole literature review can be divided into six main sections: 1) the concepts of integrated urban flood management, exploring integrated urban flood management approaches being applied around the world; 2) the challenges in China's medium-sized cities, describing the challenges of urban flood management in these cities and highlighting the need for effective stakeholder engagement strategies; 3) engaging urban flood management stakeholders in China, introducing the challenges of stakeholder engagement and common institutional arrangements in China; 4) stakeholder theory, answering the question why 'stakeholding' is an important management practice; 5) stakeholder engagement strategies, explaining the different types of engagement strategies that exist; and 6) stakeholder analysis processes, answering the question of what different types of stakeholder analysis methods exist. The material was sourced from published and unpublished journals, books, conference and workshop papers etc.

The following section explains the concepts of integrated urban flood management, a building block for this review.

2.2 An integrated urban flood management

As one of the most serious disasters around the world, urban flooding poses a serious challenge to the development and lives of people, especially the residents of rapidly expanding towns and cities in developing countries. Such flooding cannot be managed in isolation at the city scale and responses to potential flood impacts are complicated by interlinked political, socio-economic and environment changes (Zevenbergen et al., 2008). In the past few decades, traditional 'defence' management approaches have been declared infeasible in most countries around the world. At the same time, it is important to search for an integrated management approach to achieve more sustainable and holistic results (Jha et al., 2012).

The next three sub-sections introduce the concepts of integrated urban flood management, related structural and non-structural measures, and the need to engage stakeholders when implementing integrated urban flood management.

2.2.1 Integrated urban flood management concept

The nature of urban settlements, climate change and rapid population growth, as well as various social and economic development activities, have together put tremendous pressure on the natural resources of urban areas (PICC-Disaster Research Center, 2012). It is evident that activities undertaken by different departments and institutions, such as transportation systems, health and social welfare, water supply and sanitation, house settlements and pollution control, will influence and interact with each other (Jha et al., 2012). Furthermore, some other development activities beyond the city scale – such as energy production, river basin management and agricultural production – will also impact flood risk management in urban areas (Kobayashi & Porter, 2012). Therefore, it is important to mainstream urban flood risks into all these related activities.

As explained by the World Meteorological Organisation (WMO, 2008), the concepts of an integrated urban flood management can be generally divided into: (1) integrated flood management (IFM); (2) total water-cycle management (TWCM); and (3) land-use planning. Figure 2.1 presents the conceptual framework of an integrated urban flood management.

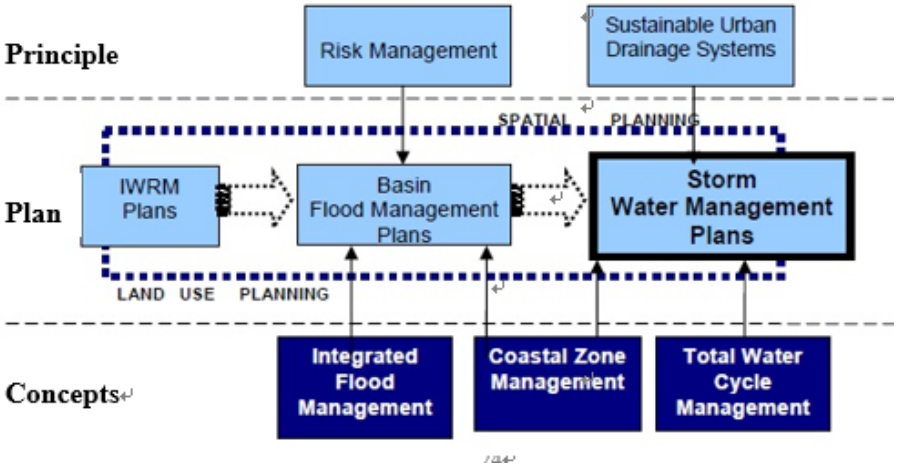


Figure 2-1 The conceptual framework of an integrated urban flood management (WMO, 2008)

Among these three urban flood risk management concepts, integrated flood management is a subset of integrated water resource management (IWRM). It aims to apply integrated and holistic measures to manage floods (APRM, 2004). As a subset of IWRM, integrated flood management combines both the IWRM's principles and risk management principles (WMO, 2008), i.e. it:

- applies the river basin approach;
- considers floods as part of the water cycle;
- integrates land and water resource management;
- adopts risk management approaches; and
- enables effective institutional collaboration and public participation.

Based on its integrated land and water resource management in a river basin, IFM aims to reduce the number of deaths and economic losses, while improving the efficient use of flood plains (Kundzewicz, 2002). To approach these aims, IFM applies both structural (e.g. reservoirs, dams and embankments) and non-structural measures (e.g. policies, regulations) to cope with floods. However, historically, floods can never be fully controlled (Christoplos, 2008). Thus, traditional flood management needs a paradigm shift away from 'flood control' to a more integrated 'flood management' approach.

The second concept, total water-cycle management (TWCM) is applied to link storm water management with water supply and sanitation management (Chanan and Woods, 2005). In other words, it is important to balance the three different types of urban water: drinking water, wastewater and surface run-off (Figure 2.2). Traditionally, storm water needs to be channelled out of the urban area as quickly and smoothly as possible. However, it is evident that in many cities, it is neither desirable to drain storm water as fast as possible nor possible to complete a separate storm water system (Pottier et al., 2005).

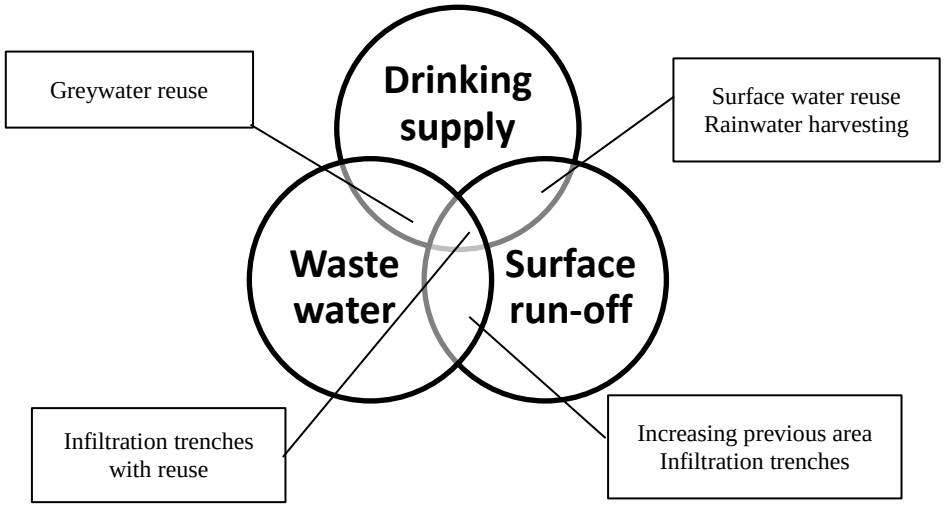


Figure 2-2 Total water-cycle management (WMO, 2008)

The third concept, land-use planning, comes through both the two previous discussed concepts of IFM and TWCM. Both of IFM and TWCM require appropriate use of land for various purposes. This means that flood management plans should be coordinated with land-use plans (FloodSite-Consortium, 2008). In urban settlements, all public infrastructure (hospitals, schools etc.), transportation, housing and location of sites, as well as other socio-economic development, are potentially affected by flood risks (Alphen & Beek, 2005). Land-use plans should be designed to include these kinds of issues to minimise flood impacts on them.

Overall, combining these three concepts provides more holistic and sustainable measures for urban flood management and leads to a general improvement in urban living conditions. However, many countries are struggling to devise appropriate polices and administrative mechanisms to facilitate that integration (WMO, 2008).

As discussed by APFM (2004), fundamental consideration should be taken for this kind of integration and harmonisation in urban flood management.

The next section introduces general structural and non-structural flood management measures that are applied around the world.

2.2.2 Structural and non-structural measures

An integrated urban flood management approach includes various types of measures. These are typically classified as either structural or non-structural (Andjelkovic, 2001; Alphen and Beek, 2005; Jha et al., 2012). Among them, structural measures aim to reduce flood risk by controlling the flow of water, both inside and outside the city scale (Jha et al., 2012). These measures include both hard-engineered structures, such as flood defences and drainage systems, and more sustainable measures, such as wetlands and natural buffers. Some of these have proved highly effective: for example, the Thames Barrier, the Dutch sea defences and the Japanese river systems. However, such structural measures usually have a high upfront cost, and can be overtopped by events outside their design capacity. Additionally, if they fail or are overtopped, these measures can result in increased impacts: for example, the tsunami in Japan in 2011 (Smith, 2013). In some circumstances, researchers believe that structural measures may only transfer flood risk by reducing flood risk in one location only to increase it in another. The redirection of water flows also frequently has an environmental impact (Alphen & Beek, 2005): for example, as with the Aswan Dam in Egypt and the Three Gorges Dam in China.

Due to these considerations, there is always a need to combine non-structural measures with structural ones. Non-structural measures look to build the capacity of people to cope with flooding within their environments (Andjelkovic, 2001). Compared with structural measures, non-structural measures do not usually require huge upfront investment, but they need a good understanding of flood hazard and an adequate flood forecasting system (Cap-Net, 2011). For example, an emergency evacuation plan is highly reliant on advance flood warning. As suggested by Jha et al. (2012), non-structural measures in urban areas can be classified under the following

four categories:

1) Flood preparedness measures which intend to raise public awareness and reduce risk during the urban management process (Andjelkovic, 2001). For example, keeping drains clear through better waste management.
2) Emergency response planning and preparedness, including material preparedness, flood warnings and evacuation plans (Hansson et al., 2008).
3) Land-use planning that avoids people living on a flood plain, by using flood risk maps (Jha et al., 2012).
4) Effective flood recovery to increase resilience by improving building design and construction (Ashley et al., 2007).

Overall, an integrated urban flood management strategy should combine both structural and non-structural measures. Structural and non-structural measures do not preclude each other; in fact, a successful structural strategy always combines both types of measures (Andjelkovic, 2001; Jha et al., 2012; Abbott et al., 2013).

The next section introduces stakeholder engagement in urban flood management, the top priority of implementing such integrated urban flood management strategies, especially in terms of non-structural measures.

2.2.3 Stakeholders' involvement in urban flood management

It is evident that the primary step for implementing such an integrated urban flood management strategy is to gain the involvement and agreement of stakeholders and their institutions (APFM, 2006; Jha et al., 2012; Beach, 2013). However, engaging stakeholders in these circumstances must overcome several challenges.

First, municipal management in most developing countries suffers from a lack of technical capacity and funding, as well as resource support (Jha et al., 2012). Compared with structural measures that may achieve more 'significant' results, decision-makers tend to overlook the importance of stakeholder engagement in urban flood management.

Second, stakeholders have different kinds of interests during the management process and these lead to different incentives and motives for their actions. For example, residents are usually unwilling to move from their homes in flood plain areas, which may be vulnerable and contravene land-use planning designed by decision-makers (Brown et al., 2009).

Similarly, moving from a top-down and hard engineering-based approach to a combined top-down and bottom-up approach may prove to be cumbersome for decision-makers who are unfamiliar with such an approach (APFM, 2006). Far from building consensus, the participatory process can generate conflicts and have the potential of stalling development. Meanwhile, engaging stakeholders is time consuming and requires long-term commitment. A prolonged process may cause people to lose interest after a while (Cornell, 2006). In such situation, often the only people who remain are those who are opposed to the process.

Finally, integrated flood management requires greater coordination between stakeholders, such as municipal, provincial and national governments, ministries, the public sector, non-governmental organisations, community-based organisations, education institutions and research centres, and the private sector. However, it is evident that either insufficient or excessive involvement of the real decision-makers leads to sub-optimal results (APFM, 2006). Therefore, it is essential to understand the capacities and incentives of these actors, including how they choose or can use their own limited resources under a high level of uncertainty (Zevenbergen, et al., 2008). Government decisions about the management of risk are balanced against competing, often more pressing, claims on scarce resources, as well as other priorities in terms of land use and economic development.

To sum up, urban flood management may benefit hugely from the effective involvement of stakeholders. Indeed, if the communication and consultation challenge is successfully overcome, the gains in flood resilience are significant.

The next two sections introduce the challenges of current urban flood management and circumstances of related stakeholder engagement in China.

2.3 Urban flood management of medium-sized cities in China

2.3.1 Urban flood management in China

Since the destructive floods in 1998, the Chinese government has increased investments in urban flood control and defence projects, and has taken a series of countermeasures, such as building reservoirs and pumping stations, moving the population in flood-prone areas to new-built towns, and amending flood defence and emergency response plans (Kobayashi & Porter, 2012). The total investment in water management by central government reached 5.4 billion dollars per year, which was 4.2 times the average annual investment during the period of 1991 and 1997 (Cheng, 2006).

Despite traditional flood management approaches, climate change, rapid urbanisation, inharmonious economic development and vulnerable ecosystems, as well as increasing pressures on food and water supplies, make urban flooding one of the most serious challenges in China (World Bank, 2013) (The World Bank, 2013). As indicated by Zhang and Li (2015), more than 62% of cities in China have suffered from urban flooding since 2010. In recent years, urban flooding has hit many cities, and caused significant economic damage and human death. For example, the heaviest rainfall in six decades fell in Beijing on 21 July 2012, with a record-breaking 460mm in 18 hours and hourly rainfall rates exceeding 85mm. This urban flooding caused economic losses valued at 1.6 billion dollars and killed 79 people (Zhang et al., 2013). On 9 October 2013, urban flooding in the city of Yuyao (in east China's Zhejiang Province) caused 1.1438 billion dollars' worth of damage. Nearly 70% of the city's downtown centre was inundated, with the water three metres deep at the deepest point (Xinhua, 2013).

After 2003, the Ministry of Water Resources of China proposed to redirect flood prevention from 'flood control' to 'flood management' (Liu, 2005). A series of new countermeasures have been undertaken since then, such as recovering lakes from croplands and moving populations in flood-prone areas to new-built towns. However,

the performance of these measures has been poor. Emerging from the experience in the past few decades, there are several challenges for current urban flood management in China. These include:

1) Inadequate urban flood control and drainage capacity. More than half of cities (55%) in China are applying flood control standards that are lower than those required by central government. The standards for drainage systems in urban areas are also low; most of these are not sufficient to withstand a ten-year water-logging (Liu, 2009).

2) Antiquated urban planning and a mass of technical defects in existing urban flood defence facilities. Compared with other developing countries, the construction quality for flood prevention facilities in China is low. Many urban flood defence facilities need to be maintained, while urban planning authorities have not paid enough attention to flood risk management. Protective facilities are either of a low-quality design or have been ignored altogether by the authorities. Moreover, rapid urbanisation and high urban land prices reduce green space and increase the speed of surface-water run-off (Cheng, 2014).

3) Incomplete urban flood management structures. More specifically, such structures are characterised by inefficient institutional collaboration, inappropriate river basin management systems, and inaccurate or deficient flood forecasting and warning systems, as well as a deficient social security system (Cheng, 2006).

4) Incomplete flood management law and regulations. Urban flood prevention facilities' construction and flood risk management activities are overseen by laws and regulations that lack sufficient detail (PICC-Disaster Research Center, 2012).

2.3.2 Medium-sized cities

As indicated by CORFU (2014), the number of people living in urban areas in China has grown from 19.4% to 52.52% since 1988, with the total number of people in urban areas projected to reach 1 billion by the end of 2030. Based on classifications by the China Society of Urban Economy in 2010, the population of a medium-sized

city is between 500,000 to 1,000,000 (Verdini et al., 2016). According to statistical data from 2000, among the 654 cities in mainland China, 641 of them are under threat of floods. Figures 2.3, 2.4 and 2.5 present the urban populations of major cities, the average annual rainfall and the 24-hour rainfall for a 100-year flood (Cheng, 2014).

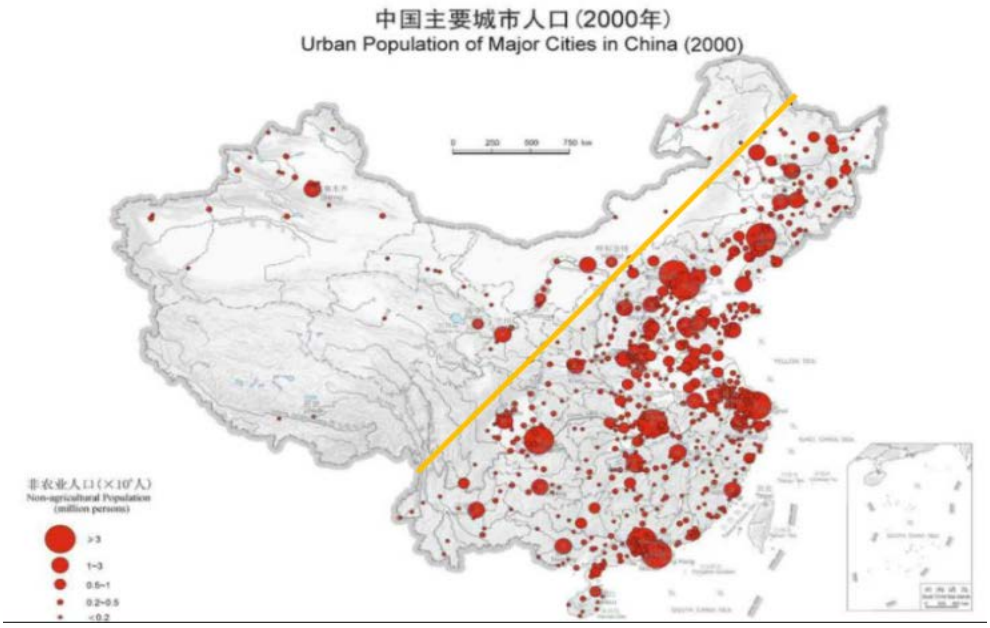


Figure 2-3 Urban population of major cities in China (2000) (Cheng, 2014)

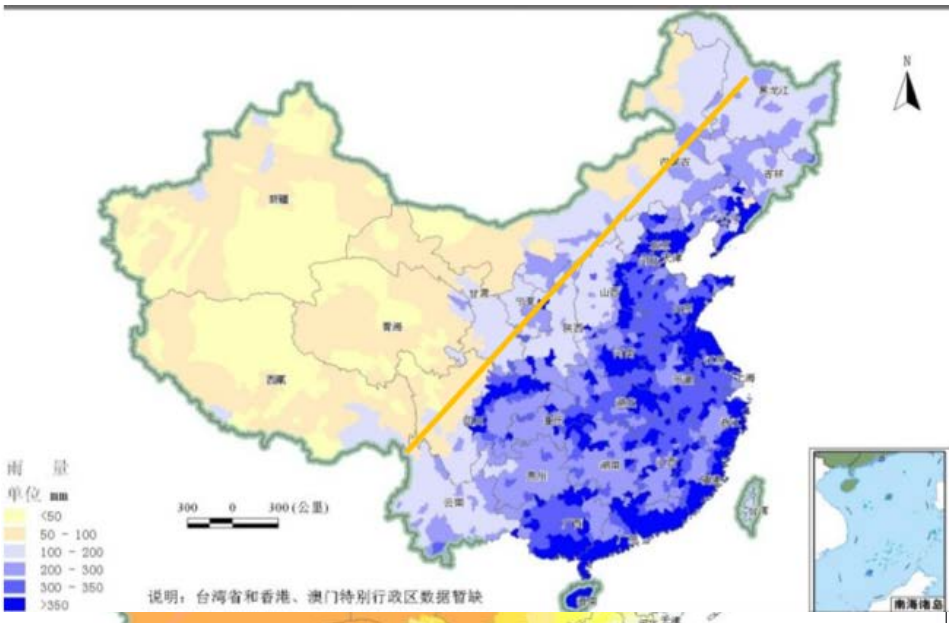


Figure 2-4 The average annual rainfall in China (2000) (Cheng, 2014)

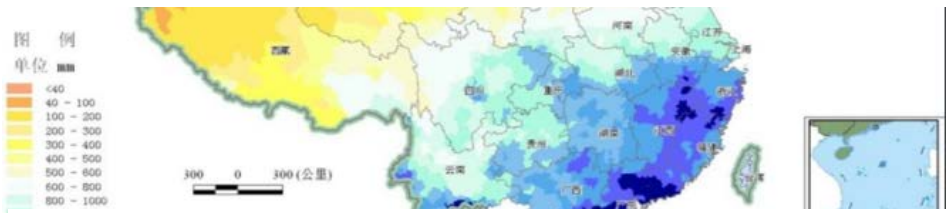


Figure 2-5 The 24-hour rainfall for a 100-year flood (2000) (Cheng, 2014)

From figures above, it is clear that more smaller cities – compared to mega cities like Beijing, Shanghai and Guangzhou – are under threat of urban floods. However, the current literature seems to focus significantly on the evolution of the mega cities, with less emphasis on smaller cities in China. Generally, urban flood management for medium-sized cities in China faces four challenges:

1) Unpredictable flooding and huge damage: Due to climate change, rapid urbanisation and the related 'urban-heat-island effect', there is a significant increase in the frequency of urban flooding in medium-sized Chinese cities. The forecasting of short-term heavy rainfall is difficult. The rapid process of urbanisation and economic development, meanwhile, increase the related flood risk of these urban areas (Song, 2015).
2) Low attention: Since 1949, the Chinese government's focus has been on the mega cities and large river basins, and it therefore pays insufficient attention to small and medium-sized cities (Cheng, 2014). This leads to a shortage of technical capacity and funding, as well as lack of resource support in these areas.
3) A disconnected urban flood management structure: Usually, managing urban flooding includes both flood prevention and the management of urban drainage systems (Higgitt & Lam, 2012). In most Chinese medium and small-sized cities, the Water Conservancy Departments only manage the main rivers. The Municipal Housing and Construction Departments, meanwhile, manage most other flood prevention and drainage facilities (Song, 2015).

This causes a disconnection between river and flood management and between the inside and outside of the city. This in turn causes chaos across the whole municipality during management of urban flooding.

4) Incomplete urban flood control and defence systems: There are many technical defects in existing urban flood defence and drainage facilities (Song, 2015). For example, the flood control standard for the drainage system in most small and medium-sized cities is not sufficient to prevent a one-year flood (Cheng, 2006).

2.4 Stakeholder involvement in urban flood management in China

2.4.1 Common institutional arrangements

"Urban flood control planning shall, in accordance with the river basin flood control planning and the regional flood control planning of the people's government at the next higher level, be formulated by the water conservancy administrative department, the construction administrative department and other relevant administrative departments under the people's government of a city which shall organise those administrative departments in the formulation of the planning, and be included into the overall urban planning subject to approval through the examination and approval procedures stipulated by the State Council. Amendment to flood control planning should be subject to the approval from the original approval organ." (Flood Control Law, 1997)

As introduced above, different levels of government departments are involved in urban flood management, such as the national, provincial, river basin, administration district and sub-district government departments. Generally, they can be divided into two parallel administration structures: one is specifically responsible for flood operations and combating floods during flooding, while the other is mainly focused on the planning, construction and routine management of urban flood control works (Kobayashi & Porter, 2012).

Flood operations: During urban flood emergencies, the Municipal Flood Control and Drought Relief Headquarters (MFCDRHs) takes command of flood operations, flood

emergency response and post-flood recovery at the municipal level (CH2MHILL, 2014). The members of the MFCDRHs include the leaders of the relevant municipal administrative departments, such as the directors of the municipal water conservancy bureau and housing and construction bureau. To confer adequate authority for coordination and swift response, the head of the MFCDRHs is the mayor or deputy mayor, who is responsible for municipal, water resource and agricultural management (Cui, et al., 2013). At the same time, both upper-level and lower-level Flood Control and Drought Relief Headquarters (FCDRHs) contribute to municipal urban flood management. The upper-level FCDRHs (national, provincial, river basin and administrational district) generally provide technical support and advice from the whole river basin's view, while the lower-level FCDRHs carry out more practical work, such as preparing material and human resources for flood fighting (H&E Research Institution, 2013a). Table 2.1 presents the general structure of the FCDRHs at each administrative level.

Table 2-1 The structure of FCDRHs at each administrative level in China (Kobayashi and Porter, 2012)

State FCDRH	
Head	Vice premier
Members	Leaders of relevant ministries
Office	Located at the Ministry of Water Resources (MWR)
Provincial FCDRH	
Head	Governor
Members	Leaders of relevant provincial administrative departments
Office	Located at the Department of Water Resources
FCDRH at other levels (city, county etc.)	

FCDRH = Flood Control and Drought Relief Headquarters

General administration and planning: At the municipal level, the routine management of flood control works is the responsibility of the Municipal Water Conservancy Department (China Institute for Water Resources and Hydropower Research, 2010). In the urban area, however, it is important for the Municipal Water Conservancy

Department to work in partnership with other administrative authorities or agencies. In China, the most significant missing link comes from land-use management. As introduced by Song (2015), the Water Conservancy Department is responsible for flood control and flood management. However, land management and spatial land-use planning fall inside the mandate of the Housing and Construction Department.

2.4.2 Benefits and drawbacks

As discussed above, engaging with stakeholders is a critical step for the implementation of an integrated urban flood management approach. In medium-sized Chinese cities, involving different stakeholders brings a series of both benefits and drawbacks.

Benefits include a significant focus on communication, in addition to the strengthening of partnerships to increase trust and willingness to cooperate between actors (Kivits, 2013). In addition, involving a diverse range of stakeholders in urban flood management provides an opportunity for all stakeholders and the public to share ideas, resources, needs and information, and therefore gain a better understanding of the whole management process (APFM, 2006). This may reduce conflicts and promote effective cooperation between actors, especially between the Water Conservancy Departments and Housing and Construction Departments (Song, 2015). Furthermore, effective stakeholder involvement helps the development of the decision-making process to build resilience in communities through cooperation and coordination (Reed, et al., 2009). The identification of public concerns and values also helps produce better consensual decisions.

Drawbacks, however, can result from the complex stakeholder environment of urban flood management in China. In a medium-sized city in China, besides the hundreds of government institutions and agencies, it is important to involve other actors in urban flood management, such as public and private sector actors, NGOs, CBOs, education institutions, the army and even local communities. Due to the huge number of municipal urban flood management actors, it is difficult to identify who should be

included or excluded during the decision-making process (Cheng, 2014). As illustrated by APFM (2006), either insufficient or excessive involvement of real decision-makers will lead to sub-optimal results. In addition, the engagement process is usually time consuming and requires long-term commitment. A prolonged process may cause people to lose interest after a while (Freeman, 1984). Furthermore, most municipal governments in China lack financial, technical and human resources, and the high cost of bringing together many stakeholders may delay or prematurely terminate the process (Song, 2015). Finally, high expectations can lead to disappointment if the process is terminated prematurely or implemented unsatisfactorily (APFM, 2006).

In medium-sized (and small) Chinese cities, municipal governments have realised the importance of encouraging stakeholder involvement in urban flood management. However, as discussed above, such involvement can lead to both benefits and drawbacks. It is important to identify and analyse the relevant stakeholders, and to design flexible and specialised engagement tools to stimulate their involvement.

The next few sections explain how to identify, analyse and engage stakeholders in urban flood management, starting with a discussion of stakeholder theory.

2.5 Stakeholder theory

The concept of the stakeholder emerged from a memorandum from the Stanford Research Institute in 1963. Since then, various relevant disciplines (i.e. individual or organisation theory) have frequently discussed the concept. Initially, stakeholders were conceived as “those groups without which the organisation would cease to exist” (Elias and Cavana, 2000). In the mid-1980s, Freeman proposed a stakeholder to be “any group or individual who can affect or is affected by the achievement of the organisation’s objectives” (Freeman, 1984). Since then, stakeholder theory has become an independent research area; many researchers have commented on the theory and the use of the word ‘stakeholder’ in research has taken on increasing importance (Aaltonen, 2010).

As discussed by Laplume et al. (2008), stakeholder theory has now reached a mature stage and has been applied to a series of fields, such as corporate social responsibility (Hillman and Keim, 2001; Friedman, 2009; Gong, 2011), education (McDaniel and Miskel, 2002; Liu, 2013), environmental management (Jonker and Foster, 2002; Caniato et al., 2014), infrastructure management (Beach, 2013), natural resource management (Prell et al., 2009; Reed et al., 2009; Lienert et al., 2013), water resource management (Liu & Sun, 2012), public policy (Brugha and Zsuzsa 2000; Martin, 2003) and research management (Bunn et al., 2002; Elias et al., 2002).

With significant increasing attention to the concept of the stakeholder, various perspectives have been taken on the subject (Friedman and Miles, 2002). In fact, different opinions have also emerged regarding the lack of agreement about who can be regarded as a stakeholder. As presented by Friedman and Miles (2002), there were 30 types of stakeholder theory at the time of writing. This has led to contention over which is the best and most practical theory, thereby resulting in limited successful implementation of the stakeholder concept in organisations. According to Freeman and McVea (2001), it is important to stop debating the minor differences between these concepts and to pay more attention in real-world problems. They believe that the continuing debate over different perspectives is unnecessary and detrimental to the process of the concept. The present challenge is how to combine stakeholder theory with stakeholder management practices (Ibid).

The next section introduces the development of stakeholder concepts.

2.5.1 The development of stakeholder concepts

There are various types of stakeholder theories existing in the literature. The major confusion comes from whether stakeholder management should be viewed from a managerial perspective (why stakeholders interact) (Freeman, 1984; Hill and Jones, 1992; Mitchell et al., 1997) or from a normative perspective (who should a stakeholder interact with) (Donaldson and Preston, 1995; Wicks et al., 1999; Philips, 2003). In 1995, Donaldson and Preston presented three aspects of stakeholder theory that existed in the literature:

- **Descriptive theory**: This is used to describe and explain the specific characteristics and behaviours of the corporation. For example, to describe the nature of the firm, how the firm is managed, how managers decide on their management activities and how some corporations are actually managed (Donaldson & Preston, 1995).
- **Instrumental theory**: This establishes a framework to identify the connections that exist between the practice of management of stakeholder groups and the achievement of various corporate performance goals (Reed, et al., 2009).
- **Normative theory**: This is used to examine the function of the corporation and identifies the "moral or philosophical guidelines for the operation and management of the corporation" (Donaldson & Preston, 1995).

However, this kind of three-part typology has also been critiqued in the literature (Reed et al., 2009). Some researchers (Jones et al., 2002; Agle et al., 2008) doubt that dividing stakeholder theory into these three seemingly separate approaches is useful. They argue the three approaches will exist at the same time in most stakeholder management areas. It is also important to develop a better integrated approach which focuses on the multiple and varied ways that stakeholders interact (Agle et al., 2008).

Furthermore, there is a stakeholder theory that is particularly relevant to a networked environment, such as urban flood management in China. As illustrated by Rowley (1997), organisations are formed with a network of relationships. In this model, Rowley (1997) indicated that stakeholders operate in a networked way, and the relationships between stakeholders should therefore be considered as an important factor during the stakeholder management approach. In the literature, this model has become prominent, as it demonstrates how stakeholders are linked within networks (Roloff, 2008; Savage et al., 2010).

Although these stakeholder theories are not perfect (Fassin, 2008), they provide a foundation for understanding the stakeholder and related management issues.

As a first step in managing stakeholders, the definition and identification of stakeholders are addressed next.

2.5.2 Stakeholder definition and identification

In 1984, Freeman defined a stakeholder to be any individual or group who could affect or be affected by the achievement of the organisation's objectives. Since then, stakeholder identification has been applied as the subject of much theoretical and analytical study. With regards to urban flood management, stakeholder identification includes all government departments and agencies, NGOs, public and private sector actors, and the communities affected or likely to be affected by urban flooding. In this case, this definition is considered to be too broad. In fact, it includes nearly everyone and removes the issue of the legitimacy of being regarded as a stakeholder (Parent and Deephouse, 2007; Agle et al., 2008; Laplume et al., 2008; van Huijstee and Glasbergen, 2008). Therefore, it is important to refine this stakeholder definition and make it more practical and relevant to stakeholder studies in urban flood management.

Due to the various types of stakeholder identification theories in the literature, Friedman and Miles (2006) presented a summary of the three major categories of stakeholder identification:

- **Descriptive**: individuals or groups who can potentially affect or be affected by achieving the organisational outcomes (Freeman, 1984; Donaldson and Preston, 1995).
- **Normative**: individuals or groups who are considered to have a valid claim on the organisation. For example, through property rights and contractual obligations (Ring, 1994; Donaldson and Preston, 1995; Mitchell et al., 1997).
- **Instrumental**: individuals or groups the organisation could consider to stakeholders by: organisational outcomes (Mitchell et al., 1997), network relationship (Rowley, 1997) and/or stakeholder-focal group (Friedman and Miles, 2006).

First, the descriptive model provides the original and broadest definition of a stakeholder. However, as it has no purpose beyond discussing the interactions between stakeholders, it is rarely used in practical stakeholder management

(Donaldson & Preston, 1995). Despite this, the definition can provide a good understanding of the current state of stakeholder relationships, before performing a normative or an instrumental analysis. This makes the descriptive approach an essential step for any stakeholder analysis (Reed, et al., 2009).

Compared with the descriptive model, normative stakeholder identification is a narrow approach through which to identify stakeholders (Mitchell et al., 1997). Traditionally, it focuses on stakeholders that have actual relationships with the organisation and highlights the legitimacy of stakeholder involvement in decision-making processes, such as through property rights and contractual obligations (Reed, et al., 2009). In the literature, some researchers have criticised this kind of stakeholder identification theory, since it does not include enough latent stakeholders. Therefore, research such as that of Friedman and Miles (2006) has suggested adding moral responsibility in this model. This, however, only solves part of the problem, since stakeholders outside the institutional framework are not included.

To strike a balance between the broad and narrow approaches, instrumental stakeholder identification has been developed to filter the broader groups of stakeholders. This model concentrates on those individuals or groups the organisation could consider to be stakeholders using organisational outcomes (Mitchell et al., 1997), stakeholder-focal group (Rowley, 1997) and network relationship (Friedman and Miles, 2004; Friedman and Miles, 2006). As discussed by Reed et al. (2009), the instrumental definition is the most pragmatic among these three approaches. It includes stakeholders with contractual or institutional claims, and stakeholders that have moral and legal responsibilities outside the legal and institutional context, as well as those who are directly or indirectly influenced by organisational objectives (Reed, et al., 2009).

This kind of instrumental definition narrows the final selection of stakeholders in the present research. It also provides sufficient account for latent stakeholders. As there is a lack of literature on how urban flood risk management defines and identifies stakeholders, this study tries to examine the extent to which urban flood risk

management agrees or disagrees with such an instrumental approach to its engagement with stakeholders. As presented in the introduction chapter, the present research project focuses on stakeholder analysis approaches and will not include designing detailed stakeholder engagement strategies to be applied to certain stakeholder groups.

However, it is still important to cover the stakeholder engagement literature in this review. The next few sections explore detailed stakeholder engagement approaches, and investigate the links between stakeholder theory and detailed stakeholder engagement strategies.

2.6 Stakeholder engagement

2.6.1 Stakeholder engagement definition

While stakeholder theory introduces which stakeholders should be involved or excluded in issues, stakeholder engagement determines which tools can be chosen for effective involvement of stakeholders (Kivits, 2013). Over the last decade, stakeholder engagement has become an important method for organisations to build constructive dialogue with and between community members and business interests for policy reform and service development (Fox et al., 2002). Within the public development context, stakeholder engagement has been recommended as a tool for creating quality outcomes and improving service delivery, by balancing different ideas and perspectives from different stakeholders and developing more robust communities (Martin, 2010). However, there are some opposing ideas about stakeholder engagement within the literature. In 2011, Kivits illustrated stakeholder engagement to be a deceptive idea. Despite this view, there are three major confusions over stakeholder engagement concepts.

The first confusion arises between the concepts of stakeholder management and stakeholder engagement. These two concepts are used interchangeably within the literature (Friedman and Miles, 2006). However, Freeman (1984) explained that stakeholder management includes a series of stages, one of which is engaging with

stakeholders. Thus, stakeholder engagement could be part of stakeholder management.

Second, as Vredenburg and Hall (2005) illustrated, stakeholder engagement is an "*idiosyncratic and context-specific*" concept. This means stakeholder engagement is an ambiguous concept that requires specification to make sure it is understandable and acceptable during practices. However, the main difficulty comes from the various types of stakeholder engagement definitions. Greenwood (2007) has listed three different dimensions (responsibility, management and social control) of stakeholder engagement. As suggested by Greenwood (2007), stakeholder engagement needs further analysis and development to overcome this ambiguity.

Another confusion comes from the use of two parallel concepts of stakeholder engagement and public participation. Moreover, within the literature, public participation is referred as "community engagement" (Head, 2007), "public involvement" (Shipley and Utz, 2012) and "public engagement" (Lowndes and Sullivan, 2004). Rowe and Frewer (2004) considered public participation to be a form of stakeholder engagement, because of "the practice of consulting and involving members of the public in the agenda-setting, decision-making, policy-formulation and implementation activities of public organisations". However, in 2008, Sullivan found stakeholder engagement to be different from public engagement and suggested that different stakeholder types require different kinds of engagement (Sullivan , 2008).

In this research project, stakeholder engagement is considered to be a subset of stakeholder management and takes into account urban flood management activities. By drawing on the literature, stakeholder engagement in this project is defined as: *the wide range of tools and practices an organisation can use as a mechanism for consent, control, cooperation, accountability, employee involvement and participation, enhancing trust, enhancing fairness and corporate governance by involving stakeholders in its organisational activities* (Kivits, 2013).

2.6.2 Stakeholder engagement strategies

In the literature, various researchers have sought to identify best practices with respect to stakeholder engagement, such as Tritter and McCallum (2006), Edwards (2008)] and Beach (2013). It is generally agreed that all relevant stakeholders should effectively participate in the decision-making process (van de Riet, 2003). During decision-making processes, all stakeholders should be given an opportunity to present their views, and all views should be taken entirely into consideration by the decision-makers (van de Riet, 2003; Edwards, 2008).

Levels of stakeholder engagement

An early contribution that is pertinent to the debate about stakeholder engagement is Arnstein's (1969) Ladder of Citizen Participation in urban planning. In this 'ladder', Arnstein (1969) presents eight rungs of engagement in a ranked order – from manipulation to the desire to engender citizen control. However, this model has been subsequently criticised in the literature. Tritter and McCallum (2006) criticise it as being overly hierarchical. And since the model specifically aims for citizen control as the ultimate outcome of participation, it diminishes the relevance of collaboration between other groups of stakeholders. Furthermore, as introduced by Head (2011), the goal of sharing power between the stakeholders in this model is inappropriate and difficult to apply in real-world situations.

Therefore, to simplify this model, Edwards (2008) has consulted the various models of stakeholder engagement in the literature, and identified three levels of engagement. These range from information dissemination to local communities and relevant groups, to the extreme of empowering them during the final decision-making process. These three levels of engagement have also been supported by some previous studies, such as OECD (2001) and Freidman and Miles (2006); these two studies use slightly different titles for each level, but the principles are the same. The three levels of stakeholder engagement are introduced and discussed as follows (OECD, 2001; Freidman and Miles, 2006; Edwards, 2008):

1) **Single-dimensional process**: This includes both 'passive' access to information upon demand by local communities and 'active' information dissemination

measures by organisations. This process includes many detailed instruments, such as surveys, public information campaigns and toll-free phones.

2) **Two-dimensional process**: At this level of engagement, organisations go beyond merely providing information to the public, and hope to get feedback from other actors. Detailed consultation processes include key contacts, interest groups, meetings, focus groups and public hearings.
3) **Multi-dimensional process**: This process exists among stakeholders who actively participate in the decision-making process. The organisations work with the public to not only provide feedback on how their input has affected decisions, but also develop options reflecting their concerns. In other words, stakeholders come to negotiate and control the decision-making processes with organisations, and call for more involvement in decision-making. Appropriate instruments, such as public enquiries, impact assessment studies and citizens' forums, can be adapted.

Based on this three-stage stakeholder engagement process and Arnstein's (1969) Ladder of Citizen Participation, van Beek (2004) and the World Meteorological Organisation (WMO, 2006) have developed six levels of stakeholder participation for integrated flood management. These include provision of information, public hearings, consultations, collaboration, delegation of responsibilities and self-management, as shown in Figure 2.6. In this model, the higher the level of participation and control over decisions, the fewer the number of stakeholder representatives engaged in the process. As stated by WMO (2006), this kind of mechanism has been applied in several river basin institutions, and it is evident that determining the level of stakeholder engagement mechanism is highly dependent on the political, economic, cultural, institutional and legal situation within a given region.

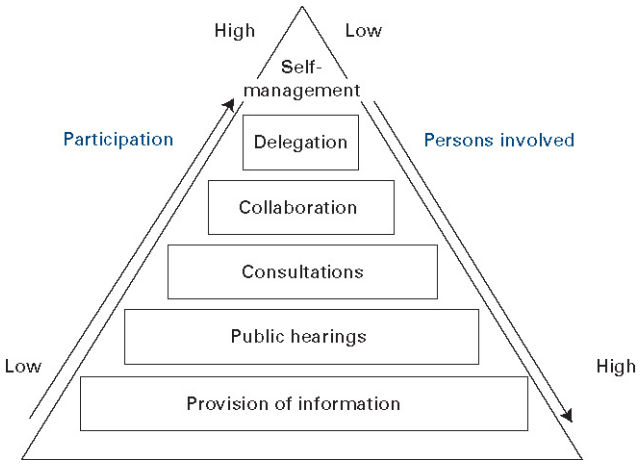


Figure 2-6 Levels of stakeholder engagement (WMO, 2006)

Establishing stakeholder engagement

After determining specific instruments for each level of stakeholder engagement, it is also important to take care of both launching and maintaining the process of engagement, so to avoid generating false expectations on the part of the stakeholder. As introduced by WMO (2006) and Kivis (2013), there are six principles that must be followed during the whole stakeholder engagement process:

1) it is important for the organisation to contact those latent stakeholders who are hardest to research;
2) it is important to change the way of governance, and share power with other stakeholders, especially communities;
3) it is important for stakeholders to listen, understand and share views and experiences between one another;
4) it is important to promote integrity in the democratic process of government;
5) it is critical to affirm diversity, therefore, to change the processes of government to incorporate diverse values and interests; and
6) it is critical to develop effective cooperation and coordination between stakeholders to add value in policy development and service delivery.

Another adaptation of Arnstein' ladder (1969) is the four-step stakeholder involvement framework proposed by Johnston and Buckley (2001). In this framework, Johnston and Buckley (2001) believed that involving stakeholders in the decision-making process had to follow four steps: to inform, listen to and advise, to interact and to collaborate. Based on this framework, some researchers (e.g. Blind, 2006; Parent and Deephouse, 2007; Kivits, 2013) have proposed that productively establishing stakeholder engagement should follow the following five steps:

1) First, it is important to **create a shared long-term vision** for stakeholder collaboration, thereby affirming diversity among actors. Such a vision is paramount to achieve positive outcomes for the whole management process (Kivits, 2013).
2) Second, decision-makers must ensure the **legitimation of actors**. It is important to ensure active participation of members in the decision-making process. However, the reality is that decision-makers are often busy and frequently ignore the views of other actors. This can hinder collaboration among stakeholders and slow up the management process. Therefore, it is critical to provide formal or delegated decision-making power for members at the beginning of management process (Blind, 2006; Parent and Deephouse, 2007).
3) Third, effective stakeholder engagement is highly reliant on **building trust** among members. Building trust develops the long-term relationship between stakeholders, therefore, aiming at a higher level of stakeholder cooperation and coordination during the management process (Williams, 2002; Leach and Sabatier, 2005).
4) Fourth, it is important to include several '**quick wins**' during the engagement process. Stakeholder engagement is a long-term process. Including a few 'quick wins' can help members to feel as if the group is achieving something, and will help to secure long-term funding and support (Ison and Collins, 2008; Veeneman et al., 2009).
5) Finally, it is important to **maintain the momentum** of stakeholder engagement during the whole management process (Muir and Rhodes, 2008; Shapiro, 2008).

Following these principles and the framework for stakeholder engagement, it is theorised that stakeholders can be engaged efficiently (Kivits, 2013). In the specific case of urban flood management, the focus of stakeholder engagement is to offer relevant stakeholders equal opportunities to share their views, concerns, resources and influences, and to build their commitment to the engagement process, ensure implementation of the measures, build resilience, and ensure sustainable planning and decision-making processes (WMO, 2006).

Understandably, stakeholder engagement in urban flood management itself requires a thorough and in-depth analysis. However, while this research project aims to develop an integrated stakeholder analysis method, adding another theoretical field of research (designing detailed stakeholder engagement strategies) will not provide significant strength to this thesis.

Given the importance of stakeholders and stakeholder engagement strategies, it appears timely to focus attention on providing a comprehensive stakeholder analysis before addressing any stakeholder engagement activities. The next few sections, therefore, start to illustrate and discuss current stakeholder analysis methods that exist in the literature.

2.7 Stakeholder analysis

The previous sections on stakeholder theory and stakeholder engagement have argued that engaging stakeholder involvement is a vital step during the relevant management process. This is particularly true for traditional urban flood management while implementing integrated approaches. Flood management in urban areas is usually affected by complex social, economic and environmental factors. Therefore, it attracts large numbers of actors, each with different backgrounds, interests, perspectives and objectives (Crocker, 2007). During the decision-making process, stakeholders hold various types of positions with respect to the relevant management issue and with respect to other actors. It is not a simple ‘for or against’ problem. Thus, it is important to focus on a detailed analysis of stakeholders and to promote a comprehensive classification and priorities for them (Mayer et al., 2005; Achterkamp and Vos, 2007; Greenwood, 2007; Aaltonen 2010). The focus of stakeholder analysis,

therefore, reduces to differentiation of the relevant stakeholders, to better understand their uniqueness, and to prioritise them for involvement in the decision-making process. By examining the available literature on stakeholder analysis, Reed et al. (2009) concluded that an integrated stakeholder analysis (Figure 2.7) should include stakeholder differentiation, categorisation and stakeholder relationships analysis.

The next section discusses current stakeholder differentiation and categorisation methods that exist in the literature.

2.7.1 Stakeholder differentiation and categorisation

After identifying the relevant stakeholders, the first step of stakeholder analysis is to

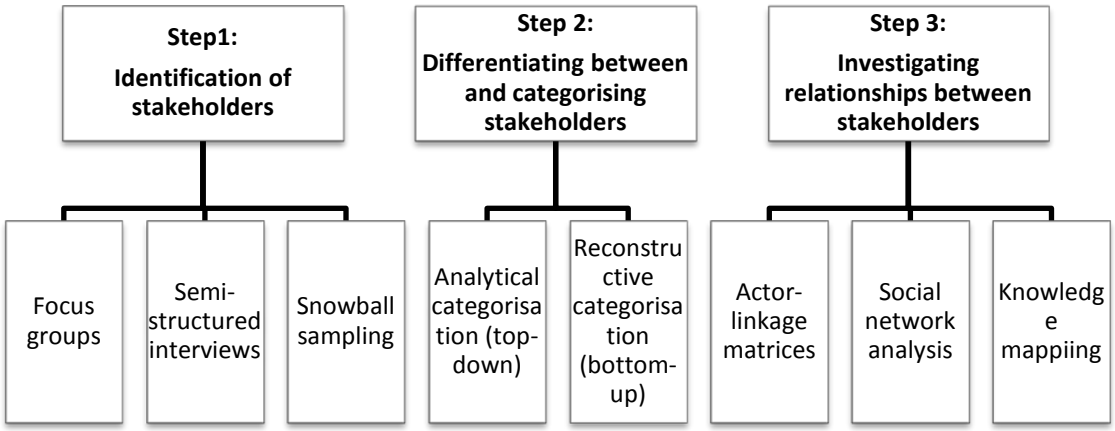


Figure 2-7 Topology and methods of an integrated stakeholder analysis (Reed et al., 2009)

differentiate and categorise them. Reed et al. (2009) suggests two major directions to categorise stakeholders based on 'top-down' and 'bottom-up' approaches. 'Top-down' approaches are also known as analytical categorisations. This type of approach comprises a set of methods where researchers describe and classify the stakeholders based on their observations of the phenomenon in question. In other words, these methods are "***embedded in some theoretical perspective on how a system functions***" (Hare and Pahl-Wostl, 2002). Detailed methods used in these analytical categorisations include the various types of stakeholder mapping techniques that adapt two or three criteria, typically by way of matrices or Venn diagrams (Reed et al., 2009; Bryson et al., 2011; Kivits, 2013). Such top-down approaches can be used

in several models, such as the level of interest and influence (Lindenberg and Crosby, 1981); cooperation and competition (Freeman, 1984); cooperation and threat (Savage et al., 1991); stakeholder interest and power (Eden and Ackermann, 1998; De Lopez, 2001) and power, urgency and legitimacy (Mitchell et al., 1997; Beach, 2013). As illustrated by Reed et al. (2009), these methods are usually used in finding the absence of direct stakeholder participation during the decision-making process. Therefore, they are based on the perceptions of the analyst or the problem owner, rather than of the stakeholders themselves. As concluded by Reed et al., (2009), such an analytical approach can add valuable results to a stakeholder analysis, as it eliminates research bias by using multiple sources and triangulation.

Meanwhile, some researchers have developed 'bottom-up' or 'reconstructive' methods to overcome the limitations of analytical categorisation. These methods allow categorisations and parameters to be defined by the stakeholders themselves, so that the analysis reflects their concerns more closely (Reed et al., 2009). For example, Hare and Pahl-Wostl (2002) used a card-sorting method in their stakeholder categorisation process for a sustainable water management project. During the process, stakeholders were required to sort cards listing all the stakeholders into groups according to their own criteria. This was used as a way of identifying the structure of groupings and interactions between stakeholders from stakeholders' own perspectives. This method enabled the models developed during the research to reflect the understanding of the stakeholders themselves (Hare and Pahl-Wostl, 2002).

By way of contrast, policy discourse analysis (de Bruijin and ten Heuvelhof, 2004) identifies the ways in which people think and talk about an issue and, in particular, the shared perceptions and common ground between individuals. Q methodology is then employed to group individuals into 'social discourses' based on these shared perceptions and commonalities (van Eeten, 2001). Q methodology also uses a card-sorting approach. It asks responders to rank statements on a specific topic according to a forced distribution. Following this approach, the categorisation of stakeholders is based on an empirical analysis of stakeholder perceptions rather than on theoretical perspectives (Barry and Proops, 1999).

Finally, strategic perspective analysis (Dale and Lane, 1994) uses interviews or workshops with stakeholders to identify and compare the goals of different groups, and the perceived opportunities and constraints that they have with respect to reaching their goals. In this way, categories of stakeholders that share similar goals can be identified. The information collected during this process may also be useful for negotiations between conflicting groups. As introduced by Reed et al. (2009), none of these methods has been widely applied to stakeholder analysis.

In terms of urban flood management in China, categorising stakeholders is still based on those 'traditional' stakeholder groups – for example, government departments, NGOs, CBOs, public and private sector actors, and the community (Alphen and Beek, 2005; APFM, 2006); decision-makers, creators, advisers, reviewers, observers and unsurprised apathetic (APFM, 2006); and the local, provincial, state or territory government (CORFU, 2014). These kinds of stakeholder classifications are very broad and a more detailed categorisation of stakeholder is required.

By examining the available literature on stakeholder analysis for flood management, the stakeholder salience model is found to be the most commonly accepted method to classify and prioritise stakeholders (Cornell, 2006; Liu 2012; United Nations, 2013). As suggested by Liu (2012), the application of the stakeholder salience model may contribute towards an integrated stakeholder classification and priorities in flood management. Thus, the first component of the stakeholder analysis process in this thesis is the differentiation of stakeholders based on salience.

The next section presents a detailed discussion of the stakeholder salience model.

2.7.2 Stakeholder salience model

As illustrated by Mitchell et al. (1997), stakeholder salience is the degree to which stakeholders have the potential to influence decisions. In the model, stakeholder salience is based on their power to influence decisions and the urgency and legitimacy of their claims during the decision-making process (Mitchell et al., 1997). Since then, various researchers have developed this model. For example:

- Chen (2003) differentiated the stakeholders of a firm by combining the three salience attitudes (initiative, importance and urgency);
- Beach (2013) separated the last attitude (urgency) into temporality and criticality to prioritise road construction stakeholders; and
- Kivits (2013) analysed the stakeholders of aviation in Australia by narrowing the salience model into two attitudes: power and urgency.

In fact, there is no commonly agreed stakeholder salience model in the literature. Researchers have developed and tested various types of salience attitudes to fit with their specific stakeholder environments. Furthermore, none of these models has been applied in the context of urban flood management, except the suggestions of APFM (2006) and Liu (2012) about application of the original stakeholder salience model (with power, legitimacy and urgency) in flood management and related water infrastructure management. As a result, this research project follows the original stakeholder salience model.

A detailed discussion of this model is presented below.

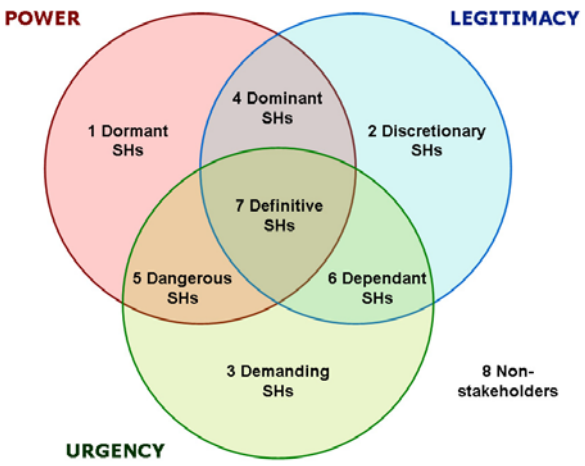


Figure 2-8 Stakeholder salience model (Mitchell et al., 1997)

As introduced above, the original 'stakeholder salience' consists of three basic types of perceptions: power, legitimacy and urgency (Figure, 2.8). Within this model, power as the first variable is considered to be the ability of stakeholders to achieve their main

objectives. The detailed dimensions of power include normative, coercive and utilitarian:

- normative power or social power is based on the use of symbolic resources such as media attention (Mitchell et al., 1997);
- coercive power or formal power is based on the application of physical resources such as restraint, force or violence (Friedman and Miles, 2006); and
- utilitarian power or resource power is based on the use of material resources, specifically goods and services (Etzioni, 1964).

Following Suchman's (1995) model, legitimacy as the second variable is defined as ***"a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions"*** (Suchman, 1995). This can be divided into three dimensions:

- pragmatic – based on the stakeholders' self-interest;
- moral – based on the stakeholders' moral obligation; and
- cognitive – comprehensibility and taken for grantees (Vidaver-Cohen and Bronn, 2008).

The last variable in this model is urgency or attention-getting ability. As indicated by Jones and Wicks (1999), the factor of urgency is determined by the time sensitivity of a stakeholder's claim (temporality) and the perceived importance of this claim to the organisation (criticality). Mitchell et al. (1997) believe that each of these two variables, by themselves, is not enough to present the urgency of a claim. To highlight the 'importance in time', it is important to combine them together.

Based on the different combinations of these three variables, Mitchell et al. (1997) identify eight different stakeholder types: non-stakeholders, Dormant, Discretionary, Demanding, Dominant, Dangerous, Dependant and Definitive stakeholders. As presented in Table 2.2, besides the non-stakeholder groups, the remaining seven stakeholder types are divided into three categories according to level of priority.

Table 2-2 Stakeholder types (Mitchell et al., 1997)

Stakeholder		**Salience attributes**		
Priority	Category	Power	Legitimacy	Urgency
High (definitive stakeholders)	Definitive	*	*	*
Moderate (expectant stakeholders)	Dominant	*	*	
	Dangerous	*		*
	Dependent		*	*
Low (latent stakeholders)	Dormant	*		
	Discretionary		*	
	Demanding			*
None	Non-stakeholders			

First, the Definitive stakeholders with high priority exhibit all three salience attitudes. Managers have a clear and specific requirement to act on the stakeholder's claims immediately (Beach, 2013). Compared with Definitive stakeholders, expectant stakeholders with moderate priority are the Dominant, Dangerous and Dependent stakeholder types. Managers perceive at least two of the three attributes – power, legitimacy and urgency – in this type of stakeholder. As presented by Mitchell et al. (1997), these stakeholder groups are seen to be 'expecting something'. The last stakeholder category with low priority comprises the Dormant, Discretionary and Demanding stakeholder types. These stakeholders only possess one of the identified attributes, and managers may even ignore their existence in the firm.

Based on these three attributes, many researchers (Mitchell et al., 1997; Agle et al., 1999; Liu, 2012; Beach, 2013; Kivits, 2013) believe that analysing stakeholder salience has the potential to provide a clear insight into stakeholder differentiation and priority processes, and indicates the potential actions each stakeholder could undertake. Therefore, an organisation can decide how it chooses to deal with each stakeholder. At the same time, the stakeholder salience model is a highly dynamic concept. Stakeholders can acquire or relinquish the attributes of power, legitimacy

and urgency, thus changing their stakeholder salience type (Agle et al., 1999; Mattingly and Greening, 2002). Regarding urban flood management, each of the stakeholders has different levels of stakeholder salience attitudes during the whole decision-making process, such as before, during and after flooding. As indicated by Kivits (2013), to keep information up-to-date, a stakeholder differentiation model should be flexible and easily updated.

2.7.3 Investigating stakeholder relationships

Following Reed et al.'s (2009) stakeholder analysis framework, the next step is to investigate the relationships that exist between stakeholders. The first scholar focusing on such stakeholder interrelationships was Rowley's (1997) research on higher education. In his article, he argues that stakeholders surrounding a particular issue are intrinsically linked to each other through a network.

In the literature, there are three major methods that can be used to analyse these interrelationships: 1) actor-linkage matrices; 2) social network analysis; and 3) knowledge mapping. Among them, actor-linkage matrices are the simplest and most flexible method to visualise stakeholder relationships. By listing stakeholders in the rows and columns of a table, and creating a grid, this method describes stakeholder relationships using key words such as: 'conflict', 'complementary' or 'cooperation' (Biggs and Matsaert, 1999).

Compared with actor-linkage matrices, social network analysis provides a more advanced model (Reed et al., 2009). Rather than using key words, stakeholder network analysis relies on quantitative data to represent: 1) the presence/absence of a tie; and 2) the relative strength of the tie (Borgatti et al., 2002). This allows researchers to identify the detailed location of a stakeholder in a network and to examine how they cluster together (Marsden, 1990; Kivits, 2013).

The last method, knowledge mapping, which evolved from organisational charts, is an increasingly important tool for management and planning within businesses and organisations (Cole, 1998). However, this kind of method cannot be applied in a complex and dynamic stakeholder environment (Reed et al., 2009), such as urban

flood management. Thus, the analysis of stakeholder relationships in this research project will focus on the application of the social network analysis method.

A detailed discussion of this model is presented in the next section.

2.7.4 Social network analysis

The traditional methods that measure stakeholder participation rely on collecting information about the attributes of actors to draw comparisons and conclusions about their relationships (Wellman and Gulia, 1999). These analyses treat each actor as an independent unit of analysis and assume that individuals act randomly without reference to one another. However, in the real world, as indicated by Coleman (1990), *"actors usually form attachments to certain persons, they group together in cliques, they establish institutions"*. To remedy such limitations, social network analysis was developed in the twentieth century (Scott, 2000).

Social networks are more or less stable patterns of relationships between mutually dependent actors that form themselves around policy problems or clusters of resources, and are formed, maintained and changed by interaction (ibid). Such relations can then be analysed for structural patterns that emerge among these actors. An analysis of a social network looks beyond individual attributes to also examine the relations among actors, how actors are positioned within a network and how relations are structured into overall network patterns (Wasserman and Faust, 1994; Wellman and Gulia, 1999; Scott, 2000; Prell et al., 2009). As indicated by Wasserman and Faust (1994), there are four principles of social network analysis:

1) actors and their actions are viewed as interdependent rather than independent, autonomous units;
2) relational ties (linkages) between actors are channels for transfer or 'flow' of resources (either material or nonmaterial);
3) network models focusing on individuals view the network's structural environment as providing opportunities for or constraints on individual action; and

4) network models conceptualise structure (social, economic, political and so forth) as lasting patterns of relations among actors.

Following these principles, social network analysis has been used widely to explore the relationships and interactions between stakeholders (Borgatti et al., 2002; Prell et al., 2009; Liu, 2012; Kivits, 2013). Generally, there are five main variables used to define a social network: density, average path distance, centralisation, core-periphery and tie strength (Borgatti et al., 2002). A detailed discussion of these variables is provided in the methodology chapter.

Like stakeholder salience, stakeholder networks are also dynamic. Networks can consist of both personal and institutional relationships linking stakeholders together (Keast and Hampson, 2007). Relations on the personal level with an institution can change quickly when actors change positions or jobs, thereby leading to the necessity of creating new relations. Moreover, entire stakeholder groups can cease to be part of a network when, for example, they dissolve themselves or opt to sever their ties with the network. Again, this characteristic of a stakeholder network requires a flexible, easily updated, classification model.

2.8 Summary and gaps in literature

As introduced in previous sections, stakeholder literature and urban flood management both emphasise the importance of understanding the stakeholder, and inherently concur that analysing the stakeholder is a critical step in stakeholder engagement. However, as Key (1999) has noted, concepts and processes that provide integrated approaches for dealing with multiple stakeholders on multiple issues are sparse, if they exist at all. An integration between and across stakeholders and issues is needed. There are linkages between external and internal stakeholder groups that impact and affect the firm, which are not adequately addressed. This leads to a failure to analyse the relevance of stakeholders.

The topic of stakeholder engagement has, for good reason, received greater attention in recent years. Stakeholder engagement can appear deceptively simple. Yet its application in urban flood management is conceptually complex and needs to be based

on a thorough understanding of the stakeholder (Jonker and Foster, 2002). Although specific stakeholder engagement strategies are outside the scope of this research, since its focus is necessarily on presenting a model to ensure more effective stakeholder analysis, it should be clear that improved stakeholder analysis can lead to improved stakeholder engagement. Aside from the need for a robust and valid stakeholder analysis, several gaps in the theory have been identified.

First, much of the literature on the stakeholder environment in urban flood management has been discussed as being complex (Graham and Healey, 1999; Crocker, 2007; Shandas and Messer, 2008). As Mainardes et al. (2011) have shown, however, this complexity, together with the interconnectedness of all the actors, is a theoretical conjunction and has not been empirically tested. The theory lacks the production of knowledge able to explain the complex and multifaceted social relationship between an organisation and its stakeholders (Mainardes et al., 2011). Various researchers have created models to demonstrate this complexity (e.g. Rowley, 2000; van Eeten, 2001; Kroesen and Broer, 2009; Mitchell et al., 1997). Yet the outcomes of these models have only highlighted part of the complex problem they set out to address. In fact, each of all the identified stakeholder analysis techniques from the literature review has a specific purpose and reveals some things, all the while overlooking, or at least not highlighting, others (Reed et al., 2009; Bryson et al., 2011). Together with complexity and interconnectedness is the perceived dynamic nature of the stakeholder environment. Mainardes et al (2011) show that there is no provision for understanding how to manage change given the dynamic nature of the stakeholders. Although multiple authors acknowledge that analysis is not a one-off procedure (Mitchell et al., 1997; Reed et al., 2009; Freeman et al., 2010), no actual proficiencies have been put in place to deal with the dynamic environment, apart from Rowley's (1997, 2000) suggestion to use the network environment to keep track of change.

Second, there is no commonly accepted stakeholder salience model available to differentiate and prioritise stakeholders during the decision-making process for urban flood management. Since the original stakeholder salience model – power, legitimacy and urgency (Mitchell et al., 1997) – researchers have developed and tested various versions of these models to fit in with their specific stakeholder environments. For

example, Chen (2003) differentiated the stakeholders of a firm by combining the three salience attitudes (initiative, importance and urgency); Beach (2013) separated the last attitude (urgency) into temporality and criticality to prioritise road construction stakeholders; and Kivits (2013) analysed stakeholders in aviation in Australia by narrowing the salience model into two attitudes: power and urgency. None of these models has been applied in the context of urban flood management. In fact, some researchers believe that the original stakeholder salience model may provide more significant results within the context of water resource management and urban flood management (APFM, 2006; Reed et al., 2009; Liu, 2012). Yet, none has provided rigorous empirical verification on its application in urban flood management.

Third, both Reed et al. (2009) and Caniato et al. (2014) highlight the importance of investigating stakeholder relations during an integrated stakeholder analysis. As discussed above, there is a collection of methods that have been developed to investigate the relationships that exist between stakeholders. These include actor-linkage matrices (ODA, 1995; Biggs and Matsaert, 1999); social network analysis (Wasserman and Faust, 1994; Reed et al., 2009); and knowledge mapping (Cole, 1998; Nissen and Levitt, 2004). Among these, several researchers (Elias and Cavana, 2000; Rowley, 2000; Liu, 2012) suggest using social network analysis to track the interactions between stakeholders within a complex and dynamic context. However, none provides enough empirical support for the application of network analysis in urban flood management.

Finally, several researchers have labelled the potential linkage between the different combinations of salience attributes and the quality of stakeholder engagement approaches undertaken (Beach, 2013; Kivits, 2013; Caniato et al., 2014). However, there is little theoretical or practical development on this. Studying stakeholder salience and its relationship with stakeholder engagement as a function of frequency and quality of information exchange will extend the stakeholder literature by showing how stakeholder salience impacts on decisions about the types of engagement processes implemented.

The above summary of gaps in the literature identifies the greatest weaknesses with existing analysis tools, especially the narrow focus of individual tools. This narrow focus is unlikely to provide the best possible result. For this reason, an integrated framework for stakeholder analysis is presented. The integrated framework depends on two different methods, a mixture of both quantitative and qualitative approaches. There is no 'one-size-fits-all' approach to any contentious problem that exists, so the application relies heavily on context. A contextual and qualitative understanding is required before a sample set can be created. Yet both salience and network analysis rely heavily on quantitative numbers, created by the perceptions of participants, to calculate stakeholder importance. The integrated analysis compares, analyses and evaluates the individual parts, scrutinises the results and explains differences.

The outcome of this research is therefore a thoroughly nuanced overview of the complete stakeholder arena and each stakeholder, down to the individual level. To arrive there, a 'mixed method' of both quantitative and qualitative aspects of research to create a comprehensive understanding of 'the stakeholder' is employed. The concept of mixed methods is further explained in section 3.3, the research design. This framework is innovative in the sense that such a comprehensive analysis framework has not been previously identified in the literature. Nor have previous frameworks placed emphasis on being dynamically applicable and easily updated, both important factors for a stakeholder analysis, especially since most contentious problems are not solved overnight, but tend to take years to address.

3. Methodology

3.1 Introduction

Decision-makers in urban flood management should consider all the surrounding issues, such as total water-cycle management and urban land-use planning (Jha, et al., 2012). This, however, highlights the many intertwined social and economic interactions between management activities, and the complex stakeholder environment during the flood preparedness, response and recovery periods. As summarised in the previous chapter, the literature does not provide a unified approach with respect to capturing the complexity and dynamics of the urban flood management stakeholder arena. To fill this gap, a mixed-method research strategy within a single case-study approach was adopted in this research. By way of contrast, the methodology combines and extends a range of methods that exist in the literature. This approach allows the coverage of the Chinese urban flood management context in a more comprehensive way than would be possible with existing approaches. Furthermore, the study provides the foundation for a two-dimensional stakeholder analysis approach and tests the proposed methodology. This methodology, if it proves to be a useful approach for stakeholder analysis of urban flood management in a medium-sized Chinese city, could be potentially applied to other complex projects which follow a top-down and highly hierarchical decision-making process.

The research perspective adopted within this study is a critical realist philosophy. Critical realists view reality as a mixture of concrete processes and contextual fields of information (Morgan and Smircich, 1980). Research philosophy in general delineates ways in which knowledge can be judged as truth, all based on the justification of knowing and believing (Poonamallee, 2009). In line with a critical realist philosophy, this study approach acknowledges that within a case study there are multiple actors, each bringing their own perspective on the truth. The research design, detailed in the following sections, addresses the complexity of urban flood management in a medium-sized Chinese city by adopting a mixture of overlapping, and triangulating qualitative and quantitative, methods in an effort to bring the research design, approach and philosophy together (Brand and Gaffikin, 2007).

The methodology used in the research, as well as the rationale behind the chosen methodology, will be discussed in the following sections. First, a mixed-method research strategy within a single case-study approach is adopted. Second, in the research design, the case selection and the case-study preparedness are discussed in detail. Finally, the detailed data collection and data analysis methods are discussed.

3.2 Approach

Exploratory case studies were deemed useful to support this research because of their focus on understanding complex issues (Yin, 2011). Case studies are both relevant and practical owing to the complex nature of decision-making processes during urban flood management (Liu, 2013). The focus of this research is on urban flood management in medium-sized Chinese cities, known for their crowded policy domains and complex stakeholder networks. The investigation of such a dynamic and complex stakeholder environment is therefore well served by using case studies. Case studies are a useful means to answer questions of how and why for events over which a researcher has little or no influence (Miles and Hubermann, 1994). As Mertens (2005) points out, a case study is "*a method for learning about a complex instance, based on a comprehensive understanding of the instance, obtained by extensive descriptions and analysis of that instance taken as a whole and in its context*".

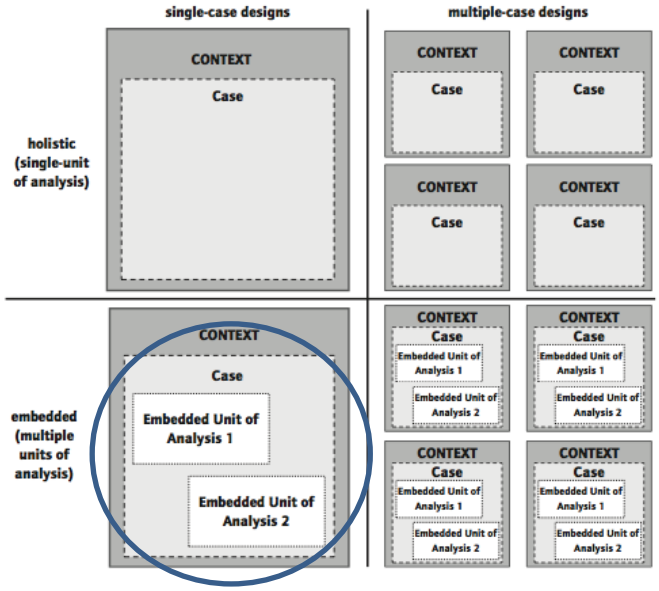


Figure 3-1 Basic types of designs for case studies (Yin, 2003)

As introduced in Figure 3.1, this study will employ a single-embedded case-study approach to understand the issues experienced by stakeholders around urban flood management in relation to the stakeholder network. Due to time constraints and data accessibility, this kind of singe-embedded case study was thought to be more useful than the multiple case-study approach (Stake, 2000). At the same time, such an approach allows the in-depth exploration of the two units of analysis: stakeholder types and stakeholder networks. By employing such a single-embedded case-study methodology, the researcher can ascertain causal linkages between these two units of analysis within each of the urban flooding periods, as well as between the whole urban management processes.

Within this single case study, the proposed mixed-method stakeholder analysis will be applied consistently over the three periods of urban flood management (flood preparedness, flood response and flood recovery), thereby allowing for cross-comparison of results (Abell, 2009). When both qualitative and quantitative methods are used, a hybrid research methodology is present. Edmondson and McManus (2007) state that hybrid methods are most appropriate in fields where the state of prior research is somewhere between nascent and mature. For the present case, stakeholder theory and the connection to stakeholder engagement during urban flooding can be described as in an intermediate state (Laplume et al., 2008; Reed et al., 2009). Each analysis component, as described in the literature review chapter, requires a different research approach to capture its complexity. Applying a mixed-method approach to the single embedded case study enables a rich exploration of each decision-making domain in urban flood management, while quantitative methods add value with analytical data (Creswell, 2003). Triangulation of multiple methods and sources of information also adds to the internal construct validity of the investigation (Denzin and Lincoln, 1994) and draws out greater meaning from the case (Scandura and Williams, 2000; Creswell, 2003)

3.3 Research design

The research is centred on investigating the stakeholder context that is currently

important for urban flood management in a medium-sized Chinese city. This section sets up the mixed-method approach for an integrated stakeholder analysis framework, applied to the singe case study: Zhuji. Before doing so, it will detail the case selection process itself.

3.3.1 Case study selection process

As pointed by Yin (2010) when applying a single case study, the case should be a unique/extreme, critical, representative/typical, revelatory or longitudinal one. The main reasons for choosing Zhuji as the unique case in this study are summarised in the following paragraphs.

First, Zhuji is a typical medium-sized city in China which suffers urban flooding. The climate and topographic conditions, as well as rapid urbanisation, increase the potential risk of urban flooding in the central urban areas in Zhuji. The detailed context of Zhuji is illustrated in the next chapter.

Second, the city has attracted a lot of attention from the central government. In 2007, the National Emergency Response Department promoted a flood control manoeuvre in Zhuji, and used Zhuji as a unique and positive example to illustrate the importance of high public awareness and effective public participation in flood emergency response systems.

Third, some Chinese researchers have pointed out that stakeholder participation, especially public participation in urban flood management in Zhuji, is relatively more effective than in other medium-sized cities in China (Zhou, 2006; Miao et al., 2012). Therefore, potential data in Zhuji will be easier to access than in other medium-sized cities in China.

Finally, Zhuji is the hometown of the researcher. After initial contact with the municipal government of Zhuji, the local government was willing to participate in the research, thus making it easier for the researcher to gain access to internal sources of data.

3.3.2 Case-study preparation

As introduced above, the proposed mixed-method stakeholder analysis will be applied consistently over the three periods of urban flood management (flood preparedness, flood response and flood recovery). The level of analysis within each period sits at the individual level, so each urban flood management period describes a network of actor organisations that come together in a variety of ways to determine how issues are dealt with, when and who gets involved. There are two units of analysis. The primary unit of analysis is the stakeholder types and the secondary unit of analysis is the stakeholder networks.

This focus on stakeholder types and networks means that governance is explored and explained in this research as a collection of rules and orders. During urban flood management, each stakeholder brings its own set of rules and orders into the stakeholder arena. In addition, each is influenced by the rules and orders of the other stakeholders. Focusing the level of analysis in this way provides an ideal setting to differentiate and prioritise stakeholder involvement during the decision-making process, as well as to explore the ways in which stakeholders communicate and share their concerns during each urban flood period. The network level of analysis also provides an opportunity to gain insights into how actors manage their relationships and agendas in a variety of spatial and jurisdiction settings at the same time.

The research, as applied to each urban flooding period, can be seen in broad terms in the framework presented in Figure 3.2. The methodology comprises the following techniques: the identification of stakeholders and their functions during urban flooding; application of the power, legitimacy and urgency model addressing stakeholder salience; and social network analysis addressing the stakeholder network.

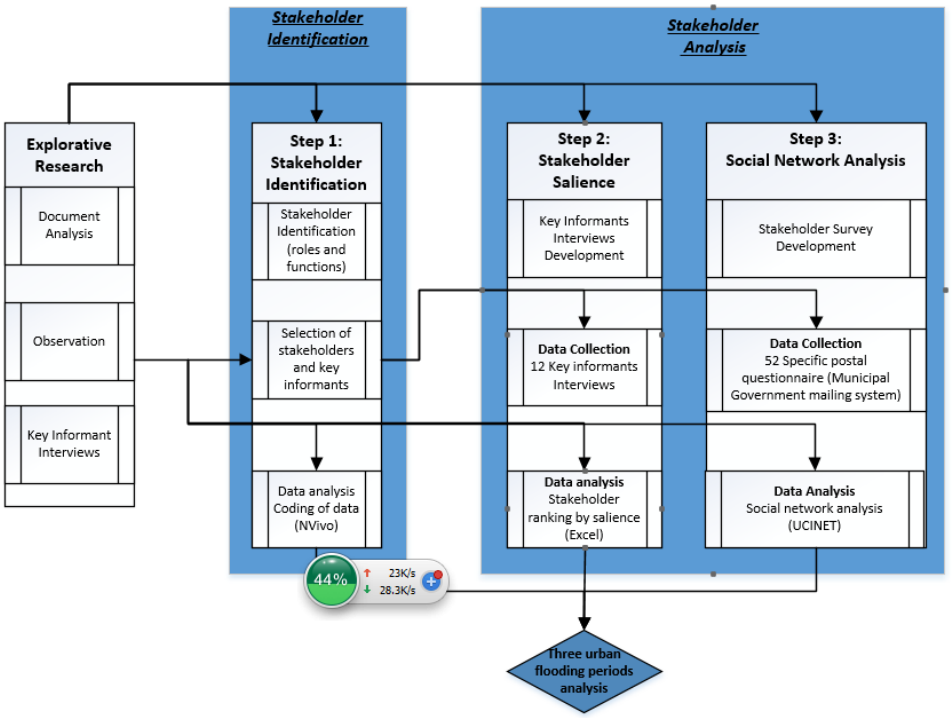


Figure 3-2 Integrated stakeholder analysis framework for each period of urban flood management

Within the context of this research, which spans several organisations, data collection is sometime classified as 'inter-organisational data collection' (Tichy, Tushman and Fombrun, 1979). Inter-organisational data collection might impact the validity of data when differences between organisations are not taken into account (de Kok et al., 2011; Yin, 2002). This problem is mainly prevalent when quantitative data, collected by the organisation itself, is considered. Qualitative data collection techniques, such as interviews performed by the researcher, are far less likely to cause concern. Yin (2002) proposes that the best method for inter-organisational data collection is the case-study approach, as adopted for this research. The case-study approach allows for the researcher to take into account the differences between stakeholders through an understanding of the context within the case study (Yin, 2002).

Analysis for each component will: i) identify the relevant stakeholders and their interests during urban flooding; ii) establish a ranking of stakeholders based on salience; and iii) create an overview of the stakeholder network. The results of the data analysis will then be integrated and a cross-periods analysis will determine the

commonalities and differences between the different urban flood management periods, allowing for generalisation of the outcomes and validity of the developed research methodology.

The next section introduces the scoping study that is applied in this research.

3.4 Scoping study

Scoping studies are an increasingly popular approach to review the literature and advance the methodology. Generally, a scoping study can be described as a process to "*map the key concepts underpinning a research area and the main sources and types of evidence available, and can be undertaken as stand-alone projects in their own right, especially where an area is complex or has not been reviewed comprehensively before*" (Mays, et al., 2001). As introduced by Arksey and Malley (2005), there are six potential steps in carrying out a scoping study:

1) identifying the research questions: what domain needs to be explored?
2) finding the relevant studies, through the usual means: electronic databases, reference lists (ancestor searching), websites of organisations, conference proceedings, etc.;
3) selecting the studies that are relevant to the questions;
4) charting the data, i.e. the information on and from the relevant studies;
5) collating, summarising and reporting the results; and
6) consulting stakeholders to get more references, providing insights on what the literature fails to highlight.

Followed this framework, a scoping phase was applied during January and April in 2015. First, a range of documents was reviewed during this scoping process. These documents included strategic plans, project reports, newsletters, minutes of meetings and previous research articles which related to the operation of the Municipal Flood Control and Drought Relief Headquarters and urban flood management in Zhuji. Second, 15 semi-structured interviews were also adapted during this scoping phase. The main respondents interviewed included the senior managers in urban flood management in the administration district and at the provincial levels, and the flood

experts from the local universities and research institutions. The main goal of these interviews and document review was to gain an understanding of the context of this study. The detailed questions of this semi-structured interview are presented in Appendix B. As a result of the scoping phase, several adjustments were made to this study.

First, the topic of this project was narrowed down from integrated urban flood risk management to urban flood management. By identifying relevant studies and research questions designed before the scoping phase, the overall concept of integrated urban flood management was found to be too broad for this research project. Both integrated urban flood management and flood risk management include too many detailed management activities. For example, integrated urban flood management includes the concepts of integrated flood management, total water-cycle management and land-use planning (WMO, 2008). Additionally, flood risk management includes flood risk analysis, flood risk assessment and flood risk reduction processes (Schanze, 2004). At the same time, most relevant Chinese literature illustrates that urban flood management in China remains in the traditional structural management phase (Pei et al., 2008; Liu 2009; PICC-Disaster Research Centre, 2012). Most such management activities rely on structural measures and focus on emergency response. Most flood control plans in China still focus on flood emergency management, which means they do not include many non-structural measures in their management.

Another important finding from the scoping studies was a lack of local community participation. Much of the literature in the UK and other countries in the world shows the importance of community engagement in urban flood management (Evans et al., 2006; Cornell, 2006; Pender and Green 2011). However, in China, the highly hierarchical government structures reduce the contributions of local communities (Cheng and Chen, 2011). Most urban flood management measures are operated by municipal governments and there are few contributions from non-government bodies, especially local communities. The potential reasons for this include:

- No flood risk maps or flood insurance: public awareness of urban floods is low.

- Most residents in urban areas are ‘floating’ populations. Compared with residents in rural areas, it is more difficult to mobilise urban populations during flooding.
- Municipal governments comprise very large and hierarchical systems (more than 200 government departments or agencies operate from the municipal level, town/street government level to the village and community level). The researcher also visited some researchers (Zhou, 2006; Zhang 2007) who have carried out studies on local communities in China. Most of these researchers highlighted the low response rate from the local community.

Finally, the focus of this research project has been removed from community engagement to the engagement of relevant main stakeholders (local government institutions, NGOs, public and private sector actors). In the literature, focus groups are usually considered to be an important research method to identify stakeholders and analyse their relationships (Wasserman & Faust, 1994). However, relevant literature in China has proved that the focus group method is not applicable in this research background (Zhang, 2007). In other words, it is not a popular research method in China. During the scoping studies, the researcher found that most Chinese people were not willing to share their opinions with someone else. They were very careful about what they talked about, especially with regard to people in government institutions. Furthermore, the researcher also tried some focus groups which included two or three interviewees – most of whom were retired officials and from similar positions. However, discussions during these interviews were rare.

3.5 Data collection

Following the proposed mixed-method research strategy, both qualitative and quantitative data were collected for this research. As pointed out by Beach (2013), such a method will strengthen the study in many ways. After analysing the different possible and applicable methods for gathering data that can be used in research, two types of data collection instruments were chosen. These were: primary data collection (key informant interviews, observation and questionnaire) and secondary sources (i.e. government publications and earlier research). These methods are introduced in detail

in the following sections.

3.5.1 Key document analysis (qualitative)

As the first data collection method used in this research project, key document analysis presented an in-depth understanding of the research context early on in the project. The relevant flood control policies and regulations produced a fundamental introduction of the context information on urban flood management in China. In addition, the various types of flood control plans, which were made by the different levels or types of government departments, provided an overview of the flood management processes and detailed stakeholder roles and functions during urban flooding. Another type of document collected in this research was the municipal urban development plans. These development plans allowed the understanding of current and future urban development issues, and of the current challenges of urban flood management in the case study area. Furthermore, some relevant project reports and studies about integrated urban flood management and effective stakeholder engagement were collected, such as the Five Water Treatment Project and the Grass-roots Flood Management System Project. These reports provided an overview of the current integrated urban flood management process and existing stakeholder management processes in the case. Overall, all these public documents formed the secondary resources collected during the fieldwork.

3.5.2 Key informant interviews (qualitative and quantitative)

After the analysis of the key documents, key informant interviews were developed as the second data collection method in this research project. The main goal of these interviews was to achieve a broader strategy of data triangulation. Such interviews could improve the researcher understanding developed through the key document analysis. In the literature, these interviews can be undertaken in three ways: non-structured, semi-structured or structured (Denscombe, 2001). The main difference comes from the degree of flexibility in undertaking the interview. In order to capture as much first-hand information as possible and to allow for flexibility from the respondents, the interview guide used in this research project was semi-structured

(Gilham, 2000; Mark, 2005). These semi-structured interviews had three main objectives:

1) to identify potential urban flood management stakeholders and their relations with the whole urban flood management system;
2) to find the main areas of contention between these stakeholders and urban flood management; and
3) to establish the ranking of stakeholders on salience.

Development of the interview

Following these objectives, these interviews consisted of three parts. The first part aimed to identify potential urban flood management stakeholders, especially those who were not mentioned in the public documents. Based on the document analysis, a list of potential stakeholders and their roles during urban flood management was developed (Appendix A). This list was used in the interviews to allow the key informants to add more potential stakeholders and provide changes to their roles, as well as describe the relations between these stakeholders and the whole urban flood management system.

In the second part of these interviews, key informants were exposed to a set of questions that allowed for description and motivations for stakeholder engagement in urban flood management. These questions aimed to describe the ways in which stakeholders interact with each other and identify major drives and obstacles of stakeholder engagement in urban flood management, as well as identify areas of contention between the stakeholders and the whole urban flood management system.

The last part of these interviews aimed to establish the ranking of stakeholders on salience. In the literature, stakeholder salience is usually determined by an analytical top-down approach using inside or expert knowledge in combination with key document analysis (Reed et al., 2009). These analytical methods were discussed and criticised earlier, resulting in three factors: power, legitimacy and urgency. Existing methods using power, legitimacy and urgency include an analytical categorisation as proposed by Mitchell et al. (1997). This study followed a top-down ‘analytical’

categorisation such as this. During the key information interviews, experts were required to rank all the identified stakeholders on salience. The full list of key information interview questions is attached in Appendix C.

Sampling

Interviewees were carefully selected, primarily to generate data for understanding the phenomena of interest, rather than for making generalisations. It was therefore essential and necessary that particular attention was given to selecting the right people who knew the subject and were likely to provide adequate answers to the questions asked. In this respect, therefore, the sampling was focused, and so justified the use of a small sample size. At the same time, with the top-down support of the Provincial and Municipal Flood Control and Drought Relief Headquarters Office, the researcher was also able to access these key informants.

Administration of the key information interviews

The key informant interviews were conducted face to face with people in senior positions in government. These people held strategic positions in their respective institutions and had knowledge and experience on issues affecting the effective management of urban floods.

Key informants identified to be interviewed were contacted personally by the researcher and a time for the interview arranged. Each respondent was briefed on the aim of the research and the key areas to be covered by the interview. The researcher further stated that results of the interview would be used solely for academic purposes and would not be given to any other person without permission from the respondent. The researcher personally conducted all the interviews.

All the respondents were willing to participate and provided answers satisfactorily. The respondents were of high standing within the area of municipal flood management in Zhuji. True to their positions, the answers given were consistent and made with sound reasoning. When asked for permission to record the interviews using a voice recorder, none expressed any problems or difficulties. Each interview was therefore

recorded using a voice data recorder. While the interviews were meant to last more than one hour, they all ended up lasting at least 50 minutes – with one or two going to one hour. In view of this, and due to time constraints and the fact that multiple data sources were used in the research, a total of only 12 key informant interviews were conducted for this project. All respondents were interviewed only once, but were contacted afterwards to provide additional information, if required. The list of people interviewed is attached in Appendix C1.

3.5.3 Questionnaire survey (qualitative and quantitative)

Questionnaires are one of the most widely used data collection methods. The method has been used to collect relationship data in a number of social network management projects (Reed et al., 2009; Prell et al., 2009; Cheong and Cheong, 2011; Caniato et al., 2014). In addition, as Yin (2002) agreed, it is an acceptable data collection technique within case-study strategy, provided it is used in addition to or in relation to other forms of evidence, rather than as a stand-alone assessment of a situation. It can be used to re-enforce the validity of data collection through other sources.

Development of the questionnaire

For this research, a questionnaire was designed on the basis that it could be answered by the respondents without any assistance (Monette et al., 2002). The role of the questionnaire is to solicit the information required to enable the researcher to answer the objectives of the research (Brace, 2004). The first step undertaken in the questionnaire design and development was determining what questions needed to be asked in relation to the research objective and the research questions. Care was taken to improve response rates by starting with an introduction to stakeholder engagement in urban flood management, the purpose and structure of this questionnaire.

Then the questionnaire was divided into three parts:

- Part 1: General questions related to responders' opinions on urban flood management
- Part 2: Questions related to stakeholder interactions

- Appendix: The list of urban flood management stakeholders in Zhuji

The first part of questionnaire started with close-ended questions including the nature of involvement of the responders and the flood types with which they were concerned. Then followed open-ended questions, which allowed a flexibility or possibility where respondents could explain the reasoning behind some of the responses they gave, e.g. Do you have any opinion about the municipal urban flood prevention plan?

The second part included five questions about stakeholder interactions. They included both open-ended and close-ended questions. The close-ended questions used the linear scale to measure the level of information exchange and interaction frequency. The five dimension scales – high, moderate, low and regular contact, occasional contact and very rare contact – were used.

Furthermore, a covering letter (Appendix D) was written and given to the respondents, together with the questionnaire. The covering letter described the objectives of the study, its relevance and conveyed general instructions. The letter stated that participation in the study was voluntary, but also gave assurance of the anonymity of the information provided by the respondents. Detailed information about the questionnaire questions is presented in Appendix D.

Samples and boundaries design

As Wasserman and Faust (1994) explained, the question of boundary specification in network analysis can be simply asked: Where does a researcher set the limits when collecting data on social relations that, in reality, may have no obvious limits. In the literature, there are two generic approaches to identifying network boundaries (Table 3.1): positional and relational approaches (Laumann et al., 1983).

Table 3-1 Network boundaries identification approaches (Knoke and Yang, 2008)

Identifying network boundaries approaches	Description
1. Positional strategies	This approach uses the attributes of actors, their membership in a formal organisation, or their occupancy of a well-defined position for inclusion in a network.
2. Relational strategies	This approach relies on knowledgeable informants or the network actors themselves to nominate additional actors for inclusion. Relational approaches embrace several procedures, including the reputational, snowball sampling, fixed-list selection, expending selection and k-core methods.

The snowball sampling of relational strategies is used for selecting the respondents in questionnaires. The sample of respondents was generated in two phases. First, the respondents were members of the Municipal Flood Control and Drought Relief Headquarters. These therefore formed the initial set of respondents for the case. Second, from analysing the key informant interview data, a subsequent group of stakeholders was identified. These stakeholders were also approached for interviews and asked to provide additional stakeholders and their contact details. This second list of stakeholders had a large overlap with those initially identified, which provided confidence that the majority of the stakeholders had been identified. Overall, there were 52 stakeholders identified for urban flood management in Zhuji.

Administration of the questionnaire

The present research used self-administered methods, which yielded a higher response rate i.e. the researcher personally administered the questionnaire. Mailing of the questionnaire used the municipal government postal and e-mail systems. The municipal government mailing system (Figure 3.3) is a formal and common mailing system in China. It is functionally efficient system. The municipal government uses this system for daily document exchange. Each of the government departments and the key institutions in the municipal area owns a mailing box here. By using this system, the research received a high response rate. By 18 August 2015, 51 questionnaires had been collected. The response rate was 98%. Only the one from the Highway Management Authority was missing.

Figure 3-3Municipal government postal system in Zhuji

3.5.4 Observation role as a researcher

Observation is one of various primary data collection methods. “The observation method involves the researcher in watching, recording, and analysing events of interest” (Blaxter, et al., 2006). Using observation as a method of data collection is potentially very time consuming. For example, the observer needs to record the information during the observation, as well as interpret and analyse the recorded data afterwards. In this research project, the researcher observed the current urban flood control planning programme in Zhuji, which is undertaken by the Water Conservancy and Hydropower Bureau, to analyse how relevant stakeholders are engaged in urban flood risk management in Zhuji. Additionally, the researcher also spent some time observing the operations of the Municipal Flood Prevention and Drought Resistance Headquarters and the Water Conservancy Association. These two organisations have a potential role in initiating cooperation and collaboration between urban flood risk management stakeholders.

3.5.5 Instrument pre-testing

Before approaching the detailed key informant interviews and questionnaires, these were pre-tested. As indicated by Caspar and Peytcheva (2011), by using a pre-test and a pilot study, the researcher can ensure the success of the main data collection.

However, in the literature, there seems to be a lack of clarity between these two terms. Some researchers use these terms interchangeably. In this research, a pre-test refers: "*… to initial testing of one or more aspects of the study design: questionnaire, and the sample design*", while pilot studies refer to "*… miniaturised walkthroughs of the entire study design*" (Babbie, 1973, p.205).

In this study, both the key informant interviews and the draft questionnaire were pre-tested, during the month of June 2015. First, three senior managers were approached for the pre-test of key informant interviews. They were from the Municipal Flood Control and Drought Relief Headquarters and the Municipal Water Conservancy and Hydropower Bureau. After evaluating the questions, it was decided that no significant alterations were required. The respondents for the pre-test of the questionnaires were five members of staff from the Municipal Water Conservancy and Hydropower Bureau, Zhuji. Based on their comments, the researcher made some adjustments to the two methods:

1) A suitable cover letter was attached to the questionnaire, introducing the context of this research project and the main objectives.
2) As most of the respondents were confused about the five-linear scale (high, moderate, low and regular contact, occasional contact and very rare contacts) to measure the level of information exchange and interaction frequency, it was reduced to a three-dimensional scale (high, moderate and low).
3) Some of the respondents mentioned that they did not see the stakeholder list (which was attached in the last page). This list was then moved forward.

3.5.5 Pilot study

In the literature, researchers are unanimous on the need to carry out a pilot study to secure the successful application of their research design (Remenyi et al., 1998; Kayaga, 2002; Beach, 2013; Kivits, 2013; Liu, 2013). Due to time and cost constraints, a pilot study was carried out within the Huandong sub-district area, Zhuji. As there were no significant problems with the key informant interview during the instrument pre-testing, this pilot study mainly focused on the questionnaires. The

respondents for the pilot study included all the ten members of the Huandong Flood Control and Drought Relief Headquarters. The following major changes were made to the draft of the questionnaire after pilot study:

1) Removal of questions about the stakeholders' opinions of urban flood control plan to reduce the length of the questionnaire.
2) Some of key words and sentences were highlighted in red and bold type. Additionally, an explanation of activities during flood preparedness, flood response and flood recovery was added.
3) Space was provided for respondents to give open-ended comments.
4) The cover letter was improved in terms of the use of an attractive letterhead, a clearer explanation of when and how the questionnaire should be returned, and it was stamped by the Municipal Flood Control and Drought Relief Headquarters.

3.5.6 Database summary

All evidence is of some use to the case study. This therefore usually results in case studies obtaining an enormous amount of data. Part of the case study therefore involves keeping a database (Gillham, 2000) of all the data that has been obtained, including the sources. This is one other way of increasing the reliability of a case-study strategy. In this research, a record was kept of all the information collected and notes made during the research in the form of a case-study database. The database would allow a critical reader to inspect the raw data that led to the case study's conclusions (Yin, 2002). Table 3.2 provides a summary of the research database.

Table 3-2 Data collection techniques

Primary sources	• **Key informant interviews (12 semi-structured interviews targeting 12 key informants)** • **Questionnaire (51 stakeholder questionnaires targeting 52 potential stakeholders)** • **Observation (no participants)**
Secondary sources	• Earlier research • Urban flood control plans • Land-use plans

- Other government publications

3.6 Data analysis

In this research project, the proposed mixed-method study generated a large amount of data; both qualitative and quantitative data were collected. Following the proposed integrated stakeholder analysis framework (Figure 3.2), data analysis was undertaken using a building block approach, in which the analysis at each stage of data collection was integrated into the next stage of data collection. As Locke (1996) introduced, data analysis should be taken as a "*recursive, process-oriented, analytic procedure*". Throughout this study there were three steps of analysis, as shown in Figure 3.2. The detailed data analysis process is discussed in the following sections.

3.6.1 Qualitative data analysis – stakeholder identification

The first type of data collected in this research included the key documents and the quality data collected during the key informant interviews. These types of data aim to:

- identify stakeholder interests and functions during urban flood management;
- identify inter-organisational relationships within the urban flood management context;
- describe the ways in which actor organisations interact with one another; and
- identify areas of contention between stakeholders and urban flood management.

First, thematic text analysis was used to investigate the key documents for key themes using Leximancer (Smith and Humphery, 2006). Leximancer enables the user to navigate the complexity of text – not merely keywords, but focused clusters of related, defining terms, as they appear in the text, and not according to a predefined dictionary or thesaurus. The themes are presented in a compelling, interactive display so that the user can clearly visualise and interrogate their interconnectedness and co-occurrence (which is as important as the themes themselves), right down to the

original text that produced the concepts. Leximancer therefore embraces the complexity of language, thereby allowing the true meaning to emerge from the text itself, and without human bias (ibid).

The identified themes were compared with the previous manually identified information for cross-comparison, so as to ensure all possible information was extracted from the documents. The definition of themes after manually analysing the text, rather than before, ensures that the researcher approaches the text with a fresh and open mind, able to identify alternative themes that might not be recognised by analytical programs. This is consistent with Perakyla et al.'s (2008) advice that thematic coding is best approached informally when the analysis of text is complementary to, but not pivotal in, the overall research design.

Second, the interviews with the key informants from the stakeholder organisations were all recorded digitally, while the interviewer also took notes. The digital recordings were transcribed verbatim as soon as possible by the researcher. These transcripts were coded and analysed using NVivo 10, a qualitative analysis software package. NVivo was used to apply thematic coding focused on collating and cross-checking responses with each other for the previous mentioned four aims.

After thematic analysis with NVivo, the transcripts were analysed as groups using Leximancer, a cross-check for the results of the NVivo approach and to gather additional information on the importance of the identified themes in the overall context. This analytical process allowed for the identification of key areas of contention that arose within each urban flooding period between urban flood management and its stakeholders.

3.6.2 Quantitative data analysis – stakeholder salience

The second part of data collected in this research was the stakeholder salience. Stakeholder salience is most frequently determined by an analytical top-down approach, using inside or expert knowledge in combination with document analysis (Reed et al., 2009). This study followed such an analytical method, which was introduced in the literature review chapter to determine the presence or absence of the

individual salience attributes: power, legitimacy and urgency. This approach has its basis in the analysis undertaken by several researchers (Mitchell et al., 1997; Parent and Deephouse, 2007; Beach, 2013).

Table 3-3 Example of salience data for one stakeholder

Salience attributes	Power	Legitimacy	Urgency
Stakeholder A	8	5	4
Percentage	67%	41%	33%
Absence/ presence of attributes	Present	Absent	Absent

As an example, Table 3.3 contains the data collected for one stakeholder in one urban flooding period and highlights the steps involved in determining the presence or absence of stakeholder salience attributes. A first step was undertaken to determine whether a salience attribute was present or absent. At the respondent level, each of the key informants ranked the 52 potential stakeholders on the salience attributes: power, legitimacy and urgency. The second step was to integrate the multiple perceptions of the 12 key informants. A cut-off point of greater than 50% was used to determine if the stakeholder perceived an attribute to be present. The final step in this part of the analysis was to plot the presence or absence of individual salience attributes, power, legitimacy and urgency, in a tabular form to show the combinations of attributes and thus stakeholder salience types identified from the data.

3.6.3 Quantitative data analysis – social network

The third type of data in this study, captured by the questionnaire, concerns social network analysis. As introduced in the literature review chapter, social network analysis is based on tested and proven methods of quantitatively representing a network. Knoke and Yang (2008) define four distinct levels of analysis for social network analysis: ego, dyadic, triadic and complete network perspectives. This study is approached from a complete network perspective, for its inherent objective to represent and explain the structural relations between all actors. Each urban flooding period examines a full network, with the intent of exploring the relations between all actors and their influence on decision-making processes (Kivits, 2013).

The analysis of the data was performed using both UCINet (Borgatti et al., 2002) and Gephi (Grunewald, 2015). UCINet was used for the mathematical analysis, whereas Gephi was used for graphical representation of the networks, using the mathematical outcomes generated by UCINet. This approach was chosen as UCINet is a widely recognised social network analysis program and is regularly cited and referenced in academic literature (Borgatti et al, 2002). The graphical representation of the network, however, is not as advanced, or easy to manipulate, as one would desire. For this reason, Gephi was used as its graphical interface allows easy manipulation of shapes, sizes and colours of the nodes and vertices, and allows easy exportation of network maps to other programs, such as Microsoft Word.

In this study, network maps were created by using the Fruchterman-Reingold algorithm. This algorithm is designed to generate a network layout that minimises the distance between nodes through an efficiency-seeking and force direction, and is regarded as ideal for non-directed network data (Frick et al., 1995). In short, nodes that are most central to the network will gravitate to the middle of the layout, while less central nodes are arranged towards the outer regions of the network map (Kivits, 2013).

Through tools such as questionnaires and observation, the researcher quantifies two variables: interaction frequency and information exchange quality. By choosing these two variables, the network characteristics could be extracted. The characteristics used to describe the network as a whole were density, average path distance and centralisation. Betweenness centrality and core-periphery analysis were used as a characteristic of the individual actors in the network. To describe the relations between the actors, the interaction frequency and information exchange quality were used. Detailed network characteristics in this study are presented in Table 3.4

Table 3-4 Network characteristics

	Measure	Description
Network as a whole	Density	This measures how much activity there is in the network, as compared to how much there could be (Keast, 2003). Networks characterised by dense links are associated with high levels of trust, a common sense of identity and are more likely to facilitate collective action within the group; however, they may have a lower propensity to cooperate with other groups (Ansell, 2003). Dense networks, furthermore, offer individual actors easy access to information about actors and activity within the group. This is valuable to the extent that it offers strategic information about the preferences and reliability of other actors, but is potentially risky since it also gives other actors access to information about them (Olsson, 2009).
	Average path distance	Average path distance is an indication of how quickly information can be spread: how easy it is to access resources, engage in planning and programming activity, or make referrals (Keast et al., 2008).
	Centralisation	A high network centralisation means there are only a few actors holding most ties linking the network together; thus, only these well-connected few need to be reached to access the entire network (Prell et al., 2009).
Network actors	Core-periphery	This indicates the network positions of an actor, either at the core or on the periphery (Scott, 2000).
	Betweenness centrality	This describes the extent to which an actor lies on paths between other actors. An actor with higher betweenness centrality will link across disconnected segments of the network, and will have the most holistic view of the problem. They can also mobilise and diffuse information to the larger network (Olsson et al., 2004; Martinez-Moyano et al., 2008).
Actor relations	Interaction frequency	This indicates how often network members interact with each other (Kivits, 2013).
	Information exchange quality	This indicates the information exchange quality between the network members (Lienert et al., 2013).

3.7 Ethical considerations

In undertaking any research, it is important to follow what is morally correct. Ethical considerations thereby become issues related to the moral rightness of the research studies. Following the ethical standards of Loughborough University, there are several ethical considerations included in this research project, especially for the key informant interviews and collective questionnaires. Some key issues were addressed as follows:

1) Before the information interviews and questionnaires, respondents were informed that the study was purely academic and was not for use in implementation of any proposals related to policy changes.
2) No one was forced or coerced to participate in this study. Everyone participated in this research voluntarily.
3) Before taking any recordings for the interviews, the interviewees were asked if they were willing to be recorded.
4) Care was taken to make sure that no one was exposed to any undue danger as a result of participating in the research.
5) All responses were treated as confidential and people's identities were kept anonymous. This was achieved by identifying the respondents by codes rather than using their names.
6) All digital data was copied to a secured server provided by the university. Backups were created and were kept on several locations 'under lock and key'; other data was treated similarly.

3.8 Conclusion

In recent years, stakeholder analysis has, for good reason, received greater attention from decision-makers in flood management. However, there is no commonly accepted stakeholder analysis method existing in the literature. As presented in the literature review chapter, most existing analysis tools was identified as the narrow focus of individual tools. For this reason, an integrated stakeholder analysis framework was developed in this study. This integrated stakeholder analysis

framework combines both the stakeholder salience model and stakeholder network analysis, which together represents a mixture of both quantitative and qualitative approaches.

This chapter described and justified the research design and methodologies used in this study. First, a mixed-method research strategy within a single-embedded case-study approach was adopted. Justification for adopting the single-embedded case-study strategy was given. The research further provided information on case study selection and case study preparedness. It also presented the integrated stakeholder analysis framework designed in this research project. The detailed process of the scoping phase was then presented. The main goal of the scoping phase was to gain the understanding of the research context. After the scoping phase, the different data collection techniques employed in the study were presented and discussed, together with the procedure through which the data was collected. This study utilised multiple sources of data, including key informant interviews, questionnaires and key documents. Both interviews and questionnaires were pre-tested to ensure the validity of the study. The questionnaire also included a pilot study. Following the proposed integrated stakeholder analysis framework, both the quantitative and qualitative data analysis processes were introduced.

4. Case context

4.1 Urban flood management in ZJ

Chapter 1 highlighted that urban flood management is increasingly provided through multiple and overlapping networks of interaction and decision-making by a range of stakeholders, rather than purely through hierarchical or contractual processes. Furthermore, Chapter 1 also established that managing urban flooding through networked forms of organisation raises questions about how stakeholder status is negotiated in this more complex environment. While Chapter 2 provided more detailed theoretical support and a framework for the analysis of stakeholder engagement by urban flood management networks, this chapter presents the historical and contextual background of urban flood management by the municipal government in Zhuji.

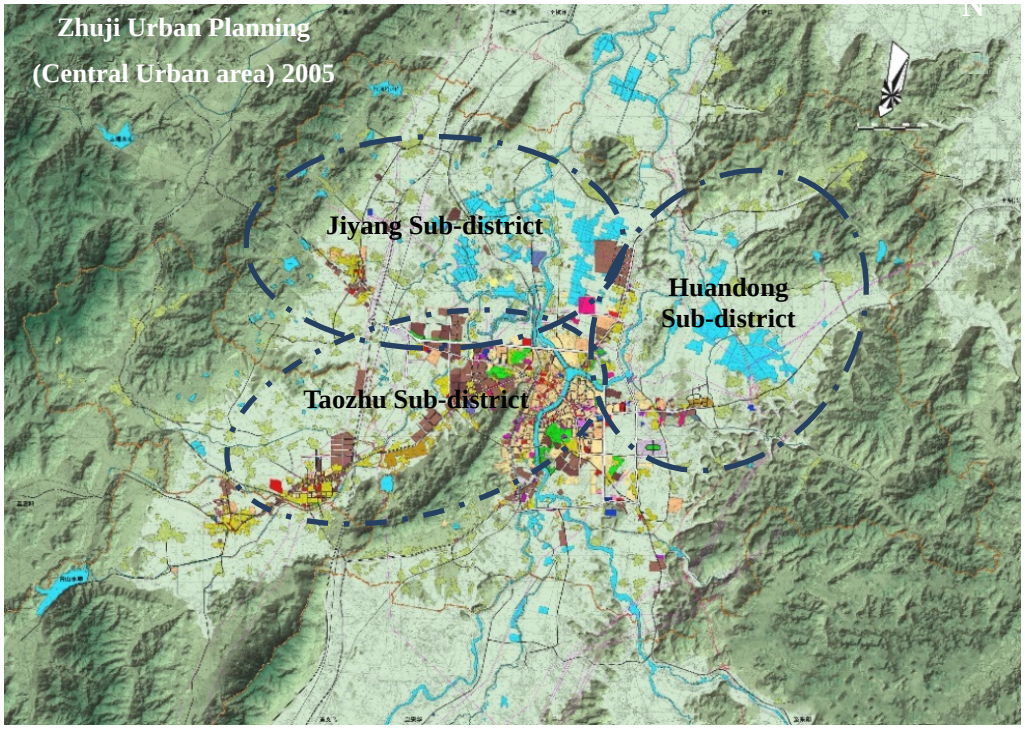
The chapter also highlights some key events that have shaped stakeholder participation in urban flood management. This synthesis was developed from a review of publications, organisational documents and initial interviews with key respondents during the scoping phase, and provides deeper contextualisation of the case. To set the scene, the factors that shape urban flooding will be discussed.

4.2 Factors that shape urban flooding in ZJ

As a typical medium-sized city in China which suffers from urban floods (Figure 4.1), Zhuji currently has a population of 1.15 million (0.35 million in the central urban area) and a gross domestic product (GDP) of 57.5 billion Yuan in 2010. According to the Municipal Urban Plan 2006-2020, the population of Zhuji will reach 1.28 million (0.5 million in the central urban area) and a GDP of 1,150 billion Yuan by 2020. It is vulnerable to flooding owing to its socio-economic development and geographic location, as well as climate change and rapid urbanisation.

Figure 4-1 Urban floods in Zhuji

First, the terrain of central Zhuji (Figure 4.2) includes foothills in the east and west areas, a river valley in the central region and a flood plain river network in the north. The Puyang River goes through the central urban area from south to north, which means the river plain network in the north plays an important role in flood detention and discharge. Furthermore, this kind of geographic location also means urban floods in Zhuji not only include pluvial and fluvial floods, but also related geological disasters.



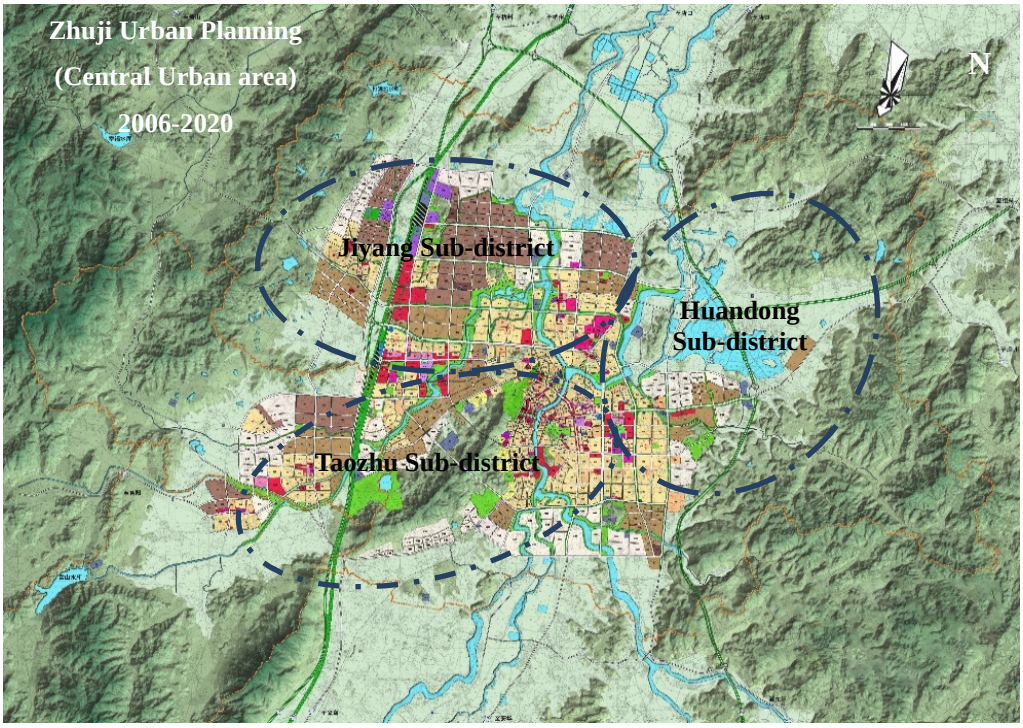


Figure 4-2 Zhuji central urban area plan 2005 and 2006-2020

Furthermore, Zhuji is in a sub-temperate monsoon zone. Compared with other cities at a similar latitude, it gets more rainfall (average annual rainfall is about 1275-1500mm)

(Zhuji Water Conservancy Bureau, 2008), and the annual temperature difference is larger. Zhuji also obviously has a hilly and mountainous climate. The annual rain seasons are from April to June (caused by spring rain) and from August to October (caused by typhoons). Between these two, the damage caused by typhoons is more significant. Due to climate change, typhoons are easily created from tropical cyclones (Zhuji Water Conservancy Bureau, 2008). Both the frequency and related destructive damage of the typhoons have been increasing recently. According to the Zhejiang Urban Flood Management report in 2011, the maximum rainfalls in 1 hour, 6 hours and 24 hours have all happened since 2004 (Zhejiang Government, 2013). Figure 4.3 presents the average, maximum and minimum rainfall in every month from 1979 to 2016. From this graph, it is obvious that there is a huge difference in rainfall during the year. Most of the rainfall comes during March, April, May, June, July and August, and the maximum rainfall always happens in June, July and August, this being caused by typhoons.

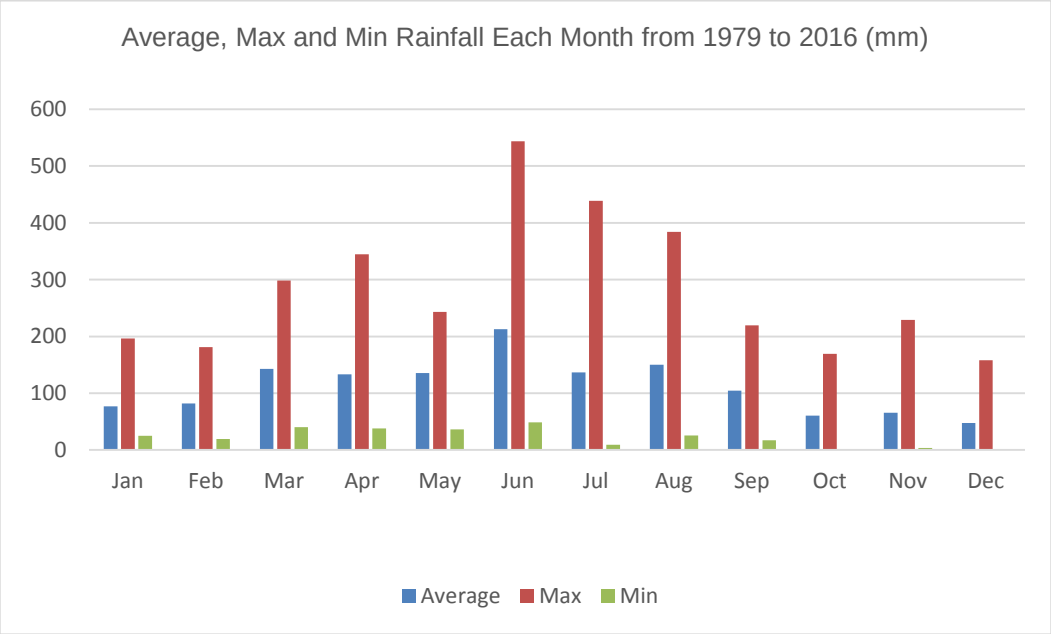


Figure 4-3 Average, maximum and minimum rainfall each month from 1979 to 2016

The central urban area of Zhuji was about 32km^2 in 2005, 40.6km^2 in 2010 and is expected to be about 52.5km^2 by 2020. The annual urbanisation rate is about 3% to 5%. The city can be divided into three sub-district areas: Jiyang, Taozhu and Huandong, as well as two urban development areas: the West Open Economic Zone and the

Commercial Mall Zone. Figure 4.2 shows the central urban area in 2005 and 2020. According to this, most urban water storage areas have and will be filled. This is especially the case for the river plain network in the north, which obstructs flood retention and discharge during the flood seasons. Moreover, the hard surface and poor drainage system of the central urban areas have aggravated the urban drainage problem. As the urban area has developed, lots of suburban and rural areas have been urbanised. This means the original rural drainage and embankment systems cannot satisfy the current need for urban flood prevention.

The next section describes the history of urban flood disasters and related development of urban flood management activities.

4.3 History of urban flood management in Zhuji

History of urban floods

Throughout history, the Puyang River, which goes through the central urban area of Zhuji, has caused lots of floods. The Puyang River Basin is surrounded by hilly mountains in the west, south and east. The elevation difference for the Puyang riverbed is huge, which speeds up the river flow. In Zhejiang, it is called the ‘small Yangzi River’ (which has caused lots of flood in China). Between the year of 1034 and 1949, the municipal area of Zhuji suffered 84 floods. Among them, 13 were urban floods. Since its founding, although the municipal government has paid more attention to urban flood management, urban flooding has remained traumatic for the residents in Zhuji.

During August and September in 1992, Zhuji suffered four typhoons. Many of the embankments of Puyang River were burst and nearly all the urban areas were flooded. This disaster caused 550 deaths and more than 3,500 people missing.

Since the 1970s, the Puyang River Basin has suffered more floods than before. Among them, the floods on 17 June 1977, 9 July 1997 and 16 June 2011 were the most serious ones. In 1977, because of the typhoon and the spring rain, the central urban areas of Zhuji suffered heavy rain. Most the rainfall came over six hours. The average rainfall

was about 128.7mm. This rainfall caused lots of flash floods and related geological disasters. From the 6 July to 11 July 1997, the average rainfall reached 319mm over six days. The disaster lasted nearly one week. Although, the local government tried to store floodwater, there were still floods in the urban areas. Because of continuous heavy rainfall and the high water level in Qiantang River during June 2011, Zhuji suffered its most serious flood since 1977. Between 3 and 20 June 2011, the Puyang River Basin suffered four heavy rainfall events. The total average rainfall was more than 500mm. This flood affected 272,200 people, with an estimated direct loss of more than 1.3 billion Yuan (RMB).

Although there has been no destructive flood disaster since 2011, the heavy rainfall during the spring rain and frequent typhoons still threaten the safety of Zhuji. In fact, Zhuji is suffering more typhoons than before. In 2013, typhoon 'Fitow' brought 160.9mm average rainfall over five days. In 2015, affected by the spring rain and typhoon 'Can-hom', the average rainfall during the spring season reached 528.6mm (Figure 4.4). This is twice as much as before. More recently, the city suffered five heavy rainfalls during 2016's spring rain. All of these involved more than 50mm of rain every day. The whole spring rainfall reached 558.6mm.

Figure 4-4 Water-logging disaster during typhoon 'Can-hom' in 2015

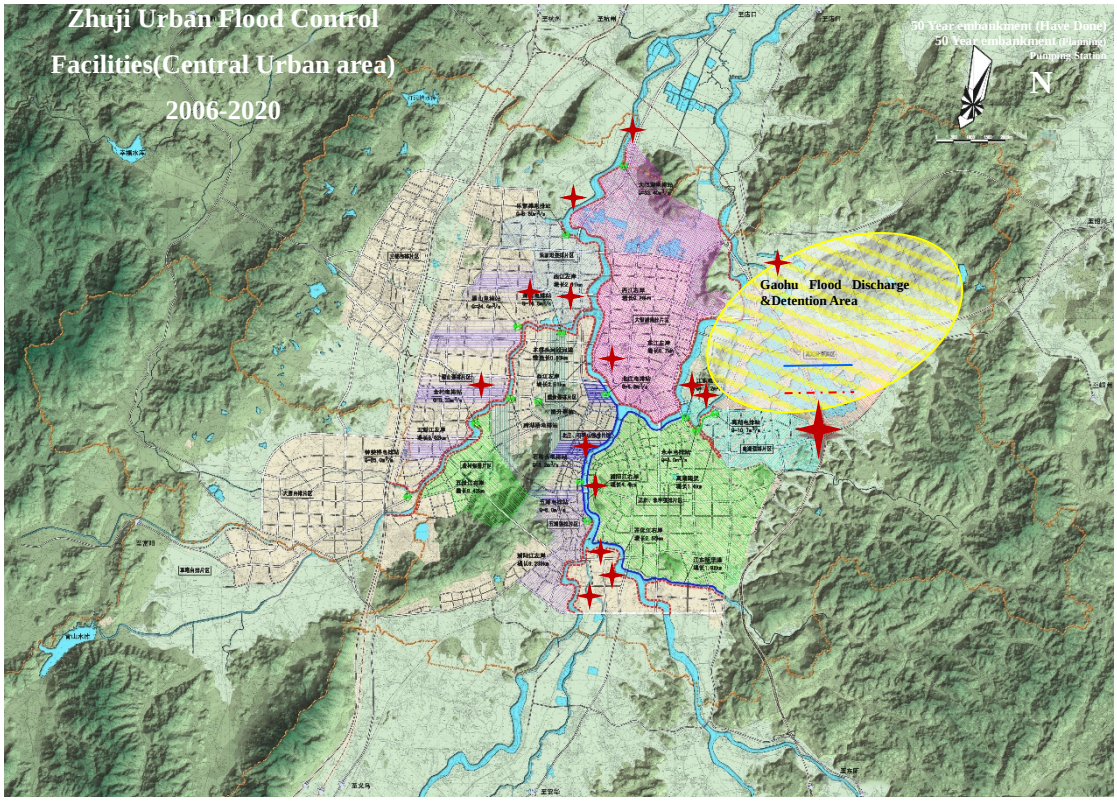
The successful prevention and control of urban flooding during the last few years has relied on the development of urban flood management, especially structural measures like flood storage reservoirs and river embankments.

The next section explains the history of urban flood management in Zhuji.

History of urban flood management

Construction of flood control facilities

In common with the other medium-sized Chinese cities, following its founding (in 1949), flood control became a focal point for the municipal government in Zhuji. Following the basic rule: 'storage upstream, diversion midstream and discharge downstream', large numbers of important flood control facilities have been constructed. According to Zhuji Urban Planning 2003-2020, the total investment in urban flood control facilities between the years 2003 and 2020 will be more than 1.4 billion Yuan. These projects include the Gaohu flood discharge and detention area, urban embankments, pumping stations and flood control



reservoirs (Figure 4.5).

Figure 4-5 Urban flood control facilities (central urban area) 2006-2020

The Gaohu flood discharge and detention area, located north-east of Zhuji, is one of the most important projects in the Puyang River flood prevention system. It was built in May 1954 and remodelled by the end of 1996. Its main goals are to protect the Hukun Railway (which connects Shanghai and Kunming) and the central urban area of Zhuji, as well as the people and 33,350 hectares of farmland downstream. At the time of writing, it had been used seven times.

Furthermore, following the building of the Gaohu flood discharge and detention area, ten flood control reservoirs (Anhua, Chencai, Shibi, Tongjiqiao etc.) were built upstream of Puyang River. The overall capacity of these ten reservoirs is more than 10 million m^3. They not only provide water for urban areas and irrigation, but also store, divert and control the floods.

The Puyang River Basin includes large numbers of branches, lakes and wetlands. Therefore, embankments must be built to secure the safety of the city. Currently, most urban embankments are able to prevent a 20-year flood. According to Zhuji Urban Planning 2006-2020, most of the embankments will be able to prevent a 50-year flood by the end of 2020. Figure 4.5 presents the standards of the current urban embankments. The blue lines indicate the embankments that have reached 50-year standard. The red lines indicate the ones that will reach the standard by the end of 2020. The total investment on these embankments between 1988 and 2012 was about 552 million Yuan.

At the same time, the municipal government of Zhuji has also built large numbers of urban pumping stations for urban drainage. Base on the standard of 1961: ‘three days’ rainfall of 200mm should drain within three days’, five pumping stations were built in 1962. However, due to rapid urbanisation and the aging pumping stations, the original drainage capacities are no long enough. In 1993, the municipal government provided a new standard: ‘24 hours’ rainfall of 224mm should drain within a day’. Currently, there are more than 18 pumping stations in the urban area of Zhuji. However, due to rapid urbanisation, as well as climate change, current urban drainage capacity is still not enough. According to Zhuji Urban Planning 2006-2020, there will be six more

pumping stations built by the end of 2020. Figure 4.5 shows the locations of the key 14, while Table 4.1 presents their current drainage capacities.

Table 4-1 Detailed information on the 14 key urban pumping stations in Zhuji

Name	**Drainage areas (km^2)**	**Current drainage capacities (m^3/s)**
BeiZhuang	2.1	9
Shitatou	1.6	3.2
Wuhu	2	2.2
Jincun	3.3	9
Zhuoshan	13.6	22.1
Tanyu	9.2	14.1
Lejiadan	4.9	8.8
Jiangdong	18.5 in total	13.2
Yongfen		8
Dalvhu	19.7	30
Gaohu	24.3	31.05
Xinbi	13.8	6
Dingdangfan	4.83	9.7
Guanyanghu	16.8	6
Total	134.63	172.35

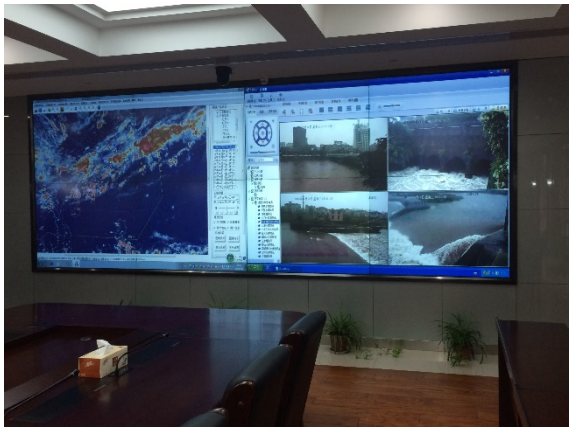
Flood monitoring system

Before 1978, water and rainfall monitoring was mainly based on manual rainfall meters and water gauges in Zhuji. In addition, insufficient monitoring stations and traditional communication technologies (telephone and telegram) reduced accurate recording of water and rainfall information, as well as the reaction speed of decision-making.

So, between 1979 and 2012, the municipal government of Zhuji built a network-based, automated flood monitoring system. The system not only monitored precipitation, evaporation, water level, river flow, sediment concentration and tide level, but also water quality. By the end of 2012, there were 90 automated water and rainfall monitoring stations built around the municipal area of Zhuji.

Flood consultation system

Along with the modern flood monitoring system, a flood consultation system was built to provide a flood information platform for decision-making in 2010. The system was located at the Municipal Flood Prevention and Drought Relief Headquarters and covered the whole 27 sub-districts of Zhuji. Following upgrades in 2012, the system could provide real-time communication among the related provincial, Shaoxin administration area, municipal and sub-district stakeholder organisations. Figure 4.6 depicts flood consultation among the municipal, Shaoxin administration area and the Provincial Flood Control and Drought Relief Headquarters during typhoon Can-hom in 2015.



Furthermore, to help municipal stakeholders manage flooding, the provincial government created the Puyang River Basin Flood Prevention Plan in April 1989. According to this plan, the flood-warning levels and related response events, as well as the stakeholder organisations, were divided into four levels: 5-year flood (24 hr rainfall less than 120mm); 5-10-year flood (24 hr rainfall between 120 and 150mm); 10-20-year flood (24 hr rainfall between 150 and 200mm); and more than 20-year flood (24 hr rainfall more than 200mm).

Due to the development of urban flood control facilities, the Municipal Flood Control and Drought Relief Headquarters (MFCDRHs) modified the plan in 2003 and 2012. The current divisions of the flood-warning levels are presented in Table 4.2.

Figure 4-6 Flood consultation during typhoon Can-hom in 2015

Table 4-2 Current flood-warning levels

Flood-warning levels in Zhuji

IV (Common)

1) The municipal weather station issues the blue warning for a typhoon. The typhoon will potentially influence the city during the next few days.
2) The average rainfall within 24 hours has reached 50-80mm within the municipal area. There will be continual heavy rainfall during the next 24 hours. The water level of the Puyang River rises significantly.
3) There is brief heavy rain within a certain area. The three-hour rainfall is more than 80mm and has caused flooding.
4) The small reservoirs, the ponds in the mountains and flood-prevention facilities like embankments and sluices are in danger.

III (Less Serious)

1) The municipal weather station issues the yellow warning for a typhoon. The typhoon will influence the city during the next few days.
2) The average rainfall within 24 hours has reached 80-120mm within the municipal area. There will be continual heavy rainfall during the next 24 hours.
3) There is brief heavy rain within a certain area. The three-hour rainfall is more than 120mm and has caused flooding.
4) The water level of the Puyang River at Taipin Bridge has reached 10.64 metres.
5) The small reservoirs, the ponds in the mountains and flood-prevention facilities like embankments and sluice are in great danger.

II (Serious)

1) The municipal weather station issues the orange warning for a typhoon. The typhoon will seriously influence the city during the next few days.
2) The average rainfall within 24 hours has reached 120-150mm within the municipal area. There will be continual heavy rainfall during the next 24 hours.
3) There is brief heavy rain within a certain area. The three-hour rainfall is more than 160mm and has caused flooding.
4) The water level of the Puyang River at Taipin Bridge is higher than 10.64 metres and is continually rising.
5) Small reservoirs and flood-prevention facilities like embankments and sluices are in great danger. Large and medium-sized reservoirs are in danger.

I (Extremely Serious)

1) The municipal weather station issues the red warning for a typhoon. The typhoon will have an extremely serious impact on the city during the next few days.
2) The average rainfall within 24 hours is more than 150mm within the municipal area. There will be continual heavy rainfall during the next 24 hours.
3) The water level of the Puyang River at Taipin Bridge is close to 12.14 metres, and will be higher than 12.14 metres.
4) Large and medium-sized reservoirs are in great danger. And flooding will endanger public safety.
5) The Puyang embankments burst and this will endanger public safety.

According to this classification, the Municipal Flood Prevention Plan allocated 31 key stakeholder organisations roles during a flood emergency. Detailed information about the stakeholder classifications and their responsibilities are introduced in the next section.

By following this kind of traditional urban flood management process, Zhuji has successfully prevented several floods in its history. However, due to economic development, urbanisation and climate change, the municipal government has realised that it is necessary to transform traditional urban flood management into integrated urban flood management. Since 2014, several integrated urban flood management projects – including the ‘the Development of Urban Flood Risk Maps’, ‘the Building of Grassroots Flood Emergency Management Organisations’ and ‘Integrated Water Resource Management’ – have been applied. However, to implement this kind of integrated urban flood management, the first step is to engage the relevant stakeholders.

The next section introduces institutional arrangements for urban flood management in Zhuji.

4.4 Institutional arrangements for urban flood management in Zhuji

First, according to No.38 of the Flood Prevention Law:

"The administrative heads of people's governments at all levels shall assume overall responsibility for the work of flood control, with different levels and different departments responsible for part of work under a centralised command"

The Mayor is responsible for urban flood management in Zhuji.

Then, as referenced in the national and provincial flood management system, there are two parallel administration structures for flood management at the municipal level of Zhuji: one is in charge of operational management and flood-fighting initiatives during the flood season, while the other is mainly concerned with planning, construction and routine management of flood control works.

Flood operations

During a flood emergency, the Flood Control and Drought Relief Headquarters (FCDRHs) at the municipal level of Zhuji takes command of all flood issues before, during and after flooding. Its main responsibilities include to:

- formulate and improve emergency plans for flood control and drought relief, Puyang River emergent water diversion plan and drought relief plan; and review and report on water diversion plans of large-sized reservoirs;
- organise and carry out inspection for the purposes of flood control and drought relief; and to supervise and urge relevant departments and units to cope with safety issues concerning flood control and drought relief promptly;
- implement orders and approve plans concerning flood control and drought relief from superior departments;
- determine to initiate (end) emergency responses to flooding, typhoons or drought in the city; organise emergent consultation for the purposes of flood and typhoon control; and announce and end warnings against flooding and typhoons;
- organise post-disaster work and coordinate work among relevant departments;
- organise, direct and supervise the storage, management and use of relief supplies for flood and typhoon control purposes;

- organise the promulgation of knowledge, laws, regulations and policies concerning flood and typhoon control, as well as related exercises; and
- carry out other duties prescribed by laws and regulations.

To fulfil the headquarters' responsibilities, an office has been created to deal with routine tasks. In Zhuji, the Municipal FCDRHs office is in the Municipal Water Conservancy and Hydropower Bureau (WCHB); most of its members come from the Municipal WCHB.

To confer adequate authority for coordination and swift response, the director of the Municipal FCDRHs is the Deputy Mayor, who oversees municipal water conservancy and agricultural development. Three deputy directors head the Municipal Public Security Bureau, People's Armed Forces Department, and the Water Conservancy and Hydropower Bureau.

According to the municipal flood prevention plan, the Municipal FCDRHs includes 31 members. According to the flood-warning levels, these stakeholders are divided into 11 groups: six for Levels II, III and IV and five more for Level I. Brief stakeholder classifications are presented in Table 4.3, while detailed information about the stakeholder groups for flood emergency management are included in Appendix E.

Table 4-3 Stakeholder groups for flood emergency management in Zhuji

Stakeholder groups for flood emergency management in Zhuji (Levels II, III, IV)
General management group
1. The City Office (CO) 2. Municipal Flood Prevention and Drought Resistance Office (MFPDRHO)
Emergency rescue and mitigation group

1. People's Armed Forces Department (PAFD)
2. Water Conservancy and Hydropower Bureau (WCHB)
3. Power Supply Bureau (PSB)
4. Housing and Construction Bureau (HCB)
5. Civil Affairs Bureau (CAB)
6. Municipal Transportation Bureau (MTB)
7. Land Resource Bureau (LRB)
8. Agricultural Bureau (AB)
9. Public Health Bureau (PHB)
10. Power Supply Bureau (PSB)
11. Municipal Telecommunication Bureau (MTCB)

Media group

1. Municipal Publicity Department (MPD)
2. Zhuji Daily (ZD)
3. Zhuji TV and Radio Station (ZTRS)
4. Municipal Flood Prevention and Drought Resistance Office (MFPDRHO)

Monitoring and forecasting group

1. Water Conservancy and Hydropower Bureau (WCHB)
2. Meteorology Bureau (MB)
3. Land Resource Bureau (LRB)

Disaster verifying and auditing group

1. Civil Affairs Bureau (CAB)
2. Water Conservancy and Hydropower Bureau (WCHB)
3. Agricultural Bureau (AB)
4. Land Resource Bureau (LRB)
5. Municipal Transportation Bureau (MTB)
6. Municipal Flood Prevention and Drought Resistance Office (MFPDRHO)

Logistical services group

1. The City Office (CO)
2. Water Conservancy and Hydropower Bureau (WCHB)

Other stakeholder groups for flood emergency management in Zhuji (Level I)

Supplies purchasing group

1. Civil Affairs Bureau (CAB) 2. Municipal Finance Bureau (MFB) *3.* Service Industry Development Office (SIDO)
Emergency medical and health group
1. Public Health Bureau (PHB) 2. Housing and Construction Bureau (HCB) *3.* Environmental Protection Bureau (EPB)
Stability maintaining group
1. Power Supply Bureau (PSB) *2.* People's Armed Forces Department (PAFD)
Mobilising group
1. Municipal Publicity Department (MPD) 2. The Communist Youth League Committee (TCYLC) *3.* Red Cross Society of China (RC)
Discipline monitoring group
1. Supervisory Bureau (SB)

General administration and planning

Municipal administration and planning for flood management are the responsibilities of the Municipal WCHB. It is responsible for flood monitoring and diversion; supervising and managing the safety of water conservancy projects; organising the emergency maintenance of water conservancy projects; as well as inspecting the maintenance of projects damaged by flood.

However, in dealing with flood management in the urban area of Zhuji, the WCHB needs to work in partnership with other municipal departments or agencies – like the Housing and Construction Bureau (HCB), Transportation Bureau (MRB), Land Resource Bureau (LRB), Environmental Protection Bureau (EPB), Planning Bureau (PB) etc. Among these municipal stakeholder organisations, the Municipal Housing and Construction Bureau (HCB) is critical for urban flood management. In Zhuji, the Municipal Housing and Construction Bureau has to manage municipal infrastructure

and buildings, especially in the central urban areas, and their drainage systems. Moreover, other administrative authorities also contribute to urban flood management in Zhuji – such as the Transportation Bureau, which manages the traffic system, including the highways (provincial, Shaoxin administration) and waterways; the Land Resource Bureau, which is responsible for urban land management; the Planning Bureau, which plans spatial land use; and the Meteorology Bureau, which forecasts the weather. At the municipal level of Zhuji, there are more than 130 administrative authorities that influence or will be influenced by urban flood management.

Furthermore, the hierarchical administration system in China also brings five sub-district administration authorities to the central area of Zhuji (Jiyang, Taozhu, Huandong, the West Open Economic Zone and the Commercial Mall Zone). These five sub-district government authorities are responsible for flood management within their administration areas.

Specific organisations

Unlike other medium-sized cities in China, Zhuji has a unique flood management organisation – the Water Conservancy Association (WCA). Its main functions are to manage small rural water resource facilities. It also prepares flood defence materials, inspects small flood defence facilities and organises communities for flood fighting during the emergency within its administration area.

The association has a long history in Zhuji. It was formed during the Ming Dynasty and has made significate contributions to water resource and flood management in the city. Unlike other flood management stakeholders in Zhuji, the Water Conservancy Association is a community-based organisation. Most of its funds and staff come from the local communities. At the time of writing, there were 50 Water Conservancy Associations within the municipal area of Zhuji. Among these, the most important is for the central urban area – the Gaohu Water Conservancy Association.

4.5 Summary

This chapter has introduced the historical and contextual background pertaining to urban flood management in Zhuji, and has shown the need to transform traditional structural-based urban flood management to integrated urban flood management. However, to implement integrated urban flood management methods, the first step is to engage the relevant stakeholders.

As presented in this chapter, urban flood management in Zhuji includes various stakeholder organisations or agencies, and overlaps or gaps often arise during management activities. Thus, it is very important to drive stakeholder prioritisation and engagement within this fluid environment. This exploration of urban flood management in Zhuji will provide insights into what drives stakeholder prioritisation and how stakeholders are included or excluded from urban flood management network activities in a medium-sized Chinese city. By exploring the link between stakeholder network analysis and engagement within urban flood management, it is also possible to obtain a deeper understanding of how stakeholders' network roles impact on related engagement activities within a complex infrastructure management environment.

4.6 Conclusion

In order to advance this research, the analysis of stakeholder engagement during urban flood management in Zhuji is divided into three steps: flood preparedness, flood response and flood recovery. The exploration of these three different urban flood management processes will show the intricate patterns of interaction between stakeholders, which is fundamental to understanding how the urban flood management network engages with stakeholders.

The next chapter analyses stakeholder engagement during the flood preparedness period.

5. Data Analysis – Flood Preparedness

5.1 Chapter structure

This chapter presents analysis and findings on the function and operation of the Zhuji urban flood preparedness network. The study explains how the results from the analysis relate to the case within the specific context of Zhuji urban flood preparedness, and how the results from each component are integrated into a comprehensive examination of the urban flood preparedness stakeholders.

The whole chapter is divided into five parts. The first part positions the case within its contextual background and discusses how institutional arrangements under the Zhuji urban flood management system operate before a flood. The second part presents primary stakeholder identification and analysis for urban flood preparedness in Zhuji, while the third analyses these key stakeholders – focusing in particular on stakeholder salience. Sections four and five discuss the outcome of stakeholder network analysis, presenting a potential correlation between the salience and network analysis. The next section outlines the background context of urban flood preparedness in Zhuji.

5.2 Background context

Adequate preparation is necessary for the municipal government of Zhuji if it is to integrate urban flood management. As introduced in Chapter 4, the local government has made great efforts in this respect. Especially since the disastrous flooding in 1997, many integration projects have been allocated to the central urban area of Zhuji. These projects include the construction and modification of flood prevention and control facilities, land-use planning,

Figure 5-1 Zhuji flood-fighting exercise in 2007

resource planning, deployment planning, flood forecasting, monitoring and warning systems, flood-fighting exercises etc. Figure 5.1 shows flood-fighting exercises in Zhuji in May 2007. More recently, the municipal government has also started to amend urban flood risk maps and promote flood insurance. However, dealing with these projects in Zhuji's urban area requires coordination among the relevant stakeholders. Unfortunately, nearly all municipal government institutions, agencies or other stakeholders like CBOs and NGOs, and even the local communities, will influence or be influenced by the urban flood management in Zhuji. Thus, it is important to prioritise the relevant stakeholders, finding out who should be included or excluded from urban flood preparedness in the city. By analysing these key stakeholders, it is possible to obtain a deeper understanding of which facets of urban flood preparedness network operations impact on stakeholder engagement.

The next section identifies the urban flood preparedness stakeholders in Zhuji.

5.3 Stakeholder identification

According to Zhuji's Municipal Flood Prevention Plan, the Municipal Flood Control and Drought Relief Headquarters (FCDRHs) includes 31 municipal stakeholder organisations. These organisations have been divided into 11 groups: general management; emergency rescue and mitigation; media; monitoring and forecasting; disaster verifying and auditing; logistical services; supplies purchasing; emergency medical and health; stability maintaining group; mobilising; and discipline monitoring. However, this classification creates many overlaps. For example: the City Office (CO) exists in both of the general management and logistical services groups; the Municipal Flood Prevention and Drought Resistance Office (MFPDRHO) is classified both in the general management group and the media group, as well as the disaster verifying and auditing group; the Water Conservancy and Hydropower Bureau (WCHB) is not only included in the emergency rescue and mitigation group and the monitoring and forecasting group, but also the disaster verifying group and the auditing and logistical services groups. Furthermore, the Municipal FCDRHs does not include all the key stakeholders involved in urban flood management. Thus, according to the 12 key informant interviews in this project, a set of 51 stakeholders

was identified as being relevant to urban flood management in Zhuji. Appendix A presents these 50 stakeholders and their roles on urban flood management in the city.

With respect to the urban flood preparedness period, not all of these 50 stakeholders are included. By analysing stakeholders' salience attitudes, only 31 of them are relevant to urban flood preparedness. The detailed process of salience analysis is presented in the next section. Based on the classification from the Municipal Flood Prevention Plan, these 31 urban flood preparedness stakeholders can be divided into five groups: comprehensive coordination, urban administration, service operation, logistics supply and community mobilisation. Table 5.1 presents the classification of the urban flood preparedness stakeholders.

Table 5-1 Flood preparedness stakeholders' classification

Stakeholder	Sector represented	Role
CO	Municipal government	Comprehensive coordination
JSGO	Sub-district government	Urban administration
TSGO	Sub-district government	Urban administration
HSGO	Sub-district government	Urban administration
MDC	Sub-district government	Urban administration
CMMC	Sub-district government	Urban administration
MFPDRHO	Municipal government	Comprehensive coordination
EMO	Municipal government	Comprehensive coordination
WCHB	Municipal government	Service operation
HCB	Municipal government	Service operation
LRB	Municipal government	Service operation
MB	Municipal government	Service operation
MFB	Municipal government	Logistics supply
MTB	Municipal government	Service operation
BIA	Municipal government	Logistics supply
MTCB	Municipal government	Logistics supply
PSB	Municipal government	Logistics supply
SIDO	Municipal government	Logistics supply
EPB	Municipal government	Service operation
MEB	Municipal government	Service operation
ETB	Municipal government	Service operation
DRB	Municipal government	Service operation
PB	Municipal government	Service operation
MUMB	Municipal government	Service operation
MBLC	Municipal government	Community mobilisation
MPD	Municipal government	Community mobilisation
ZD	Public sector	Community mobilisation
ZTRS	Public sector	Community mobilisation

CLPCIC	Public sector	Logistics supply
WAGL	Public sector	Service operation
WCA	Community-based organisation	Service operation

As introduced in the Figure 5.2, most urban flood preparedness stakeholders (84%) either come from the municipal or the sub-district government. The high concentration of government institutions existing in the stakeholder groups indicates that there is little non-government input into urban flood preparedness. Only five stakeholders come from a non-government body, i.e. from the public sector (Zhuji Daily [ZD], Zhuji TV and Radio Station [ZTRS], Zhuji Branch of the China Life Property and Casualty Insurance [CLPCIC] and Zhuji Water Affairs Group Limited [WAGL]) and one community-based organisation (the Water Conservancy Association [WCA]). At the same time, in terms of urban flood preparedness roles, most (42%) provide a variety of urban flood services.

A detailed discussion of the five stakeholder groups during the urban flood preparedness period is presented below.

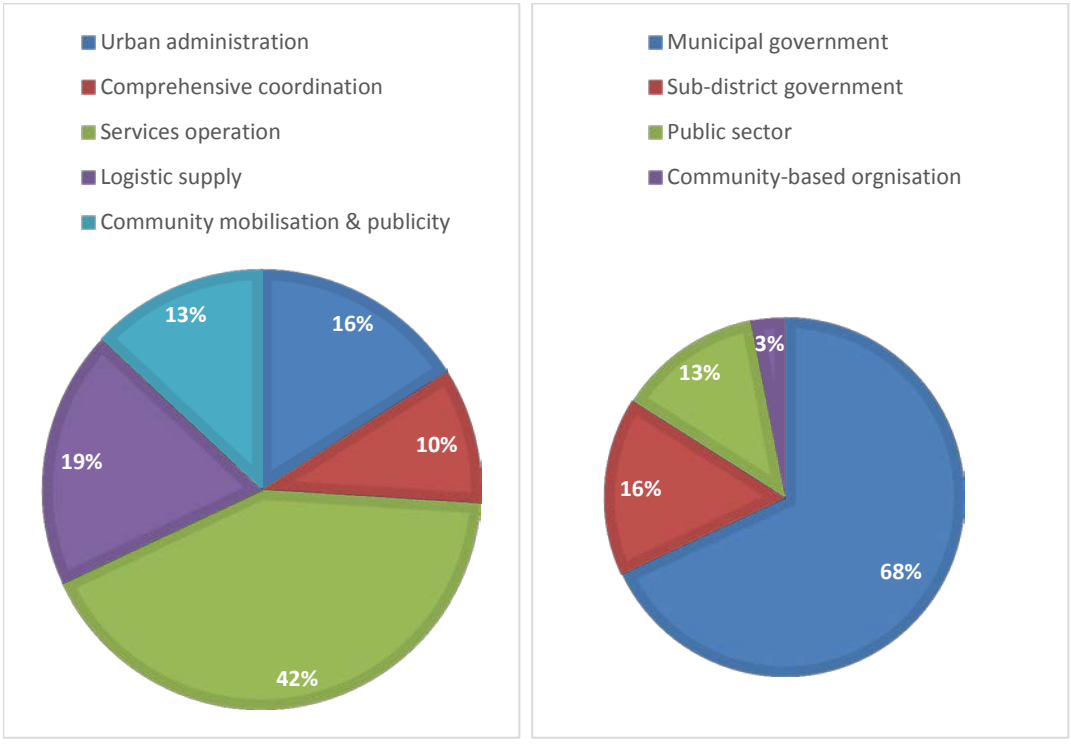


Figure 5-2 Stakeholder groups of urban flood preparedness in Zhuji

The breakdown in Table 5.2 shows the extent to which government departments are influential in decision-making, to the exclusion of other stakeholders. As such, inputs on important issues such as community engagement were not considered. The various stakeholder groupings identified in Table 5.2 now discussed in greater detail.

Urban administration stakeholder

Urban administration stakeholders during urban flood preparedness include Jiyang Sub-District Government Office (JSGO), Taozhu Sub-District Government Office (TSGO), Huandoing Sub-District Government Office (HSGO), the Municipal Development Committee (MDC) and the Commerce Mall Management Committee (CMMC). These five stakeholders are sub-district administration organisations that manage the central urban area of Zhuji. The deputy director of the Municipal Flood Prevention and Drought Resistance Office (MFPDRHO, Interviews, 29 July 2015) said: “they were just like small government in their administration areas, they did more practical works”. Seven (7) respondents (Interviews, 13 July 2015 a, b and c; 17 July 2015 a and b; 27 July 2015) indicated that the sub-district administration organisations were the grassroots units for flood preparedness. Most emergency rescue resources (material and human) were prepared by the sub-district administration organisations. Furthermore, these respondents also believed these sub-district administration organisations carried the responsibility to engage with the public. As the Municipal Water Conservancy Bureau of Zhuji (2015) showed, these sub-administration stakeholders had responsibility to organise and manage all kinds of flood preparedness activities (including for related geological disasters) within their related administration areas.

Comprehensive coordination stakeholder

Three stakeholders – the City Office (CO), MFPDRHO and the Emergency Management Office (EMO) – were identified as being comprehensive coordination stakeholders during urban flood preparedness. This type of stakeholder had to coordinate other municipal stakeholders during urban flood preparedness. Among them, the CO was considered an important municipal coordination stakeholder. The Municipal Flood Control Plan (2015) described the major role of CO was to “organise

specialised meetings for the purposes of flood control and drought relief, coordinate work among relevant departments and supervise the implementation of work". This was also agreed with the deputy director of the MFPDRHO (Interview, 29 July 2015). As the leader of municipal flood management in Zhuji, the MFPDRHO had a key role during flood preparedness. It formulated and improved all kinds of emergency plans for flood control and drought relief. It organised and carried out inspections for the purposes of flood control and drought relief, and supervised and urged relevant departments and units to cope with safety issues concerning flood control and drought relief promptly. Furthermore, MFPDRHO also implemented orders and approved plans concerning flood control and drought relief from superior departments (Municipal Water Conservancy Bureau of Zhuji, 2015). Due to the existence of the MFPDRHO, the EMO played a less important role during the urban flood preparedness period. The main responsibility of EMO was to prevent other disasters caused by floods (such as epidemics).

Service operation stakeholder

Nearly half the urban flood preparedness stakeholders were identified as service operation stakeholders. These stakeholders were: WCHB, the Housing and Construction Bureau (HCB), the Land Resource Bureau (LRB), the Meteorology Bureau (MB), the Municipal Transportation Bureau (MTB), the Environmental Protection Bureau (EPB), the Municipal Education Bureau (MEB), the Economic and Trade Bureau (ETB), the Development Reform Bureau (DRB), the Planning Bureau (PB), the Municipal Urban Management Bureau (MUMB), WAGL and WCA. They were either responsible for the prevention of and preparedness for a typical urban flood (WCHB for fluvial and flash floods, HCB for water-logging floods, LRB for geological disasters), or for providing a specific service for urban flood preparedness. For example: the MB could provide meteorological information and the EPB would prevent pollution caused by flooding. Combined with the data collected from the literature review and fieldwork, Table 5.2 describes the services these stakeholders provide for urban flood management.

Table 5-2 Roles of service operation stakeholders in urban flood preparedness

Stake-holders	Roles for preparedness
WCHB	• General management of urban floods; • To predict and monitor rainfall and river water; • To supervise and manage the safety of water conservancy projects; and • To organise and direct the emergency maintenance of water conservancy projects; and inspect and direct the maintenance of projects damaged by flood.
HCB	• To supervise and protect municipal infrastructure and buildings from flood and typhoons; • To manage the drainage system in the central urban area; • To supervise and urge departments in charge of property management companies to make efforts for flood control, drainage of urban flooding, as well as typhoon control in urban residential areas; • To organise surveys of typhoon-prevention capability for residential buildings; and • To direct the construction, planning and quality control of residential buildings before flooding.
LRB	• To prevent and defend against geological disasters; direct, supervise and urge the inspection, monitoring and release of early warnings of geological disasters and transfer of people in dangerous areas before flooding; and • To provide the Municipal Flood Prevention and Drought Resistance Headquarters with updates and warnings of geological disasters promptly.
MB	• To monitor the whole process of each typhoon; update the real-time information of the path, wind and rain and forecast the trend; release early warnings; and • To provide the Municipal Flood Prevention and Drought Resistance Headquarters with weather forecasts promptly in the short, medium and long term; monitor and forecast short-term rainstorms; and release rainstorm warnings.
MTB	• Be responsible for safety work against flooding and typhoons for highways, waterways, docks and transportation stations (fields); • Protect transit projects under construction from flooding and typhoons; organise and coordinate rescue work during traffic emergencies; implement water traffic control in accordance with the law; • Be responsible for traffic management during emergency periods against flooding and typhoons; direct, supervise and urge units like stations and ports to reschedule or cancel transport promptly, and inform the public of such information;

	• Release early warnings for transport disruptions; and • Organise maintenance of highways and channels damaged by flood; organise and deploy vehicles and vessels for rescue and relief work; and provide information on damage to transport systems.
EPB	• To prevent potential environmental pollution caused by flooding.
MEB	• To supervise and manage the work of protecting schools in the city from flooding and typhoons; • To supervise and urge schools to promulgate damage caused by natural disasters like typhoons and flooding, as well as measures for disaster prevention and alleviation; and • Supervise and direct schools to suspend classes and avoid danger during the emergency in accordance with orders from the Municipal Flood Prevention and Drought Resistance Headquarters.
ETB	• To engage with the local public or private sectors, and supervise their flood prevention activities.
DRB	• To coordinate among the review, approval and investment plans of relevant projects against flooding and typhoons and non-engineering projects; coordinate among related departments to give priority to emergencies; and • To supervise and direct the work of protecting key municipal construction projects from flooding and typhoons.
PB	• Be responsible for municipal land-use planning.
MUMB	• Be responsible for the safety of outdoor advertising boards and store signs; and • Organise the timely clearance of garbage; and clean up and restore damaged municipal facilities.
WAGL	• To monitor and ensure the safety of the water supply.
WCA	• To provide local advice to the municipal government; • To inspect the embankments and small reservoirs; and • To prepare the flood emergency rescue materials.

From Table 5.2, it is obvious that the service operational roles of these stakeholders experience several overlaps. First, as the WCHB is responsible for general management of municipal flood preparedness, it actually manages most urban flood control facilities, which include the pumping stations. At the same time, the HCB has the right to manage the drainage system in the central urban area. Both respondents from WCHB and HCB recognised the existence of this overlap (Interviews, 17 July

2015 and 27 July 2015) and pointed out that it caused chaos. For example, as the previous director of WCHB indicated (Interview, 27 July 2015), the urban drainage standards provided by WCHB and HCB are different. The standard from WCHB is higher than that from HCB. Second, an overlap arises from the urban land use. The previous director and deputy director of WCHB (Interview, 27 July 2015), as well as the director of the MFCDRHO (Interview, 29 July 2015), pointed out that urban land-use planning did not sufficiently consider flood management. As the director of FCDRHO mentioned (Interview, 29 July 2015), LRB and PB did not consult with WCHB and FCDRHO regarding flood management when planning urban land use. Furthermore, another overlap exists with regard to urban road management. Although the role of MTB is to protect the roads from urban floods within the municipal area, most of the roads within the central urban area are managed by HCB. Most of the roads managed by MTB are in rural or suburban areas. Due to rapid urbanisation, it is very difficult to differentiate the jurisdiction for these roads. According to interviews with the deputy director of HCB (Interview, 27 July 2015) and the director of MTB (Interview, 13 July 2015), only a few experts knew the jurisdiction for urban roads in any detail. Again, this causes confusion in relevant flood preparedness activities.

Logistics supply stakeholder

As the second large group of stakeholders during urban flood preparedness, the logistics supply stakeholders only provide the material, human and financial resources. This group of stakeholders includes: the Municipal Finance Bureau (MFB), the Building Industry Authority (BIA), the Municipal Telecommunication Bureau (MTCB), the Power Supply Bureau (PSB), the Service Industry Development Office (SIDO) and CLPCIC. Based on the literature review and data collected from the 51 questionnaires, Figure 5.3 shows the resources prepared by these six stakeholders.

Figure 5-3 Logistics stakeholder group for urban flood preparedness in Zhuji

Community mobilisation and publicity stakeholder

The last four organisations: the Municipal Bureau for Letters and Calls (MBLC), the Municipal Publicity Department (MPD), ZD and ZTRS are identified as stakeholders due to their roles in community mobilisation and publicity during urban flood preparedness. First, MPD, ZD and ZTRS are identified as mobilisation and publicity stakeholders because they are the major media departments or companies at the municipal level. The major difference between the ZD, ZTRS and MPD is that MPD is a municipal government department, while ZD and ZTRS are in the public sector. Furthermore, the director of MB indicated that all the news published by ZD and ZTRS must be agreed first by the MPD (Interview, 13 July 2015). MBLC, meanwhile, was nominated by respondents as a stakeholder due to its role in community consultation (Interviews, 27 July 2015, 29 July 2015).

To sum up, the 12 key informants identified 51 urban flood management stakeholders. Due to their salience attitudes, 31 of these were indicated as being relevant to the preparedness period. Despite the number of stakeholder groups identified, urban flood preparedness stakeholders are primarily drawn from municipal government. The focus on inter-governmental groups as stakeholders means that the diverse perspectives of

the wider community and business groups – such as those in the public or private sectors, voluntary organisations, NGOs and urban residents – are overlooked.

The next section examines the salience of urban flood preparedness stakeholders through an analysis of respondents' attributions of power, legitimacy and urgency to each stakeholder.

5.4 Salience of stakeholders

As discussed in the literature review, the salience of stakeholders is derived from combinations of power, legitimacy and urgency. Accordingly, the key informants rated all 50 urban flood management stakeholders for salience. Based on the ratings of the respondent group overall, stakeholders involved during urban flood preparedness comprise five stakeholder types: Definitive, Discretionary, Dormant, Dominant and Dependent. Respondents declined to rate the salience of the remaining stakeholders: the Supervisory Bureau (SB), the Red Cross (RC), the Agricultural Bureau (AB), the Fire Brigade (FB), PSB, MFB, MAO, the Municipal Statistical Bureau (MSB), the Tourism Bureau (TB), the Civil Affairs Bureau (CAB), the Safety Inspection Bureau (SIB), the People's Armed Forces Department (PAFD), the Municipal Justice Bureau (MJB), Zhuji Branch of the People's Bank of China (BPBC) and the Municipal Auditing Bureau (MAB), citing that relationships with these stakeholders during preparedness were inactive. Table 5.4 contains a summary of the combinations of power (P), legitimacy (L) and urgency (U) attributed to various stakeholders and the subsequent stakeholder types that these combinations represent.

Table 5-3 Salience analysis of urban flood preparedness stakeholders

Stakeholder	Attitude	Salience type	Stakeholder	Attitude	Salience type
CO	PLU	Definitive	MEB	LU	Dependent
JSGO	PLU	Definitive	MJB	/	/
TSGO	PLU	Definitive	MAO	/	/
HSGO	PLU	Definitive	ETB	L	Discretionary
MDC	PLU	Definitive	DRB	PL	Dominant
CMMC	PLU	Definitive	PB	PL	Dominant
MFPDRHO	PLU	Definitive	SIB	/	/

EMO	PLU	Definitive	SB	/	/
WCHB	PLU	Definitive	MSB	/	/
HCB	PLU	Definitive	MAB	/	/
LRB	PLU	Definitive	PSB	/	/
MB	PLU	Definitive	FB	/	/
PHB	/	/	PAFD	/	/
MFB	PL	Dominant	MUMB	P	Dormant
CAB	/	/	MBLC	P	Dormant
MTB	PLU	Definitive	MPD	L	Discretionary
AB	/	/	ZD	L	Discretionary
BIA	P	Dormant	ZTRS	L	Discretionary
MFB	/	/	RC	/	/
TB	PLU	Definitive	BPBC	/	/
PSB	PLU	Definitive	CLPCIC	L	Discretionary
SIDO	PLU	Definitive	WAGL	L	Discretionary
EPB	L	Discretionary	TCYLC	/	/
TB	/	/	WCA	LU	Dependent
MFB	/	/	CF	/	/

5.4.1 Reflection on stakeholder salience

By drawing on the information presented in Tables 5.1 and 5.3, it was calculated that:

- Beside the no-stakeholder group, urban flood preparedness does not include the Dangerous and Demanding salience types. The remaining five types are Definitive, Discretionary, Dormant, Dominant and Dependent.
- Excluding non-stakeholders, 51.6% of flood preparation stakeholders are the Definitive type, with all coming from municipal or sub-district government.
- The second largest stakeholder group is Discretionary (22.6%), with seven stakeholders: the EPB, ETB, WAGL, MPD, ZD, ZTRS and CLPCIC. More than half of these stakeholders are in the public sector.
- 9.6% of the stakeholders were identified as Dormant: BIA, MUMB and MBLC, all of which are municipal government departments.

- Another 9.6% of stakeholders are Dominant: the MFB, DRB and PB. They are all municipal government departments.
- The remaining two Dependent stakeholders existing in urban flood preparedness for Zhuji (6.4%) are: MEB and WCA, which are both service operation stakeholders.

A detailed discussion of these five stakeholder types is highlighted below.

Definitive stakeholders (power, legitimacy and urgency)

The key informants perceived more than half the flood preparedness stakeholders to have both power and legitimacy claims, and to convey the urgency of their claims. As Definitive-type stakeholders, they are the core network participants during urban flood preparedness in Zhuji. For example, the MFPDRHO has the power to control the flood preparedness resources, and its urgent claims are perceived as legitimate due to its self-interest. The director of the MFPDRHO indicated

"As the routine work agency of the Flood Control and Drought Relief Headquarters, MFPDRHO did lots of the detailed works like flood prediction, flood warning and the design of the flood control plan. They are the leader of urban flood management in Zhuji. And they can acquire any resource compulsorily during urban flood management." (Interview, 27 July 2015)

Furthermore, the high proportion of government departments in the definite type of stakeholders shows that the government-based stakeholders have the greatest potential in changing and influencing decisions and policies regarding urban flood preparedness in Zhuji. Thus, this type of stakeholder will encounter a high level of continuing engagement by the urban flood preparedness network.

Discretionary stakeholder (legitimacy)

As Discretionary-type stakeholders, EPB, ETB, MPD, ZD, ZTRS, WAGL and CLPCIC were identified as having legitimacy for their claims, but none of the other salience attributes. Among these stakeholders, MPD, ZD and ZTRS are the local media. The lack of power probably indicated insufficient community mobilisation for

urban flood management during the preparedness period. Similarly, inadequate attention to environmental protection within the municipal area of Zhuji caused the lack of power of EPB. Furthermore, according to the Water Conservancy Annual (2008), there had been no flood-related environmental pollution within the urban area (Zhuji Water Conservancy Bureau, 2008). Thus, the key informants may have overlooked the importance of EPB during flood preparedness. Another two stakeholders that may have been underestimated by the key respondents were the ETB and WAGL. Although ETB has the role to engage the public and private sectors and WAGL provides the water supply during flood preparedness, the respondents did not perceive their importance during this period. As the director from the MFCDRHO illustrated (Interview, 29 July 2015), the headquarters and the WCHB did not engage with them for flood preparedness activities. Finally, because of the lack of flood insurance, CLPCIC was perceived by the respondents to be unimportant too; respondents from MFCDRHO, WCHB and CO (Interviews, 23 July 2015, 27 July 2015, 29 July 2015) agreed with this.

Dormant stakeholder (power)

The next salience type of stakeholder is Dormant. Identified as Dormant-type stakeholders, BIA, MUMB and MBLC are peripheral to the flood preparedness network in that they only show the power attribute. As some key informants indicated (Interviews, 7 July 2015, 27 July 2015, 29 July 2015), although these three municipal government departments have the power to influence flood preparedness, they did not actually carry out their obligations in this regard. For example, as mentioned by the deputy director of WCHB, the community consultation for the construction of flood defence facilities is under the control of sub-district governments, MFCDRHO and WCHB (Interviews, 27 July 2015, 29 July 2015).

Dominant stakeholder (power and legitimacy)

Peripheral to urban flood preparedness, Dominant stakeholders – MFB, DRB, PB – were seen by respondents to be powerful and their claims were considered to have legitimacy. However, during the flood preparedness period itself, these stakeholders have neither pressed to have their claims recognised immediately nor have they

pushed the importance of those claims. The claims of these stakeholder are usually perceived to be more urgent during a flood emergency (Interview, 17 July 2015).

Dependent stakeholder (legitimacy and urgency)

MEB and WCA, the two Dependent stakeholders identified by the 13 key informants, were considered to make legitimate and urgent claims regarding urban flood preparedness activities. However, the informants did not observe the power of these stakeholders. For example, as a community-based organisation, the claims of WCA were perceived as legitimate due to its self-interest, while its role in flood defence facility inspection creates the urgency of its claim. However, because the urban flood management system in Zhuji is government based, the power of WCA has been weakened (Interviews, 23 July 2015, 13 July 2015, 27 July 2015).

To sum up, there are five salience groups of stakeholders during urban flood preparedness in Zhuji: the Definitive type, Discretionary type, Dormant type, Dominant type and Dependent type. As most of the Definitive stakeholders are government-based, it is obvious that the municipal and sub-district government departments have the greatest potential to change and influence decision-making regarding urban flood preparedness.

According to the literature, during stakeholder engagement, the Definitive and Dominant stakeholders are the groups a system must include. The participation of Discretionary and Dependent ones needs to be developed. The engagement of Dormant, Demanding and Dangerous stakeholders should be specifically monitored. Thus, the lack of any Dangerous and Demanding-type stakeholders demonstrates that the urban flood preparedness network is relatively stable.

By analysing the stakeholder salience attitudes, it is possible to find who should be included and excluded during urban flood preparedness. The categorisation of stakeholders following this analysis will potentially provide inspiration on related engagement approaches. For example, Definitive-type stakeholders will encounter a high level of continuing engagement by the urban flood preparedness network. A detailed discussion on the relative engagement approaches is presented in Chapter 8.

The next section explores the connection between the urban flood preparedness network and its stakeholders.

5.5 Urban flood preparedness network analysis

Unlike with the salience model, which focuses on stakeholder differentiation and categorisation, the social network analysis is used to investigate the relationships between stakeholders. A set of key measurements is applied to untangle the complexity of the network, as has been discussed in chapter 2. These measures are the density and average path distance of the network, the betweenness centrality of actors, and the strength, frequency and level of interaction of the relationship. Table 5.4 reiterates the definition for each measure.

Table 5-4 Network measures and their definitions

Measure	Description
Density	This measures how much activity there is in the network, as compared to how much there could be. The higher the density ratio of the network, the higher the level of cohesion within the network.
Average path distance	Average path distance is an indication of how quickly information can be spread: how easy it is to access resources, engage in planning and programming activity, or to make referrals.
Centralisation	A high network centralisation means there are only a few actors holding most ties linking the network together; thus, only these well-connected few need to be reached to access the entire network.
Core-periphery	This indicates the network positions of an actor, either at the core or on the periphery.
Betweenness centrality	This describes the extent to which an actor lies on paths between other actors. An actor with higher betweenness centrality will link across disconnected segments of the network, and will have the most holistic view of the problem. They can also mobilise and diffuse information to the larger network.
Interaction frequency	This indicates how often network members interact with each other.
Information exchange quality	This indicates the information exchange quality between the network members

5.5.1 The stakeholder network examined

Network Maps 5.1 and 5.2 present the network structures of information exchange and stakeholder interaction frequency during urban flood preparedness. The coloured nodes represent the roles of stakeholders, while the shape of the nodes denotes the traditional sector represented, as referenced in Figure 5.4. The coloured lines between the nodes represent the fact that those two stakeholders are linked, and have interacted or exchanged information with each other during urban flood preparedness. The black lines present strong relations, green lines mean medium relations and grey lines mean weak relations. It is known that most of these stakeholders, especially the government departments, interact with each other on matters other than urban flood preparedness, but those interactions are outside the scope of this research and are thus not included in the network maps. Furthermore, during the study, nobody stated feeling really cut off from the information flow. In fact, obtaining all necessary information is generally easy for most stakeholders in Zhuji, from the few sources of information that they can receive. The network structures displayed in the basic maps are used to calculate the four network measures density, centralisation, average path distance, and core-periphery, as discussed in chapter 2.

The average densities of the information exchange network and the interaction frequency network are 0.237 and 0.232. That means only 23.7% of information exchange and 23.2% of interaction relationships are active during urban flood preparedness, demonstrating that stakeholders appear not to be interacting with one another extensively. In other words, the stakeholders do not appear to have the same interests at heart, which was confirmed by the interviews with the deputy director of CAB (Interview, 17 July 2015) and director of MFCDRHO (Interview, 29 July 2015).

The average path distances between stakeholders for urban flood preparedness networks are 1.86 and 1.828, which shows that stakeholders, on average, must go through 1.86 and 1.828 other stakeholders to access or disseminate information. These are relatively positive numbers, thus indicating that information is travelling through the network with relative ease. This, in theory, increases the network's

ability or capacity to work together, should the level of commitment increase (Ansell, 2003; Olsson, 2009).

The degrees of centralisation for the information exchange and stakeholder interaction networks are 74.5% and 64.3%. This means that the networks are highly centralised, which indicates that only a few actors hold most ties linking the network together; thus only these well-connected few need to be reached to access the entire network.

These three measures are a useful starting point to gain a sense of the stakeholder network. Next, the actors occupying the core and the periphery will be assessed using the core-periphery, betweenness centrality and strength measures.

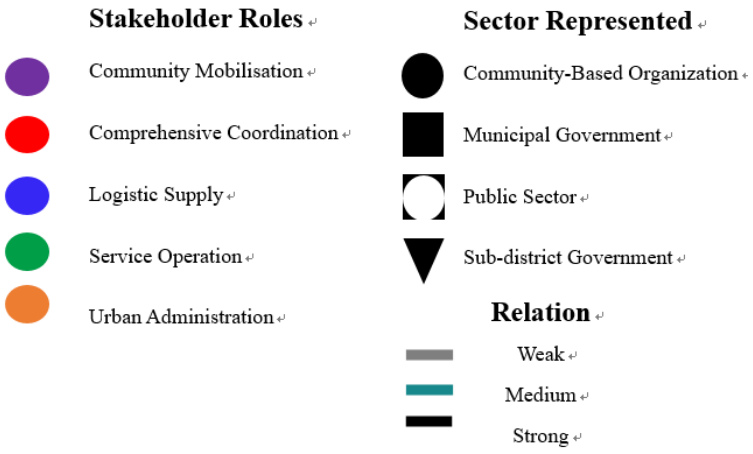
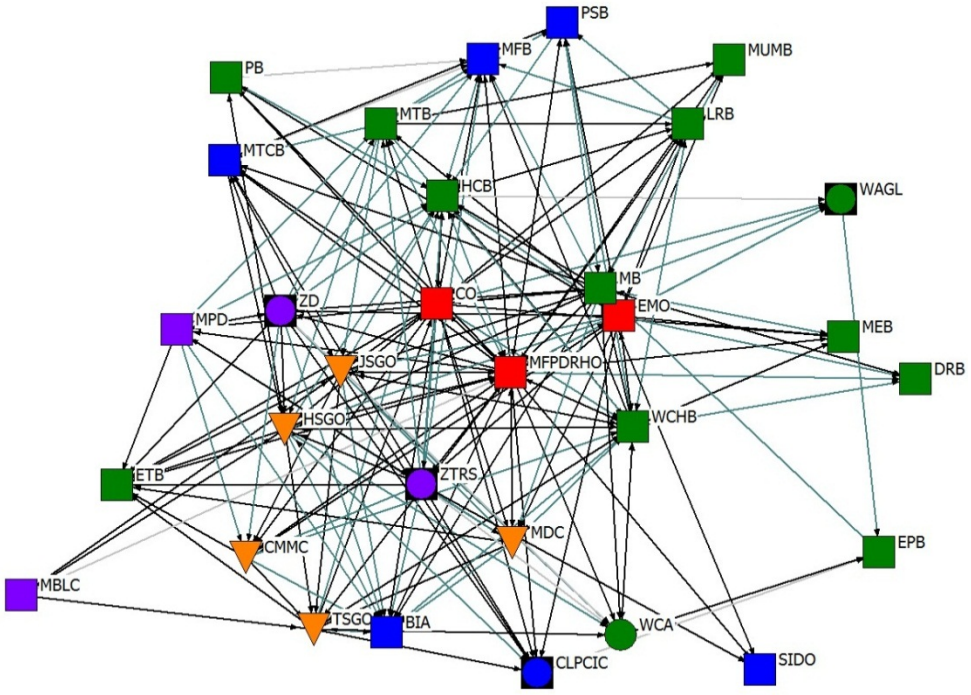
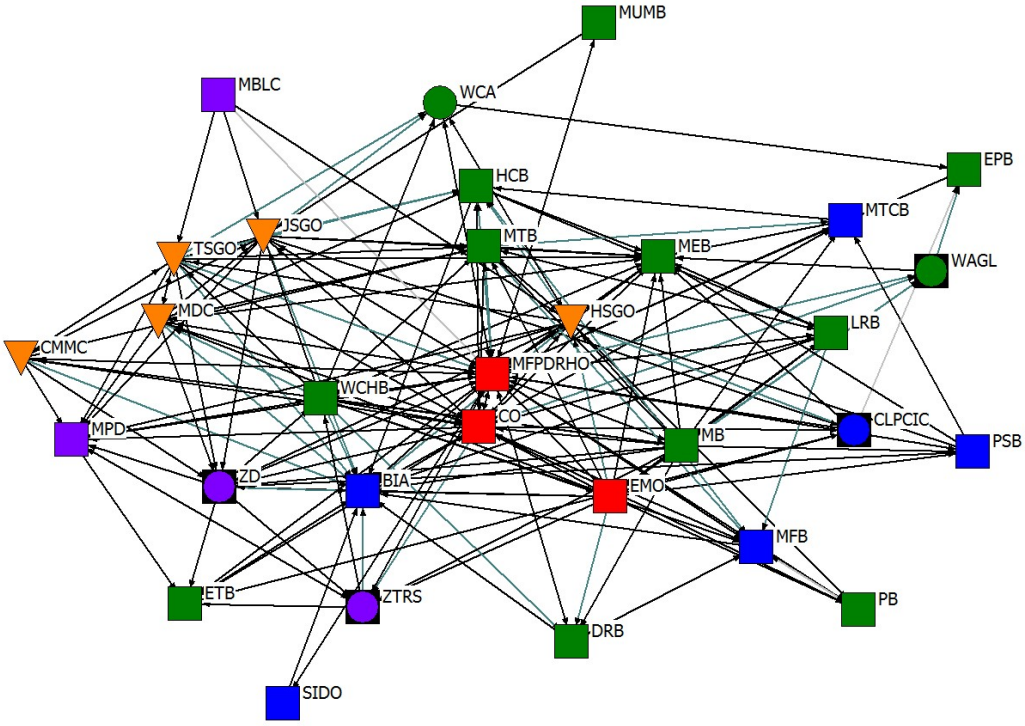


Figure 5-4 Legend for the network maps as used in Network Maps 5.1 and 5.2



Network Map 5-1 Stakeholder information exchange quality for urban flood preparedness



Network Map 5-2 Stakeholder interaction frequency for urban flood preparednes

Core or periphery

The core-periphery model analyses the network position of the stakeholder by determining which stakeholders are part of a densely connected core and which are part of a sparsely connected periphery. Core stakeholders will also be reasonably well connected to peripheral nodes, but the latter are not well connected to a core or to each other (Rombeach, 2014). Table 5.5 presents the results of the core-periphery analysis during urban flood preparedness.

Table 5-5 Core-periphery analysis for urban flood preparedness networks

Information exchange quality		**Interaction frequency**	
Core	***Periphery***	***Core***	***Periphery***
CO JSGO TSGO HSGO MFPDRHO EMO WCHB HCB LRB MB	MDC CMMC MFB MTB BIA MTCB PSB SIDO EPB MEB ETB DRB PB MUMB MBLC MPD ZD ZTRS CLPCIC WAGL WCA	CO JSGO TSGO HSGO MFPDRHO EMO WCHB LRB MB BIA MPD ZD	MDC CMMC HCB MFB MTB MTCB PSB SIDO EPB MEB ETB DRB PB MUMB MBLC ZTRS CLPCIC WAGL WCA

As indicated in Table 5.5, most core stakeholders come from the comprehensive coordination (CO, MFPDRHO and EMO) and urban administration (JSGO, TSGO and HSGO) groups. The remainder are the WCHB, HCB, LRB, MB, BIA, MPD and ZD. The major differences between information exchange quality and interaction frequency networks are in the HCB, BIA, MPD and ZD. This indicates that the engagement approaches used by the HCB are mainly multi-direction and low-frequency ones, while BIA, MPD and ZD usually use a one-direction but high-frequency engagement approach. Meanwhile, the periphery-type stakeholders also contribute to urban flood preparedness, so it is important for the core stakeholders to develop efficient stakeholder engagement approaches with them.

Betweenness centrality

Betweenness centrality describes the extent to which a stakeholder lies on paths between other stakeholders. It can also be used to measure the resource-control abilities of stakeholders. As shown in Network Maps 5.3 and 5.4, betweenness

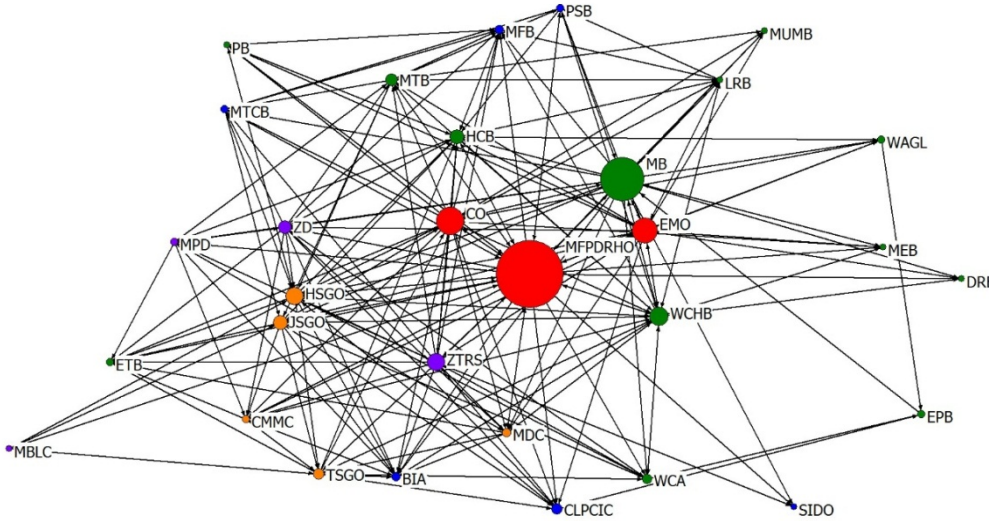
centrality is indicated by node size: the larger the node, the higher the betweenness centrality. Within a network, a stakeholder with a high betweenness centrality indicates that it links across disconnected segments of the network and has the most holistic view of the network activities. A high betweenness centrality also represents the ability to mobilise and diffuse information to the other members within the network. By contrast, a stakeholder with a low betweenness centrality means it can feel constrained or torn between two or more positions.

As the largest node within both interaction and information exchange networks, MFDRHO has the greatest power to dominate flood preparedness resources, as well as to mobilise and diffuse flood prevention information to the other actors within the urban flood preparedness network. As such, MFDRHO performs a broker role of bringing together disconnected segments of the urban flood preparedness network, thus bringing diversity and new ideas to the network. However, it should be noted that such a 'broker' may feel torn between the different elements of the network and forced to take sides, especially between urban land-use management and flood management. Some key informants mentioned that MFPDRHO belongs to the WCHB (Interviews, 23 July 2015, 13 July 2015).

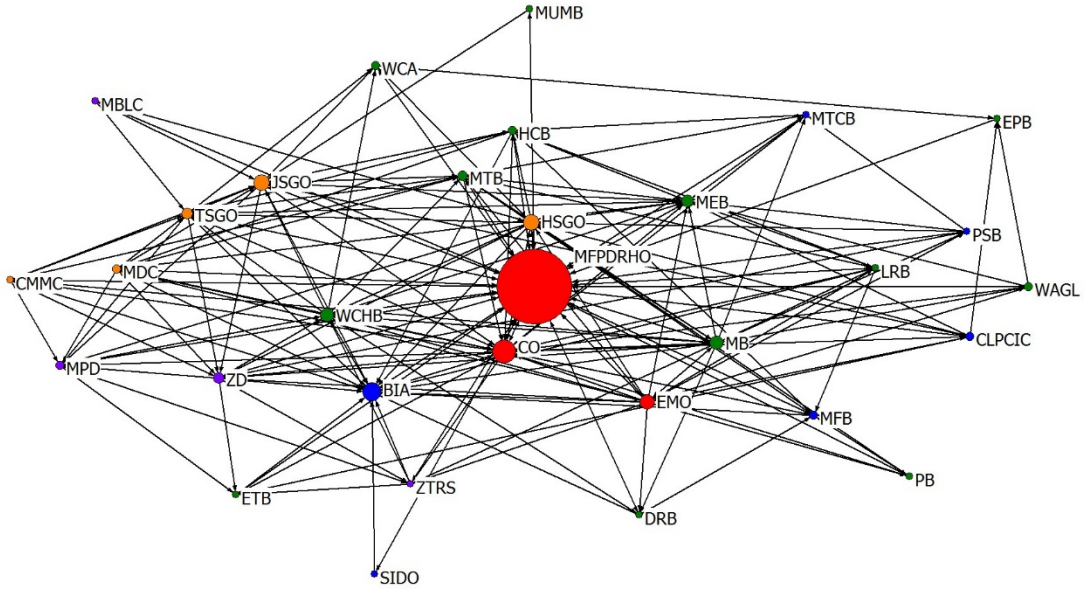
Thus, MFPDRHO must be aware of its central role and responsibility to coordinate with the other stakeholders during urban flood preparedness. Furthermore, as the second largest node within the information exchange network, MB has a great ability for flood information dissemination. This may be due to its role in weather prediction before a flooding.

Besides these two, stakeholders like CO, EMO, WCHB, MTB and HCB have a relatively medium level of betweenness centrality. This shows that they are active within the urban flood preparedness network, but do not have the same reach as MPDRHO. These stakeholders are also important to the urban flood preparedness network. This is because their connectedness indicates that they are active stakeholders that clearly hold an interest in at least some flood preparedness issues. They are also proactively, rather than reactively, engaging with other stakeholders to gather and share information.

The remainder of the stakeholders, like WAGL and EPB, have relatively small nodes. This indicates that they feel constrained and independent from both the interaction and information exchange networks.



Network Map 5-3 Information exchange network for urban flood preparedness, showing network centrality in node size



Network Map 5-4 Stakeholder interaction network for urban flood preparedness, showing network centrality in node size

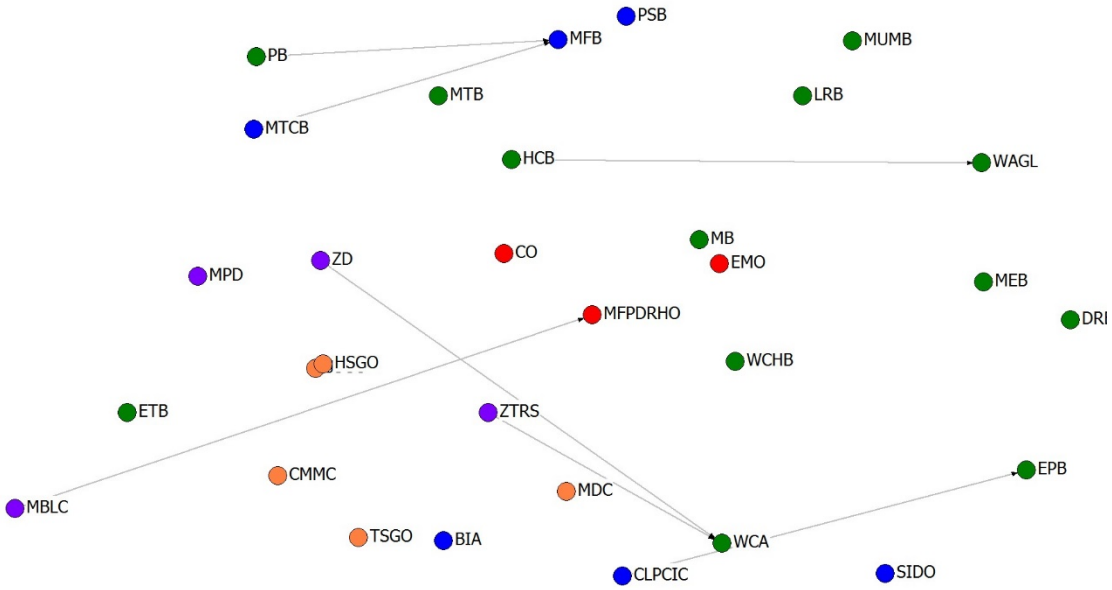
Relationship strength

According to the Network Maps 5.1 and 5.2, there are three different strengths of relationship (strong, medium and weak). Black lines represent strong relationships, with high efficiency, usefulness and trust. Green links mean a medium level of relationship, whereas grey indicates a weak link. Weak links are often caused by either antagonistic relations with low levels of trust, or relations that are perceived to be not efficient or useful. In this case, only a handful of relations are weak in the networks, with the majority grouped around MFPDRHO (Network Maps 5.5 and 5.6). According to the Municipal Flood Prevention Plan, MFPDRHs only includes 31 members. Thus, the weak ties between MFPDRHO and stakeholders like MBCL, CLPCIC, EPB and ETB may be caused by this issue. As an example, the weak tie between MFPDRHO and non-headquarters member MBLC shows that MFPDRHO does not interact with MBLC enough for the community consultation. As the core stakeholder during urban flood preparedness, it is important for MFPDRHs to enhance relations with these stakeholders. Similarly, other key stakeholders like HCB, MTB, CO and EMO should all strengthen the weak ties (Network Maps 5.5 and 5.6).

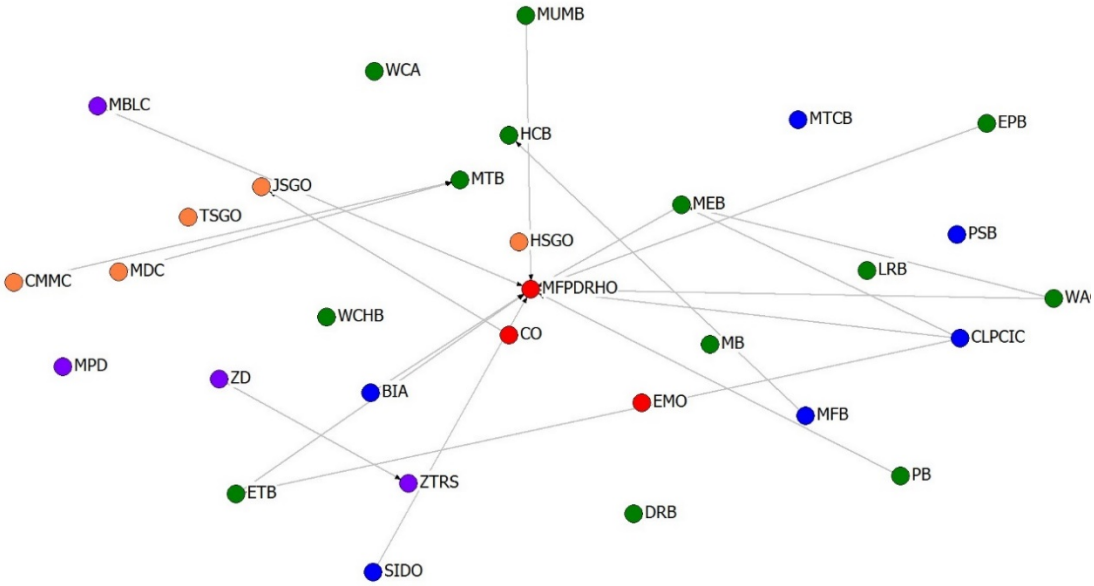
Furthermore, compared with the information exchange quality and interaction frequency networks, there are more weak ties within the interaction frequency network. This means that although the information exchange is efficient during urban flood preparedness, the stakeholder engagement frequency is relatively low. This means many engagement activities among these stakeholders are currently based on one-way static communication techniques like information sharing. Thus, it is important for these stakeholders to reconsider their engagement approaches, transforming approaches from one-direction to multi-direction.

To sum up, these linkage patterns shows where certain stakeholders might want to increase their level of engagement with each other, as well as which stakeholders have good relations and therefore potential to engage coordination and collaboration. The results suggest that some additional effort might be needed by stakeholders like

MFCDRHO, given that it is a key stakeholder during urban flood preparedness, to increase active engagement in the network.



Network Map 5-5 Information exchange network during urban flood preparedness, showing weak ties



Network Map 5-6 Stakeholder interaction network during urban flood preparedness, showing weak ties

5.5.2 Integrated discussion of the components and issues

The two different stakeholder analysis methods used thus far to examine the stakeholder arena each create an exceptional view of the stakeholders. Rather than presenting two different data sets, an attempt has been made to integrate the outcomes of the two approaches into a single source of reference capable of conveying the gathered data and outcomes to the analyst or reader. By using the network map as the main vehicle to display and communicate the information, a foundation is created that can potentially be easily used and adjusted for communication purposes. Incorporating the information extracted using the first component, salience, is relatively easy, as will be demonstrated in this section. Unlike the straightforward relations between salience and the issues, integrating the stakeholder network and the issues is slighting more complex.

Stakeholder salience was used earlier to categorise the stakeholder based on the seven salience types: Definitive, Dominant, Dangerous, Dependant, Dormant, Discretionary and Demanding. However, there are only five of this present study on urban flood preparedness. The Dangerous and Demanding types of stakeholders have been identified as being absent. The classifications derived for each stakeholder can be incorporated into the Network Maps (5.8 and 5.9) so as to allow for an easy visualisation of the data. Five different colours are assigned to the nodes. Definitive stakeholders are identified as red, Dependent stakeholders as blue, Discretionary stakeholders as black, Dominant stakeholders as orange and Dormant stakeholders as green (see Figure 5.7).

With these definitions in mind, the following network maps have been created for urban flood preparedness. The maps show the variables of core-periphery in shape, salience in colour and betweenness centrality in the size of the nodes, as well as relationship strength in the colour of the links.

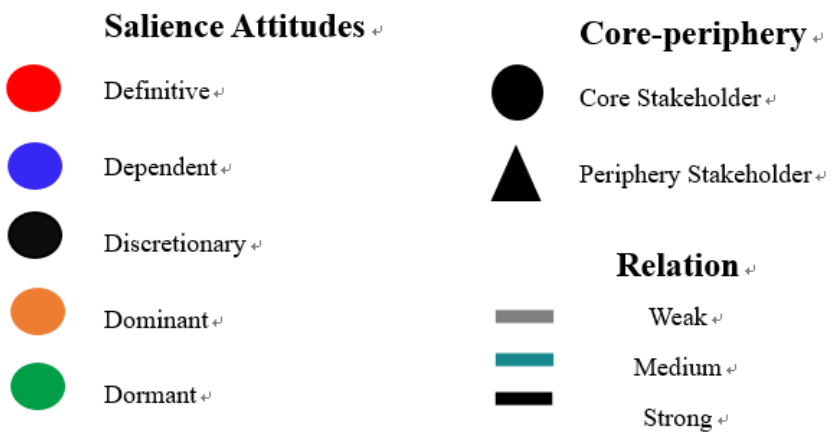
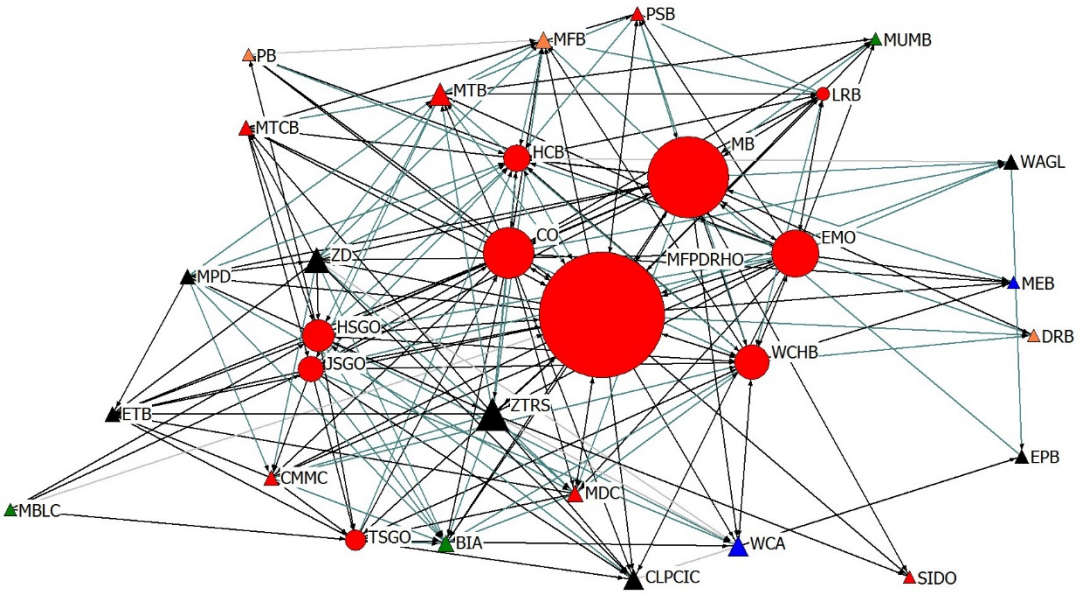
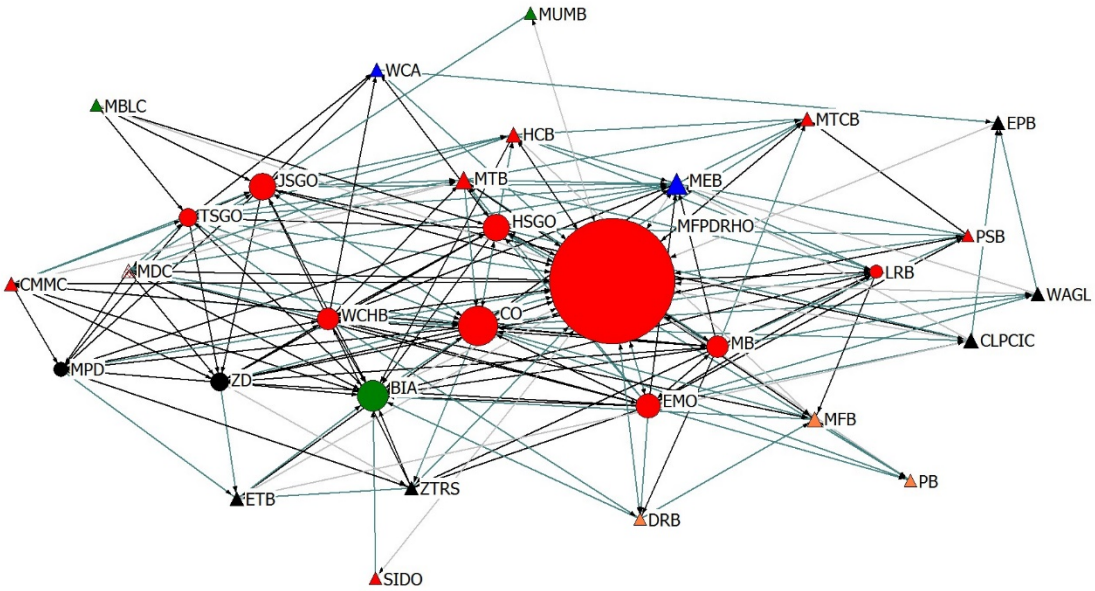


Figure 5-7 Legend for the network maps as used in this chapter, showing salience attitudes



Network Map 5-8 Information exchange network during urban flood preparedness showing stakeholder salience attitudes



Network Map 5-9 Stakeholder interaction network during urban flood preparedness showing stakeholder salience attitudes

Integration of the salience model and stakeholder network analysis

Network Maps 5.8 and 5.9 show the integrated picture of the two research components in one single overview. By narrowing the network down, using the issues as a filter, a distilled map is created that is easier to interpret and narrows the scope to allow a clearer examination of the context. It can be seen that there is a correlation between some of the variables incorporated. Salience and core-periphery analysis have some apparent relations. Most of the Definitive stakeholders are indeed the core ones within the urban flood preparedness networks. Only a few – like HCB, MTB, MTCB, PSB, SIDO, CMMC and MDC – are peripheral in urban flood preparedness. Furthermore, all the Dominant stakeholders are also identified as periphery-type ones. As described in this chapter, Definitive and Dominant stakeholders (PB, MFB and DRB) are the ones that must be included in the network. Thus, it is important for the seven Definitive stakeholders and three Dominant stakeholders to develop their engagement approaches for more effective participation in urban flood preparedness. Most of the salience types without power (Dependent, Discretionary and Dormant) are identified as being on the periphery of the networks, which indicates that stakeholder engagement during urban flood preparedness in Zhuji is highly dependent on power. For effective management of urban flood

preparation in Zhuji, it is important to enhance the power of these three types of stakeholders. At the same time, the salience and betweenness centrality of the stakeholder have no apparent relationship. The Definitive stakeholder MFCDRHO has the highest betweenness centrality; however, there is no significant betweenness centrality difference among the other stakeholders. The incorporation of all the components to one data set, leading to this jumble, enhances the notion that the stakeholder arena is a complex environment, and one that cannot be defined by either stakeholder salience or network analysis alone. However, with the combined knowledge of the two components, engagement between the stakeholders can become more effective, more direct and on topic.

An analysis, as discussed above, could be performed for every single stakeholder in the network. However, doing so would unduly increase the length of this study and divert attention away from the argument that is being presented: that, combined, the two research components provide an overview of stakeholder engagement for urban flood preparedness. This combination provides a level of depth that could not be obtained if only one of the components was to be applied. The combination of all the information outlined, collected together in one network map, allows urban flood preparedness in Zhuji to improve its stakeholder engagement programme by creating more effective, individually specialised ways of engaging.

As a conclusion to this study of urban flood preparedness, Table 5.6 provides a final overview of all the stakeholders in urban flood preparedness in Zhuji and shows their salience, position in the network and betweenness centrality. All of this again indicates that there appears to be no correlation between either of the two research components.

5.6 Conclusion

Table 5.6 sets out a final overview of the stakeholders identified in the urban flood preparedness stakeholder network. The two main metrics are displayed in this table, salience and network betweenness centrality. The other aspects of the network measures, based on the relations, cannot be captured in a table such as this, and have been omitted. This provides another indication of the complexity and intricateness of

the data involved. There is no relation between either one of the main metrics, which presents evidence that the context and environment to the urban flood preparedness arena is indeed complex and multifaceted. After reviewing this urban flood management period, one cannot look at this data and pick ‘the most important’ stakeholder nor ‘the least important’ stakeholder. In fact, the data is so complex that it defies categorisation. This implies that stakeholder engagement within complex and dynamic environments, such as urban flood management, requires a more contingent and specialised approach, one which is based on each stakeholder being considered separately. The integrated network maps are for that reason a source of reference that can assist in drafting engagement polices.

Table 5-6 Final overview of urban flood preparedness stakeholders in Zhuji

Stakeholder	Sector represented	Role	Salience attitudes	Core-periphery (information exchange)	Core-periphery (interaction frequency)	Betweenness centrality (information exchange)	Betweenness centrality (interaction frequency)
CO	Municipal government	Comprehensive coordination	Definitive	Core	Core	42.952	70.300
JSGO	Sub-district government	Urban administration	Definitive	Core	Core	13.669	23.496
TSGO	Sub-district government	Urban administration	Definitive	Core	Core	20.802	5.833
HSGO	Sub-district government	Urban administration	Definitive	Core	Core	41.780	26.486
MDC	Sub-district government	Urban administration	Definitive	Periphery	Periphery	7.299	8.058
CMMC	Sub-district government	Urban administration	Definitive	Periphery	Periphery	3.228	4.839
MFPDRHO	Municipal government	Comprehensive coordination	Definitive	Core	Core	222.106	474.350
EMO	Municipal government	Comprehensive coordination	Definitive	Core	Core	14.511	10.449
WCHB	Municipal government	Service operation	Definitive	Core	Core	71.498	21.774
HCB	Municipal government	Service operation	Definitive	Core	Periphery	47.937	6.011
LRB	Municipal government	Service operation	Definitive	Core	Core	5.794	3.650
MB	Municipal government	Service operation	Definitive	Core	Core	109.346	8.801
MFB	Municipal government	Logistics supply	Dominant	Periphery	Periphery	0.560	3.733
MTB	Municipal government	Service operation	Definitive	Periphery	Periphery	15.658	8.217
BIA	Municipal government	Logistics supply	Dormant	Periphery	Core	0.000	2.986
MTCB	Municipal government	Logistics supply	Definitive	Periphery	Periphery	2.861	0.833
PSB	Municipal government	Logistics supply	Definitive	Periphery	Periphery	1.515	0.200
SIDO	Municipal government	Logistics supply	Definitive	Periphery	Periphery	0.000	0.000
EPB	Municipal government	Service operation	Discretionary	Periphery	Periphery	8.269	0.000
MEB	Municipal government	Service operation	Dependent	Periphery	Periphery	0.000	0.000
ETB	Municipal government	Service operation	Discretionary	Periphery	Periphery	0.000	0.583
DRB	Municipal government	Service operation	Dominant	Periphery	Periphery	0.000	0.417

PB	Municipal government	Service operation	Dominant	Periphery	Periphery	0.478	0.367
MUMB	Municipal government	Service operation	Dormant	Periphery	Periphery	0.389	0.000
MBLC	Municipal government	Community mobilisation	Dormant	Periphery	Periphery	0.000	0.000
MPD	Municipal government	Community mobilisation	Discretionary	Periphery	Core	5.205	11.419
ZD	Public sector	Community mobilisation	Discretionary	Periphery	Core	6.089	16.194
ZTRS	Public sector	Community mobilisation	Discretionary	Periphery	Periphery	5.717	7.769
CLPCIC	Public sector	Logistics supply	Discretionary	Periphery	Periphery	7.446	4.374
WAGL	Public sector	Service operation	Discretionary	Periphery	Periphery	6.908	10.493
WCA	Community-based organisation	Service operation	Dependent	Periphery	Periphery	11.985	13.367

6. Data Analysis – Flood Response

6.1 Chapter structure

This chapter continues to present analysis and findings on the function and operation of Zhuji urban flood management, while focusing particularly on the flood emergency response. The study will explain how the results from the analysis relate to the case within the specific context of the Zhuji urban flood emergency response, and how the results from each component are integrated into a comprehensive examination of the urban flood emergency response stakeholders.

Following the analysis processes in Chapter 5 (Data analysis [flood preparedness]), this chapter will also be divided into five sections. The first section presents the contextual background and related institutional arrangements for urban flood emergency management in Zhuji. The second section primarily identifies and analyses the key stakeholders based on their roles and sector represented. The third section provides a deep analysis on the salience attitudes of these key stakeholders. The last two sections discuss the outcome of the stakeholder network analysis, and present the correlations between the stakeholder salience and network analysis.

The next section explains the background context of urban flood emergency response in Zhuji.

6.2 Background context

In line with traditional urban flood management, most urban flood prevention activities in Zhuji actually focus on emergency response. Thus, there are many stakeholders that are active in this period; this is why the Municipal FCDRHs is organised to coordinate the relevant stakeholders and enhance flood management activities. According to the Municipal Flood Prevention Plan, the municipal FCDRHs includes 31 members. However, during a flood emergency, nearly all the municipal government institutions, agencies, public and private sector stakeholders, as well as NGOs, CBOs and voluntary organisations, will influence or be influenced by urban flood emergency response activities. It is therefore important to prioritise

and analyse the relevant stakeholders, finding out who should be included or excluded from the decision-making process. By analysing these key stakeholders, it is possible to obtain a deeper understanding of which facets of urban flood emergency response network operations impact on stakeholder engagement.

The next section identifies the urban flood response stakeholders in Zhuji.

6.3 Stakeholder identification

Compared with those stakeholder groups active during urban flood preparedness, there are more stakeholders included in flood emergency response. Stakeholders who are responsible for emergency rescue, maintaining social order, resident evacuation and preventing epidemics all participate during this period. By analysing the stakeholders' salience attitudes, overall there are 40 stakeholders active in urban flood emergency response. The detailed process of salience analysis is presented in the next section. Based on the classification from the Municipal Flood Prevention Plan, these 40 stakeholders can be divided into six groups: comprehensive coordination; urban administration; service operation; logistics supply; community mobilisation; and emergency rescue. Table 6.1 illustrates the classification of urban flood response stakeholders in Zhuji.

Table 6-1Urban flood response stakeholder classification

Stakeholder	Sector represented	Role
CO	Municipal government	Comprehensive coordination
JSGO	Sub-district government	Urban administration
TSGO	Sub-district government	Urban administration
HSGO	Sub-district government	Urban administration
MDC	Sub-district government	Urban administration
CMMC	Sub-district government	Urban administration
MFPDRHO	Municipal government	Comprehensive coordination
EMO	Municipal government	Comprehensive coordination
WCHB	Municipal government	Service operation
HCB	Municipal government	Service operation
LRB	Municipal government	Service operation
MB	Municipal government	Service operation
PHB	Municipal government	Emergency rescue and mitigation
MFB	Municipal government	Logistics supply
CAB	Municipal government	Emergency rescue and mitigation
MTB	Municipal government	Service operation

AB	Municipal government	Service operation
BIA	Municipal government	Logistics supply
MFMB	Municipal government	Service operation
MTCB	Municipal government	Logistics supply
PSB	Municipal government	Logistics supply
SIDO	Municipal government	Logistics supply
EPB	Municipal government	Service operation
TB	Municipal government	Service operation
MFSB	Municipal government	Logistics supply
MEB	Municipal government	Service operation
ETB	Municipal government	Service operation
DRB	Municipal government	Service operation
SB	Municipal government	Service operation
MPSB	Municipal government	Emergency rescue and mitigation
FB	Municipal government	Emergency rescue and mitigation
PAFD	Municipal government	Emergency rescue and mitigation
MUMB	Municipal government	Service operation
MPD	Municipal government	Community mobilisation
ZD	Public sector	Community mobilisation
ZTRS	Public sector	Community mobilisation
RC	NGO	Emergency rescue and mitigation
WAGL	Public sector	Service operation
TCYLC	Voluntary Organisation	Logistics supply
WCA	CBO	Service operation

As presented in the Figure 6.1, the majority stakeholders (85%) during the flood response period also come from the municipal or sub-district government. However, compared with the urban flood preparedness stakeholders, more non-government actors participate in a flood emergency response, which involves three public sector actors (ZD, ZTRS and WAGL), an NGO (the Red Cross [RC]), a voluntary organisation (The Communist Youth League Committee [TCYLC]) and a community-based organisation (WCA). On the other hand, although only 15% of stakeholders were identified as being in the emergency rescue and mitigation group, most other stakeholders also have an emergency rescue role during this flood period. Furthermore, as the urban administration and comprehensive coordination stakeholder groups do not change their members during a flood event, these two groups of stakeholders will not be discussed in this chapter.

A detailed discussion of the remaining four stakeholder groups (service operation, logistics supply, emergency rescue and mitigation, and community mobilisation) during urban flood emergency response are illustrated below.

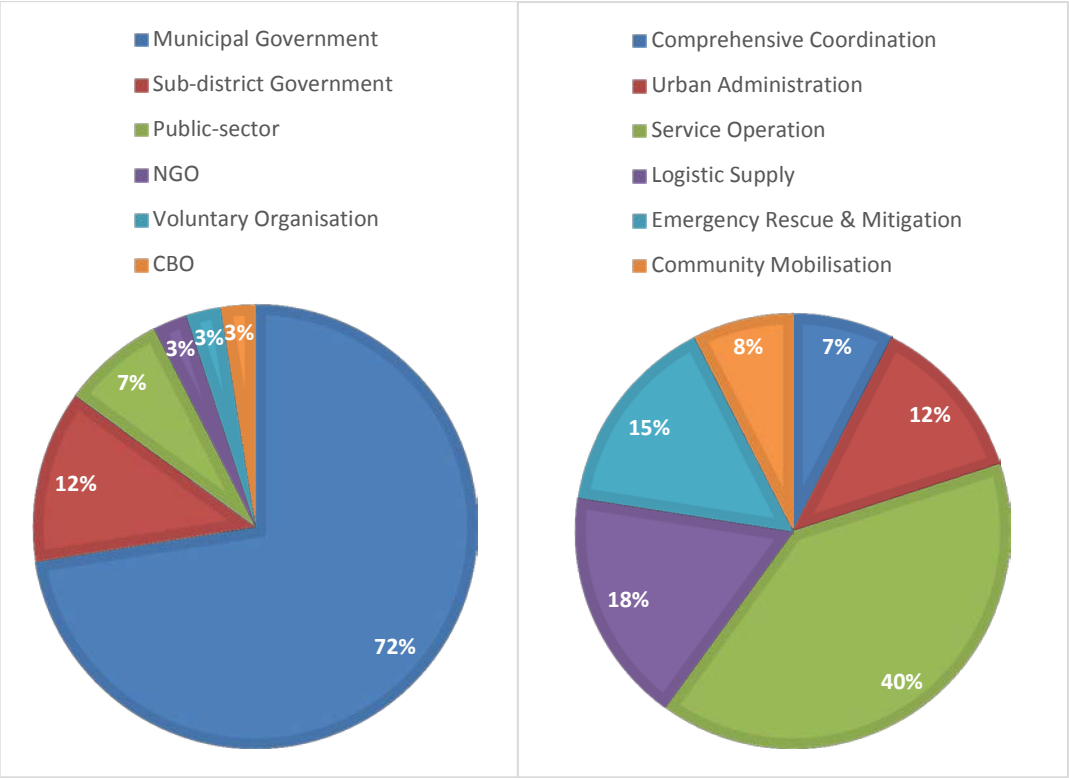


Figure 6-1 Stakeholder groups for urban flood response in Zhuji

Service operation stakeholders

As identified by the 13 key respondents, there are 16 stakeholders included in the service operation group during a flood emergency. These stakeholders are: WCHB, HCB, LRB, MB, MTB, the Agricultural Bureau (AB), the Municipal Forestry Bureau (MFMB), EPB, the Tourism Bureau (TB), MEB, ETB, DRB, the Supervisory Bureau (SB), MUMB, WAGL and WCA. Compared with this stakeholder group in flood preparedness, four more service operation stakeholders – AB, MFMB, TB and SB – participate during a flood. As introduced in the Chapter 5, service operation stakeholders are either responsible for the management of a typical urban flood or provide a specific service during the flood emergency. These four stakeholders participate in the urban flood emergency response by providing unique services like agriculture management, tourism management, forest protection and flood prevention supervision.

The detailed responsibilities of the stakeholders are presented in Table 6.2.

Table 6-2 Roles of service operation stakeholders in urban flood emergency response

Stakeholders	**Roles in emergency response**
AB	• To protect agriculture and animal husbandry against flooding and typhoons; help resume post-disaster production; offer technical guidance; and • To direct and help farmers protect agriculture and animal husbandry against flooding and typhoons; direct farmers to harvest mature crops promptly; and • To participate in investigating and verifying disasters, promptly reporting losses within its system incurred as a result of flooding and typhoons to the Municipal Flood Prevention and Drought Resistance Headquarters.
MFMB	• To direct the work of protecting forestry against flooding and typhoons and post-disaster recovery of production and reconstruction; and investigate and verify losses of forestry.
TB	• To supervise and manage the safety of scenic spots and holiday resorts during flooding and typhoons; to direct, supervise and urge the implementation of safety precautions at such places; • To supervise relevant departments to shut down scenic spots and amusement facilities before weather disasters; and • To direct the evacuation and transfer of tourists.
SB	• To supervise and inspect the implementation of discipline and working efficiency during flood and typhoon control.

Logistics supply stakeholders

During the fieldwork, the key informants also identified seven stakeholders as they provide a variety of supplies during the flood emergency. These stakeholders were: MFB, BIA, MTCB, PSB, SIDO, MFSB and TCYLC. However, the level of interaction with them is different during a flood emergency. The director of the MFCDRHO indicated that the headquarters interacted with MFB and SIDO more frequently than with the other logistics supply stakeholders during a flood emergency. Other stakeholders like TCYLC are more reactive rather than active during an urban flood emergency. As explained by the deputy director of the HCB (Interview, 17 July 2015): *"They will not participate without the government's orders"* and *"without the guide of the government, they do not know what to do"*.

Figure 6.2 represents details of the supplements provided by these logistics stakeholders.

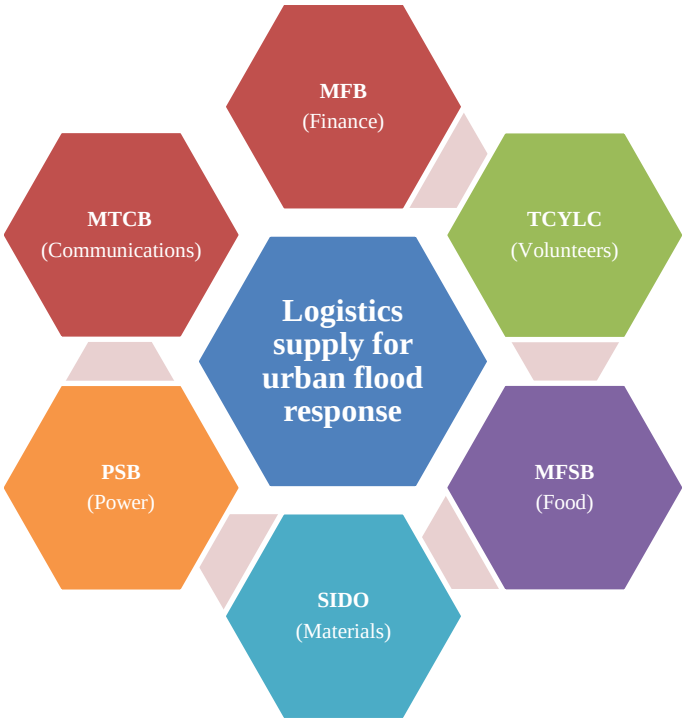


Figure 6-2 Logistics stakeholder group for urban flood response in Zhuji

Emergency rescue and mitigation stakeholders

Although most of the stakeholders during the flood response period have an emergency rescue role, six of them were identified as emergency rescue and flood mitigation stakeholders during a flood. These stakeholders are: the Civil Affairs Bureau (CAB), the Public Health Bureau (PHB), the Public Security Bureau (MPSB), the Fire Brigade (FB), the People's Armed Forces Department (PAFD) and the RC. Among them, PAFD was identified as the most important due to its role of organising its subordinated reserve forces and militia to participate in flood fighting. Many respondents mentioned the importance of PAFD during an emergency response (Interviews, 23 July 2015, 13 July 2015).

Community mobilisation and publicity stakeholders

With respect to community mobilisation and publicity, respondents identified several community mobilisation and publicity organisations as stakeholders: MPD, ZD and ZTRS. As introduced in Chapter 5, these three stakeholders are the major media actors in the municipal area of Zhuji. However, during a flood emergency, the level of interaction between the MFCDRHs and these stakeholders is different. As indicated by a key informant, the interaction between the MFCDRHs and ZTRS will be more frequent than the other two (Interview, 13 July 2015a)

6.4 Salience of stakeholders

The outcome of the stakeholder salience analysis, using the variables power, legitimacy and urgency, is presented in Table 6.3. Accordingly, based on the rating of the respondent group overall, stakeholders during the emergency response were found to be variously Definitive, Discretionary, Dominant or Dependent. Respondents declined to rate the salience of the remaining stakeholders: MJB, PB, SIB, MSB, MAB, MBLC, BPBC, MAO, CLPCIC and CF, citing that relations with these stakeholders during a flood event were inactive.

Table 6-3 Salience analysis of urban flood emergency rescue and response stakeholders

Stakeholder	Attitude	Salience type	Stakeholder	Attitude	Salience type
CO	PLU	Definitive	PSB	PLU	Definitive
JSGO	PLU	Definitive	SIDO	PLU	Definitive
TSGO	PLU	Definitive	EPB	PLU	Definitive
HSGO	PLU	Definitive	TB	PLU	Definitive
MDC	PLU	Definitive	MFSB	L	Discretionary
CMMC	PLU	Definitive	MEB	PLU	Definitive
MFPDRHO	PLU	Definitive	ETB	PLU	Definitive
EMO	PLU	Definitive	DRB	L	Discretionary
WCHB	PLU	Definitive	SB	PLU	Definitive
HCB	PLU	Definitive	MPSB	PLU	Definitive
LRB	PLU	Definitive	FB	PLU	Definitive
MB	PLU	Definitive	PAFD	PLU	Definitive

PHB	PLU	Definitive	MUMB	PLU	Definitive
MFB	PL	Dominant	MPD	PLU	Definitive
CAB	PLU	Definitive	ZD	LU	Dependent
MTB	PLU	Definitive	ZTRS	LU	Dependent
AB	PLU	Definitive	RC	L	Discretionary
BIA	PLU	Definitive	WAGL	LU	Dependent
MFMB	PL	Dominant	TCYLC	L	Discretionary
MTCB	PLU	Definitive	WCA	LU	Dependent

6.4.1 Reflection on stakeholder salience

By drawing on the information presented in tables 6.1 and 6.3, it has been calculated that:

- Besides the no-stakeholder group, the urban flood emergency response does not include the Dormant, Dangerous or Demanding types. The remaining four are Definitive, Discretionary, Dominant and Dependent salience types.
- Excluding non-stakeholders, 75% of urban flood response stakeholders are of the Definitive type, with all coming from the municipal or sub-district government.
- 10% of the stakeholders are identified as Dependent stakeholders, which includes ZD, ZTRS, WAGL and WCA. All of these come from non-government bodies.
- Another 10% come from the Discretionary stakeholder group, i.e. four stakeholders: MFSB, DRB, RC and TCYLC.
- The remaining two stakeholders – MFMB and MFB – are classified in the Dominant stakeholder group.

A detailed discussion of these four stakeholder types is represented below.

Definitive stakeholders (power, legitimacy, and urgency)

The majority of stakeholders (75%) during a flood emergency were perceived by the key informants to have a high salience level. As Definitive-type stakeholders, they

are the most important participants during a flood emergency. All of them come from the municipal or sub-district government. This meets the current 'government-led' urban flood emergency management situation in China, which indicates that the contributions from non-government bodies are not valued during the emergency response period.

Dependent stakeholders (legitimacy and urgency)

The stakeholders ZD, ZTRS, WAGL and WCA were identified as having a medium salience level. These stakeholders were considered to make legitimate and urgent claims during the flood emergency. However, the informants did not recognise them as being powerful. As these four stakeholders all come from non-government bodies, this indicates that non-government organisations do not hold much power during flood emergencies.

Dominant stakeholders (power and legitimacy)

Another stakeholder group with a medium salience level is the Dominant stakeholder. As identified by the key respondents, MFMB and MFB belong to this group. During an urban flood emergency, these two stakeholders do not present the urgency of their claims.

Discretionary stakeholders (legitimacy)

The remaining stakeholders – MFSB, DRB, RC and TCYLC – were identified by respondents as being Discretionary ones. The Discretionary stakeholder is a low-salience level group in that they only show their legitimate claims during an urban flood emergency. Only a few respondents confirmed their roles during a flood event.

Overall, there were four types of stakeholder salience groups identified as being key during a flood. These were the Definitive, Dependent, Dominant and Discretionary groups. The lack of Dormant, Dangerous and Demanding types shows that the urban flood emergency network is also stable. No one needs to be specifically monitored during a flood event. On the other hand, the majority (75%) were identified as

Definitive stakeholders, which have both power and legitimate claims, and convey the urgency of their claims. This highlights the complexity of the urban flood emergency response arena and the need for a comprehensive stakeholder prioritisation and analysis.

The next section discussed the urban flood emergency response network.

6.5 Urban flood emergency response network analysis

As demonstrated in Chapter 5, by using the data generated by the stakeholder survey in Zhuji, network maps can be constructed to demonstrate the extent to which stakeholders are connected to other stakeholders during an urban flood emergency response. The measures used for the analysis are the density and average path distance of the network, the betweenness centrality of actors, and the strength, frequency and information exchange quality of the relationship. Table 6.4 reiterates the definitions for each measure.

Table 6-4 Network measures and their definitions

Measure	Description
Density	This measures how much activity there is in the network, as compared to how much there could be. The higher the density ratio of the network, the higher the level of cohesion within the network.
Average path distance	Average path distance is an indication of how quickly information can be spread: how easy it is to access resources, engage in planning and programming activity, or make referrals.
Centralisation	A high network centralisation means there are only a few actors holding most ties linking the network together; thus, only these well-connected few need to be reached to access the entire network.
Core-periphery	This indicates the network positions of an actor, either at the core or on the periphery.
Betweenness centrality	This describes the extent to which an actor lies on paths between other actors. An actor with high betweenness centrality will link across disconnected segments of the network, and will have the most holistic view of the problem. They can also mobilise and diffuse information to the larger network.
Interaction frequency	This indicates how often network members interact with each other.

Information exchange quality	This indicates the quality of information exchange between the network members.

6.5.1 The stakeholder network examined

Network Maps 6.1 and 6.2 describe the basic network structures as obtained for the urban flood emergency response network, displaying stakeholder roles and relationship strength in colour and with sectors represented according to shape – following the legend shown in Figure 6.3. Some of the main structural metrics that reveal the texture of a system include density, average path distance and centralisation.

The average densities of the information exchange network and the interaction frequency network are 0.203 and 0.210, which represent a low-to-medium level of density. Given the nature of the flood emergency response networks, these numbers are surprising, as a high level of density was expected. Overall, stakeholders appear less committed to the network, and are not interacting extensively with one another. This also indicates a lack of any common sense of identity. In other words, the stakeholders do not appear to have the same interests at heart. Low-density networks decrease the ability and willingness of stakeholders to access information about each other and learn about others' perspectives (Ansell, 2003; Olsson, 2009). This is closely connected to the fact that it will be more difficult to facilitate collective action within the network, compared to networks with a higher density (Sobel, 2002; Keast, 2003).

The average path distances between stakeholders for urban flood emergency response networks are 1.928 and 1.847. This shows that stakeholders, on average, must go through 1.928 and 1.847 other stakeholders to access or disseminate information. This is a relatively positive number, thus indicating that information is travelling through the network with relative ease. This, in theory, increases the network's ability or capacity to work together, should the level of commitment increase. Although the MFPDRHO may play a central role in the network, it does not hold a 'gatekeeping' position from which it can control and manipulate information. The stakeholders involved are capable of learning information through other avenues when desired.

The centralisations of the information exchange and stakeholder interaction networks are 75.8% and 69.6% respectively. Compared with the urban flood preparedness networks, both emergency response networks are slightly more centralised. This means that only a few stakeholders hold most ties linking the network together, thus only these well-connected few need to be reached to access the entire network.

These three measures provide a useful starting point for gaining a sense of the stakeholder network. Next, the actors occupying the core and the periphery will be assessed using the core-periphery, betweenness centrality, and strength measures.

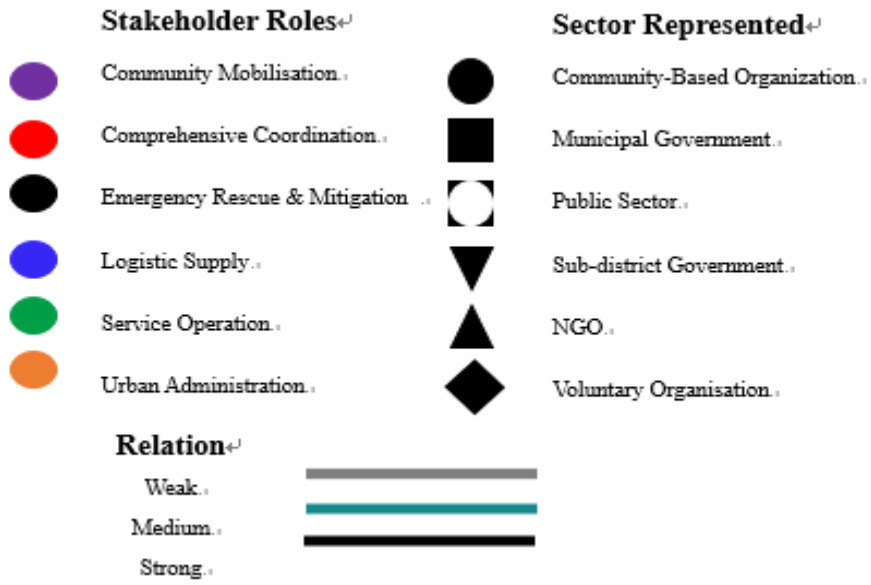
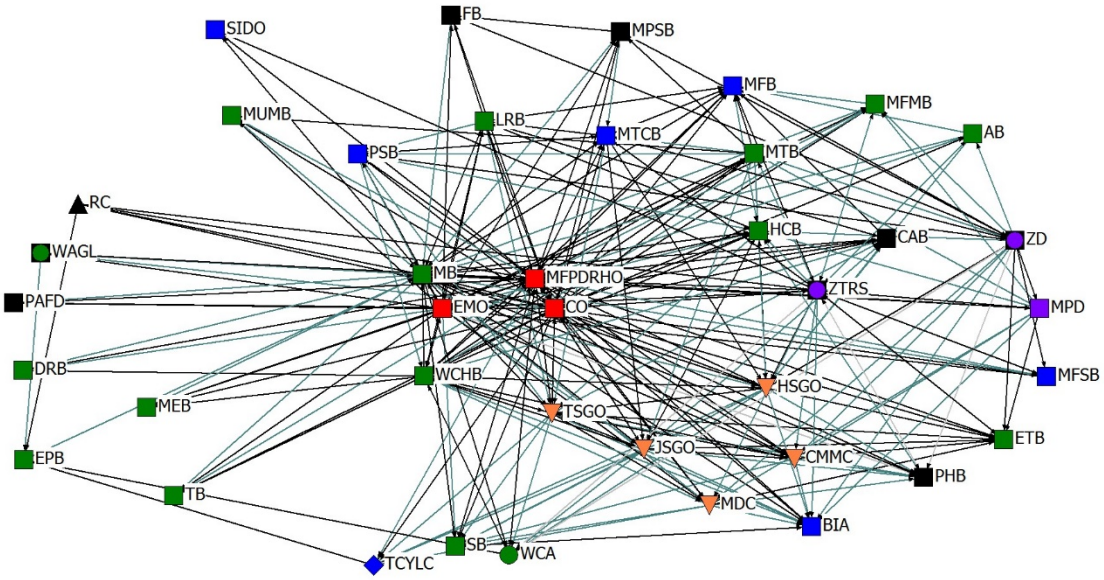
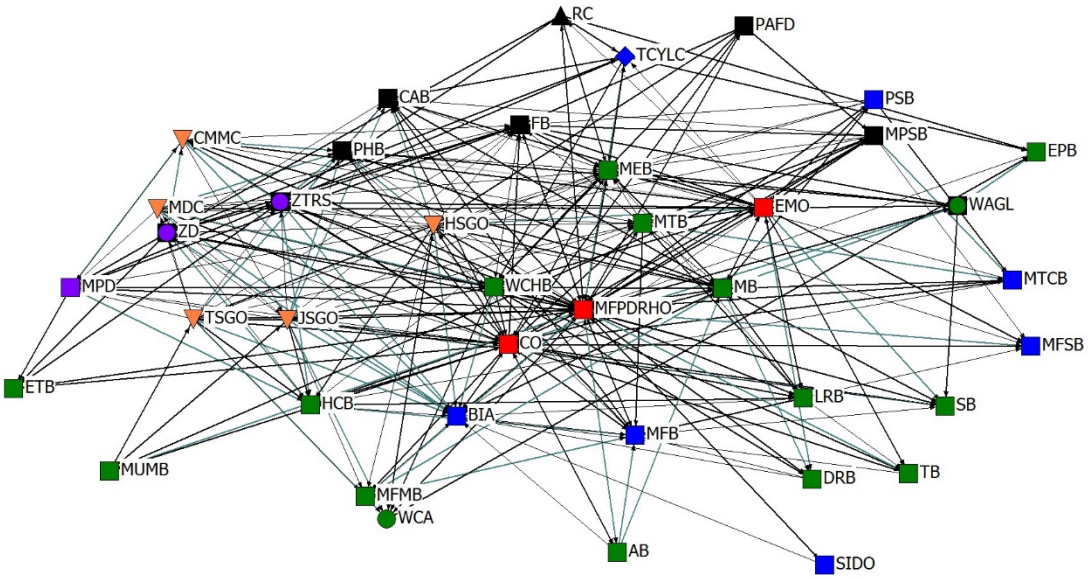


Figure 6-3 Legend for network maps as used in Network Maps 6.1a and 6.1b



Network Map 6-1 Stakeholder information exchange quality for urban flood response



Network Map 6-2 Stakeholder interaction frequency for urban flood response

Core or periphery

As introduced in the Chapter 2 (Literature review), the core-periphery model is used to analyse the network positions of the stakeholders. It determines which stakeholders are part of a densely connected core and which are part of a sparsely connected periphery. Core stakeholders are also reasonably well connected to peripheral nodes, but the latter are not well connected to the core or to each other (Rombeach, 2014), Table 6.5 presents the results of the core-periphery analysis of urban flood emergency response networks.

Table 6-5 Core-periphery analysis of urban flood emergency response networks

Information exchange quality		**Interaction frequency**	
Core	**Periphery**	**Core**	**Periphery**
CO JSGO TSGO HSGO MFPDRHO EMO WCHB HCB LRB MB MTB MTCB ZTRS	MDC CMMC PHB MFB CAB AB BIA MFMB PSB SIDO EPB TB MFSB MEB ETB DRB SB MPSB FB PAFD MUMB MPD ZD RC WAGL TCYLC WCA	CO JSGO TSGO HSGO MFPDRHO EMO WCHB MB MFB CAB BIA MEB FB MPD ZTRS	MDC CMMC HCB LRB PHB MTB AB MFMB MTCB PSB SIDO EPB TB MFSB ETB DRB SB MPSB PAFD MUMB ZD RC WAGL TCYLC WCA

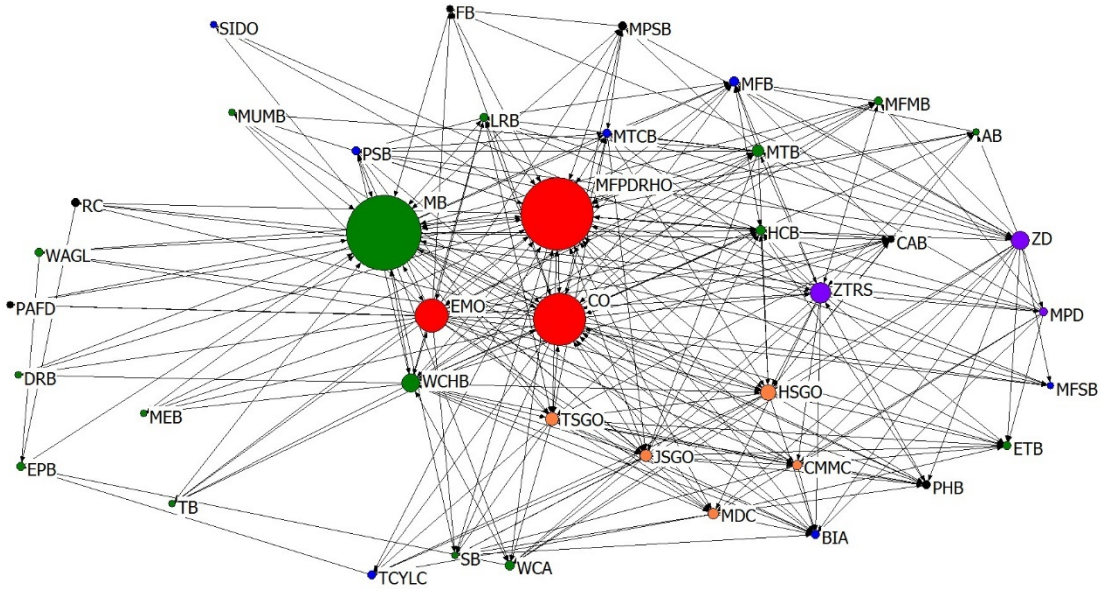
According to Table 6.5, the core stakeholders include the three comprehensive coordination stakeholders (CO, EMO and MFPDRHO), three urban administration stakeholders (JSGO, TSGO and HSGO), nine key service operation stakeholders (WCHB, HSB, LRB, MB, MTB, MTCB, CAB, MEB and BIA), an emergency rescue and mitigation stakeholder (FB), and a community mobilisation stakeholder (ZTRS). Compared with the core stakeholders during preparedness, the additional stakeholders are MTB, MTCB, CAB, MEB, FB and ZTRS. Among these stakeholders, ZTRS replaces ZD as the community mobilisation and publicity stakeholders during a flood.

Betweenness centrality

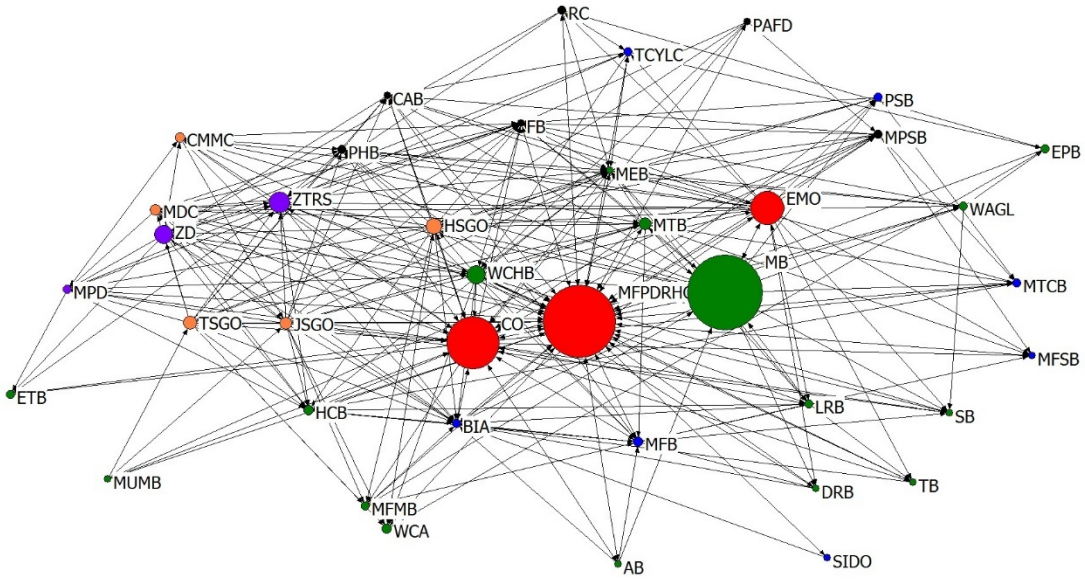
Compared with the core-periphery analysis, the betweenness centrality of a stakeholder focuses on the relationships among the stakeholders by measuring how many times an actor remains on a short path connecting two others who are themselves disconnected. Stakeholders holding high betweenness centrality will have

the power to dominate the flood emergency response resources. These stakeholders will bring together disconnected segments of the network, thus bringing diversity and new ideas to the network. As discussed in last chapter, because of such a 'brokering' role, these stakeholders may feel torn between the different elements of the network and forced to take sides.

According to Network Maps 6.3 and 6.4, the stakeholders with relatively large betweenness centralities are the MFPDRHO, CO, EMO and MB. During the fieldwork, the key informants highlighted these stakeholders' coordination role in when a flood takes place.



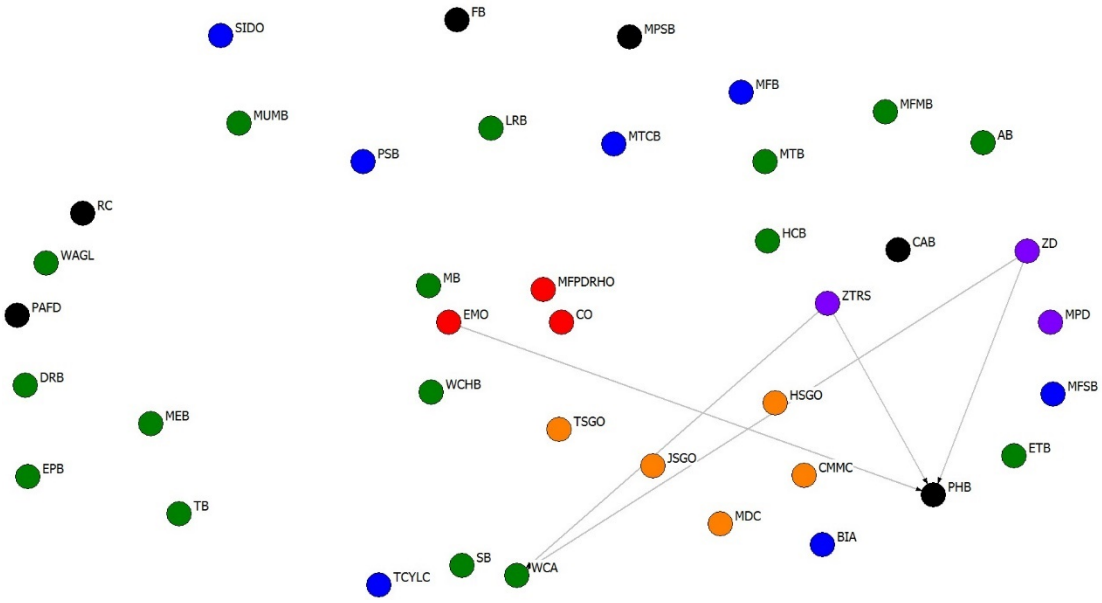
Network Map 6-3 Information exchange network for urban flood response, showing network centrality in node size



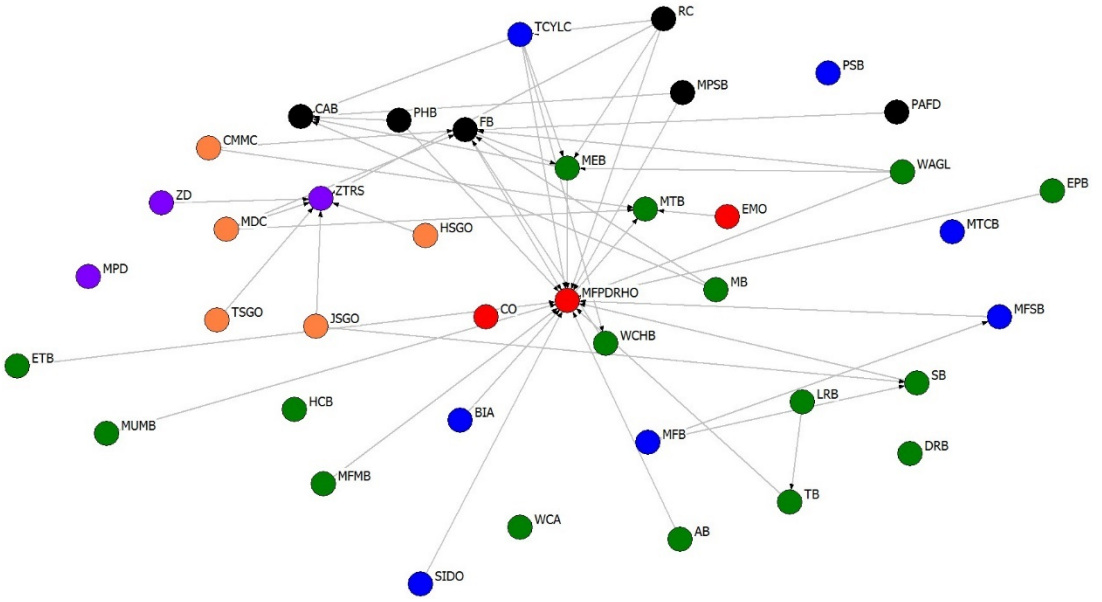
Network Map 6-4 Stakeholder interaction network for urban flood response, showing network centrality in node size

Relationship strength

Network Maps 6.1 and 6.2, which show the strength of relationship, are characterised by three different colours. Black links indicate strong relationships, with high efficiency, usefulness and trust. Green links indicate a medium level of relations, whereas grey indicates a weak link. Weak links are often caused by either antagonistic relationships with low levels of trust, or relationships that are perceived to be not efficient or useful. Network Maps 6.5 and 6.6 present the weak links in the urban flood emergency response networks. As is visible, the few relationships are weak, and the majority centre around MFPDRHO. This is noteworthy as the core-periphery analysis suggested that MFPDRHO is a core stakeholder during a flood. It appears that, although it is connected, the engagement approaches of MFPDRHO with other stakeholders leaves some room for improvement. Some of these perceived weaknesses in relations can be explained by the structure of the MFPDRHs. MFPDRHs only involves 31 key members during a flood.



Network Map 6-5 Information exchange network during urban flood response, showing weak ties



Network Map 6-6 Stakeholder interaction network during urban flood response, showing weak ties

6.5.2 Integrated discussion of the components and issues

Earlier, stakeholder salience was used to categorise the stakeholders based on seven salience types: Definitive, Discretionary, Dormant, Dominant, Demanding, Dangerous and Dependent. However, there are only four of these types present during a flood. The Dangerous, Demanding and Dormant stakeholder groups were identified as absent. Four different colours are assigned to the nodes indicating Definitive stakeholders as red, Dependent as blue, Discretionary stakeholders as black and Dominant ones as orange. With these definitions in mind, the following network maps have been created for the urban flood emergency response (Network Maps 6.7 and 6.8). The maps show the variables of core-periphery in shape, salience in colour, and betweenness centrality in the size of the nodes, as well as relationship strength in the colour of the links (Figure 6.4).

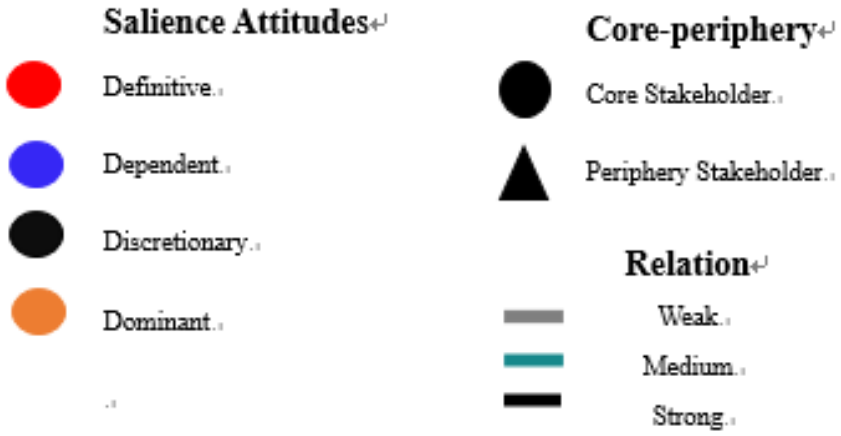
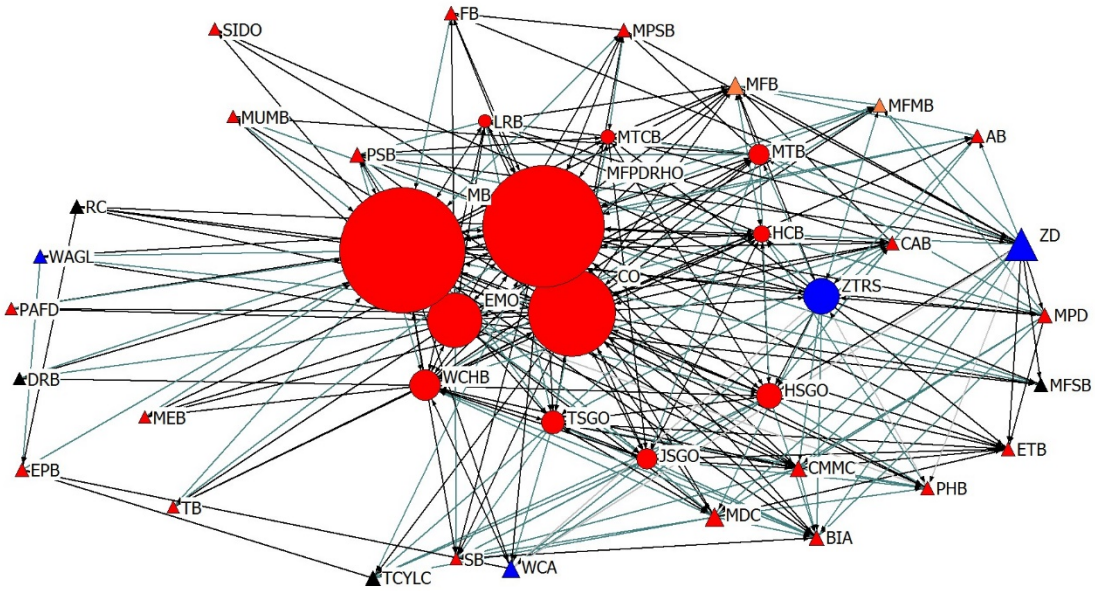
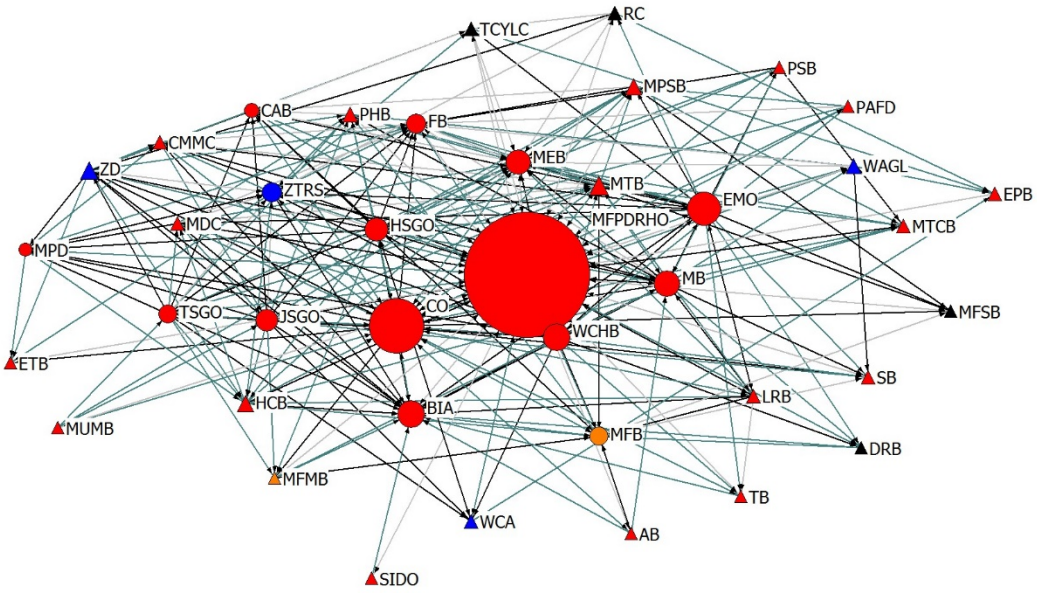


Figure 6-4 Legend for the network maps as used in this chapter, showing salience attitudes



Network Map 6-7 Information exchange network during an urban flood response, showing stakeholder salience attitudes



Network Map 6-8 Stakeholder interaction network during an urban flood response, showing stakeholder salience attitudes

Integration of the salience model and stakeholder network analysis

Network Maps 6.7 and 6.8 show the integrated picture of the two stakeholder analysis methods in one single overview. There is a correlation between the salience and network analysis methods. Nearly all the core stakeholders also belong to the Definitive group. Only two core stakeholders come from other salience groups: ZTRS belongs to the Dependent group while MFB belongs to the Dominant group. As introduced in this chapter, Definitive and Dominant stakeholders are the most important ones during an urban flood emergency response. Thus, it is important for the other Definitive and Dominant stakeholders to develop their stakeholder engagement approaches for effective participation in an urban flood emergency response. At the same time, most of the salience types, including the Dependent and Discretionary types, are identified as being at the periphery of the networks. As both salience types lack power, this indicates that the decision-making process during a flood mainly depends on power. For effective stakeholder engagement, it is important to enhance the power of these stakeholders.

Although the four Definitive stakeholders – CO, EMO, MFPDRHO and MB – have the highest betweenness centrality, there is little correlation between stakeholder salience and betweenness centrality. The incorporation of all the components into one data set, leading to this disarray, enhances the notion that the stakeholder arena is a complex environment, and one which cannot be defined by either stakeholder salience or network analysis alone. However, with the combined knowledge of the two components, engagement between the stakeholders can become more effective, more direct and on topic.

An analysis, as discussed above, could be performed for every single stakeholder in the network. However, doing so would unduly increase the length of this study and divert attention away from the argument that is being presented: that, in combination, the two research components provide an overview of stakeholder engagement for urban flood emergency response. This combining of the two methods provides a level of depth that could not be obtained if only one of the components was to be applied. The combination of all the information outlined, combined in one network

map, allows urban flood emergency response in Zhuji to improve its stakeholder engagement programme by creating more effective, individually specialised ways of engaging.

As a conclusion to this study of urban flood emergency response, Table 6.6 provides a final overview of all the stakeholders in the urban flood emergency response in Zhuji and shows their salience, position in the network and betweenness centrality. All of this again indicates that there appears to be no correlation between either of the two research components.

6.6. Conclusion

Table 6.6 sets out a final overview of the stakeholders identified in the urban flood emergency response network. The three main metrics are displayed in this table: salience, core-periphery, and betweenness centrality. The other aspects of the network measures, which are based on relations, cannot be captured in a table such as this, and have been omitted. This provides another indication of how complex and intricate the data involved is. There is no relationship between either one of the main metrics, which presents evidence that the context and environment to the urban flood emergency response arena is indeed complex and multifaceted.

Table 6-6 Final overview of the urban flood emergency response stakeholders in Zhuji

Stakeholder	Sector represented	Role	Salience attitudes	Core-periphery (information exchange)	Core-periphery (interaction frequency)	Betweenness centrality (information exchange)	Betweenness centrality (interaction frequency)
CO	Municipal government	Comprehensive coordination	Definitive	Core	Core	166.210	165.113
JSGO	Sub-district government	Urban administration	Definitive	Core	Core	8.837	38.969
TSGO	Sub-district government	Urban administration	Definitive	Core	Core	16.156	4.382
HSGO	Sub-district government	Urban administration	Definitive	Core	Core	17.954	49.400
MDC	Sub-district government	Urban administration	Definitive	Periphery	Periphery	12.760	3.764
CMMC	Sub-district government	Urban administration	Definitive	Periphery	Periphery	8.634	7.151
MFPDRHO	Municipal government	Comprehensive coordination	Definitive	Core	Core	482.943	794.409
EMO	Municipal government	Comprehensive coordination	Definitive	Core	Core	19.918	15.581
WCHB	Municipal government	Service operation	Definitive	Core	Core	52.767	37.683
HCB	Municipal government	Service operation	Definitive	Core	Periphery	65.215	10.754
LRB	Municipal government	Service operation	Definitive	Core	Periphery	7.445	4.160
MB	Municipal government	Service operation	Definitive	Core	Core	216.554	25.003
PHB	Municipal	Emergency rescue and	Definitive	Periphery	Periphery	2.956	3.475

	government	mitigation					
MFB	Municipal government	Logistics supply	Dominant	Periphery	Core	1.010	12.051
CAB	Municipal government	Emergency rescue and mitigation	Definitive	Periphery	Core	2.390	16.501
MTB	Municipal government	Service operation	Definitive	Core	Periphery	21.593	11.844
AB	Municipal government	Service operation	Definitive	Periphery	Periphery	3.279	0.200
BIA	Municipal government	Logistics supply	Definitive	Periphery	Core	41.227	2.670
MFMB	Municipal government	Service operation	Dominant	Periphery	Periphery	6.202	1.450
MTCB	Municipal government	Logistics supply	Definitive	Core	Periphery	15.939	1.033
PSB	Municipal government	Logistics supply	Definitive	Periphery	Periphery	9.423	0.200
SIDO	Municipal government	Logistics supply	Definitive	Periphery	Periphery	0.000	0.000
EPB	Municipal government	Service operation	Definitive	Periphery	Periphery	39.592	0.000
TB	Municipal government	Service operation	Definitive	Periphery	Periphery	0.259	0.077
MFSB	Municipal government	Logistics supply	Discretionary	Periphery	Periphery	2.476	0.000
MEB	Municipal government	Service operation	Definitive	Periphery	Core	0.259	10.031
ETB	Municipal government	Service operation	Definitive	Periphery	Periphery	0.000	0.000
DRB	Municipal	Service operation	Discretionary	Periphery	Periphery	0.000	0.400

	government						
SB	Municipal government	Service operation	Definitive	Periphery	Periphery	0.125	2.017
MPSB	Municipal government	Emergency rescue and mitigation	Definitive	Periphery	Periphery	10.405	3.575
FB	Municipal government	Emergency rescue and mitigation	Definitive	Periphery	Core	5.803	11.722
PAFD	Municipal government	Emergency rescue and mitigation	Definitive	Periphery	Periphery	0.101	2.466
MUMB	Municipal government	Service operation	Definitive	Periphery	Periphery	0.402	5.795
MPD	Municipal government	Community mobilisation	Definitive	Periphery	Core	2.318	8.099
ZD	Public sector	Community mobilisation	Dependent	Periphery	Periphery	17.595	10.199
ZTRS	Public sector	Community mobilisation	Dependent	Core	Core	45.980	19.141
RC	NGO	Emergency rescue and mitigation	Discretionary	Periphery	Periphery	6.977	7.493
WAGL	Public sector	Service operation	Dependent	Periphery	Periphery	6.831	10.702
TCYLC	Voluntary organisation	Logistics supply	Discretionary	Periphery	Periphery	7.517	13.069
WCA	CBO	Service operation	Dependent	Periphery	Periphery	12.948	11.421

7. Data Analysis – Flood Recovery

7.1 Chapter structure

In the third part of the data analysis, the findings on stakeholder engagement during the urban flood recovery period are presented. Divided into five sections, the first section positions the case within its contextual background and discusses institution arrangements under the Zhuji urban flood management system during flood recovery. The second section presents primary stakeholder identification and analysis of the urban flood emergency recovery in Zhuji, while the third section analyses these key stakeholders while focusing in particular on stakeholder salience. The last two parts discuss the outcome of the stakeholder network analysis and present a potential correlation between the salience and network analysis.

The next section provides the background context of urban flood recovery in Zhuji.

7.2 Background context

The final period of urban flood management in Zhuji measures flood recovery – which aims to provide relief for flood victims, the restoration of basic services and functions, and reconstruction of damaged infrastructure. As described in the Municipal Flood Control and Prevention Plan (Zhuji Water Conservancy Bureau, 2008), detailed recovery activities in Zhuji include checking the flood disaster level and related disaster compensation, providing relief for flood victims and medical assistance, epidemic prevention, environmental protection, reconstruction of damaged infrastructure and the replenishment of flood-fighting materials. As can be seen, many organisations need to participate in urban flood recovery in Zhuji. Thus, it is important to prioritise and analyse the relevant stakeholders, finding out which are key during the decision-making process.

The next section presents a general identification of the urban flood recovery stakeholders in Zhuji.

7.3 Stakeholder identification

Unlike the other periods of urban flood management, stakeholders during flood recovery in Zhuji include some specific service operation actors. For example, these stakeholders include the Municipal Statistical Bureau (MSB) and the Municipal Auditing Bureau (MAB), which check the damage caused by the flood disaster; the Public Health Bureau (PHB), which is responsible for medical assistance and epidemic prevention; and the Municipal Agricultural Office (MAO), which has a role in directing the reconstruction of damaged infrastructure in suburban areas. Based on the stakeholder salience model, there were 35 stakeholders identified as being key during urban flood recovery. A detailed discussion on the salience analysis is presented later in this chapter. Table 7.1 presents the classification for urban flood recovery stakeholders in Zhuji.

Table 7-1 Urban flood recovery stakeholders' classification

Stakeholder	Sector represented	Role
CO	Municipal government	Comprehensive coordination
JSGO	Sub-district government	Urban administration
TSGO	Sub-district government	Urban administration
HSGO	Sub-district government	Urban administration
MDC	Sub-district government	Urban administration
CMMC	Sub-district government	Urban administration
MFPDRHO	Municipal government	Comprehensive coordination
WCHB	Municipal government	Service operation
HCB	Municipal government	Service operation
LRB	Municipal government	Service operation
PHB	Municipal government	Emergency rescue and mitigation
MFB	Municipal government	Logistics supply
CAB	Municipal government	Emergency rescue and mitigation
MTB	Municipal government	Service operation
AB	Municipal government	Service operation

BIA	Municipal government	Logistics supply
MTCB	Municipal government	Logistics supply
PSB	Municipal government	Logistics supply
SIDO	Municipal government	Logistics supply
EPB	Municipal government	Service operation
MJB	Municipal government	Service operation
MAO	Municipal government	Service operation
SB	Municipal government	Service operation
MSB	Municipal government	Service operation
MAB	Municipal government	Service operation
MBLC	Municipal government	Community mobilisation
MPD	Municipal government	Community mobilisation
ZD	Public sector	Community mobilisation
ZTRS	Public sector	Community mobilisation
RC	NGO	Emergency rescue and mitigation
CLPCIC	Public sector	Service operation
WAGL	Public sector	Service operation
TCYLC	Voluntary organisation	Logistics supply
WCA	CBO	Service operation
CF	Charity	Service operation

Accordingly, nearly 77% of the urban flood recovery stakeholders (Figure 7.1) in Zhuji come from the municipal or sub-district government. Compared with other urban flood periods in Zhuji, there are more stakeholders from non-government bodies. These include four public sector actors, ZD, ZTRS, CLPCIC and WAGL, a non-government organisation (RC), a voluntary organisation (TCYLC), a community-based organisation (WCA) and a charity (Zhuji Charity Federation [CF]). According to the stakeholder roles during the recovery, these 35 stakeholders are also classified primarily into six groups: urban administration; comprehensive coordination; service operation; community mobilisation; emergency rescue and flood mitigation; and logistics supply. The members of the urban administration, logistics supply and community mobilisation stakeholder groups during urban flood

recovery are almost the same as those active during urban flood preparedness. The major differences come from the remaining three stakeholder groups. These are discussed below.

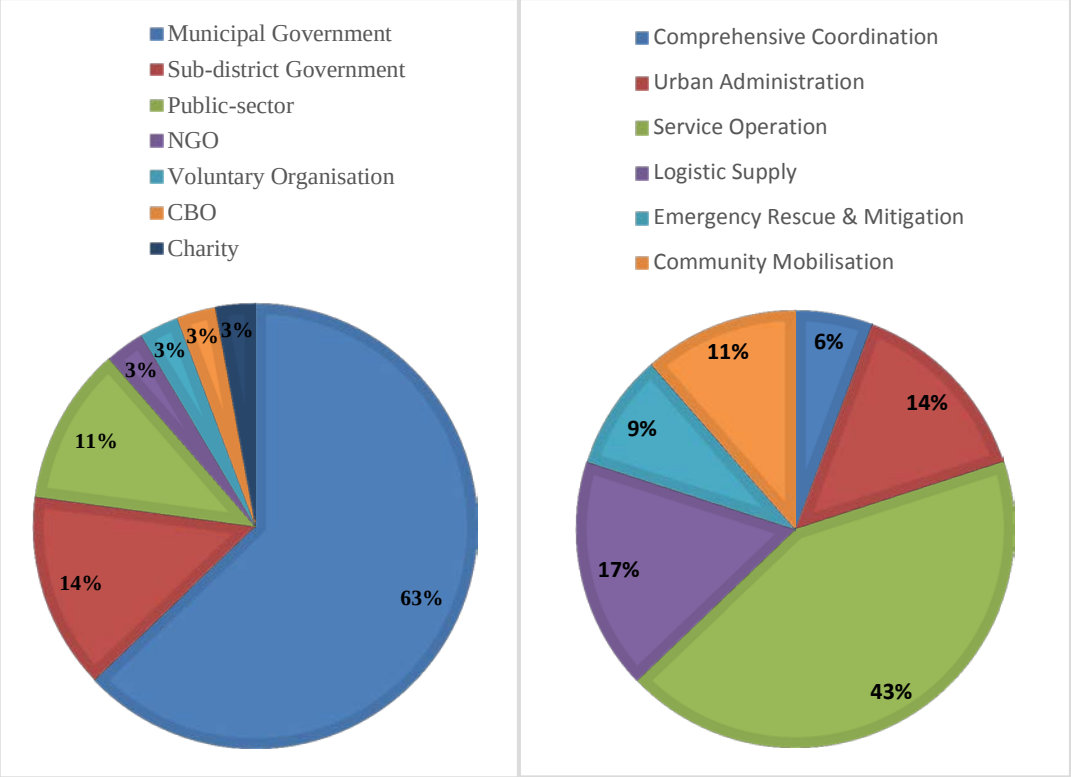


Figure 7-1 Stakeholder groups for urban flood recovery in Zhuji

Comprehensive coordination stakeholders

As discussed in the Chapter 5, comprehensive coordination stakeholders have a role coordinating stakeholders during urban flood management. During the urban flood recovery period, MFPDRHO and CO were identified as the two unique members of this stakeholder group. EMO is no longer coordinating stakeholders after a flood.

Service operation stakeholders

Some 43% of stakeholders were classified as service operation stakeholders. Compared with the members of this stakeholder group in the other two flood periods, the major differences come from the MJB, MAO, MAB, MSB and CF.

Emergency rescue and flood mitigation

The major three emergency rescue and flood mitigation stakeholders in urban flood recovery are PHB, CAB and RC.

7.4 Salience of stakeholder

According to the ratings of the 13 key informants, stakeholders in urban flood recovery were divided into three salience types: Definitive, Discretionary and Dependent. Respondents declined to rate the salience of the remaining stakeholders: EMO, MB, MFMB, TB, the Municipal Food Supply Bureau (MFSB), MEB, ETB, DRB, PB, SIB, MPSB, FB, PAFD, MUMB and BPBC, citing no engagement with these stakeholders following a flood. Table 7.2 provides a summary of the combinations of power, legitimacy and urgency attributed to the various stakeholders and the subsequent stakeholder types that these combinations represent.

Table 7-2 Salience analysis of urban flood recovery stakeholders

Stakeholder	Attitude	Salience type	Stakeholder	Attitude	Salience type
CO	PLU	Definitive	SIDO	PLU	Definitive
JSGO	PLU	Definitive	EPB	LU	Dependent
TSGO	PLU	Definitive	MJB	L	Discretionary
HSGO	PLU	Definitive	MAO	L	Discretionary
MDC	PLU	Definitive	SB	LU	Dependent
CMMC	PLU	Definitive	MSB	PLU	Definitive
MFPDRHO	PLU	Definitive	MAB	PLU	Definitive
WCHB	PLU	Definitive	MBLC	PLU	Definitive
HCB	PLU	Definitive	MPD	PLU	Definitive
LRB	PLU	Definitive	ZD	LU	Dependent
PHB	PLU	Definitive	ZTRS	LU	Dependent
MFB	PLU	Definitive	RC	LU	Dependent
CAB	PLU	Definitive	CLPCIC	LU	Dependent
MTB	PLU	Definitive	WAGL	LU	Dependent
AB	PLU	Definitive	TCYLC	L	Discretionary
BIA	PLU	Definitive	WCA	LU	Dependent

MTCB	LU	Dependent	CF	LU	Dependent
PSB	PLU	Definitive			

7.4.1 Reflection on stakeholder salience

By drawing on the information represented in Tables 7.1 and 7.2, it is calculated that:

- Beside the non-stakeholder group, urban flood recovery does not include the Dominant, Dormant, Dangerous or Demanding salience types. The remaining three are Definitive, Discretionary and Dependent salience types.
- Excluding non-stakeholders, 63% of urban flood recovery stakeholders are the Definitive type, with all coming from the municipal or sub-district government.
- Some 29% of the stakeholders were identified as Dependent stakeholders: MTCB, EPB, SB, ZD, ZTRS, RC, CLPCIC, WAGL, WCA and CF.
- The remaining three stakeholders – MJB, MAB and TCYLC – are Discretionary stakeholders.

A detailed discussion of these three stakeholder types is provided below.

Definitive stakeholders (power, legitimacy, and urgency)

Although 63% of urban flood recovery stakeholders were identified as being the Definitive type, this proportion is relatively small compared to the preparedness and emergency response stakeholders. On the other hand, all the Definitive-type stakeholders come from the municipal or sub-district government, this being in common with the groups from the other periods.

Dependent stakeholders (legitimacy and urgency)

The proportion of Dependent stakeholders in urban flood recovery is much higher than those during the preparedness and response periods. This indicates that some stakeholders are not given enough power following a flood. These stakeholders are: MTCB, EPB, SB, ZD, ZTRS, RC, CLPCIC, WAGL, WCA and CF.

Discretionary stakeholders (legitimacy)

As a unique stakeholder group with low salience during urban flood recovery, the Discretionary stakeholder group comprises MJB, MAO and TCYLC. By only showing their legitimate claims during the urban flood recovery period, these stakeholders are normally considered to be ‘not important’.

7.5 Urban flood recovery network analysis

As introduced in the previous two chapters, social network analysis is a stakeholder analysis method which focuses on the relations between stakeholders. A set of key measurements is applied to untangle the complexity of the network, as has been discussed in Chapter 2 (Literature review). These measures are the density and average path distance of the network, the betweenness centrality of actors, and the strength, frequency and quality of information exchange during the relationships. Table 7.3 reiterates the definition for each measure.

Table 7-3Network measures and their definitions

Measure	Description
Density	This measures how much activity there is in the network, as compared to how much there could be. The higher the density ratio of the network, the higher the level of cohesion within the network.
Average path distance	Average path distance provides an indication of how quickly information can be spread: how easy it is to access resources, engage in planning and programming activity, or make referrals.
Centralisation	A high network centralisation means there are only a few actors holding most ties linking the network together; thus, only these well-connected few need to be reached to access the entire network.
Core-periphery	This indicates the network position of an actor, either at the core or on the periphery.
Betweenness centrality	This describes the extent to which an actor lies on paths between other actors. An actor with higher betweenness centrality will link across disconnected segments of the network, and will have the most holistic view of the problem. They can also mobilise and diffuse information to the larger network.
Interaction	This indicates how often network members interact with each

frequency	other.
Information exchange quality	This indicates the quality of information exchange between the network members

7.5.1 The stakeholder network examined

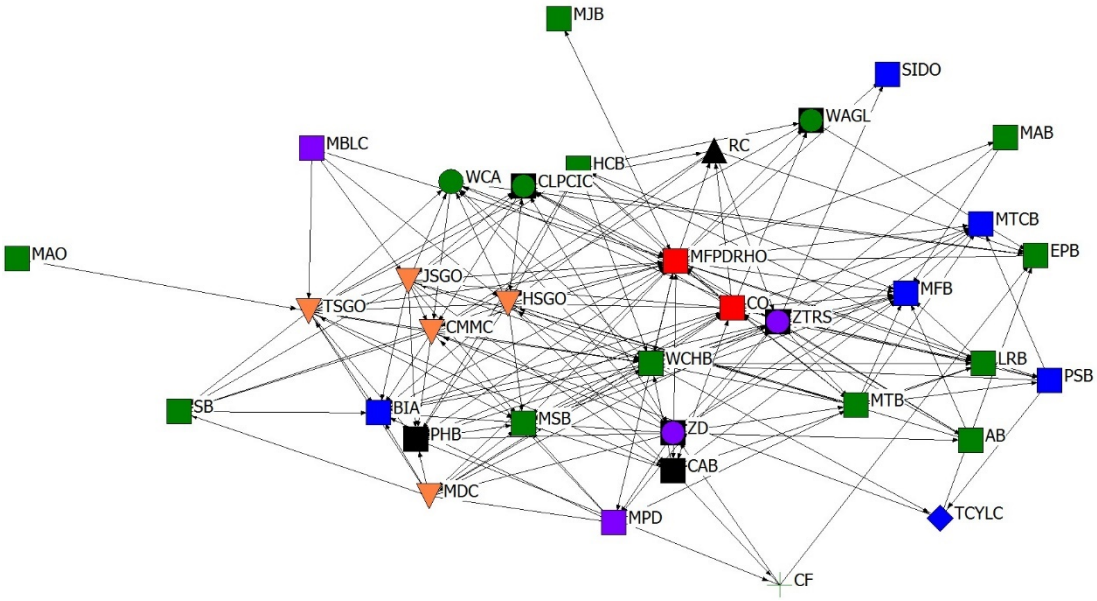
Network Maps 7.1 and 7.2 show the basic structure of the urban flood recovery networks in Zhuji. The coloured nodes represent the stakeholders, as indicated by the labels, while the colour of the nodes represents the stakeholder roles and the shape of the nodes indicates the traditional sectors, as referenced in Figure 7.1. The lines between the nodes indicate that those two stakeholders are linked and have interacted with each other during urban flood recovery. Although some of the stakeholders, especially the government departments, interact with each other on matters other than urban flood recovery, those interactions are outside the scope of this research and are therefore not included in this network maps. The network structures displayed on the basic maps are used to calculate the four network measures of density, centralisation, average path distance, and core-periphery, as discussed in Chapter 2.

The average densities of the information exchange quality network and the interaction frequency network are both 0.177. This indicates that only 17.7% of the relationships are active during urban flood recovery, suggesting that the stakeholders appear not to be interacting with one another extensively. In other worlds, the stakeholders do not appear to have the same interests at heart.

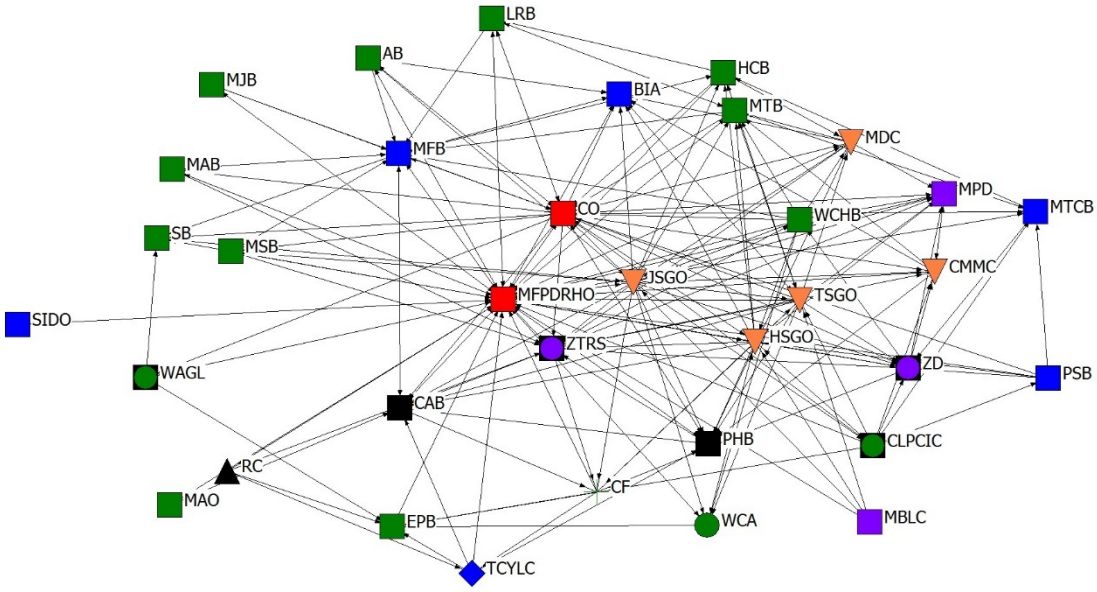
The average path distances between stakeholders for urban flood recovery networks are 2.059 and 1.978. These figures show that stakeholders, on average, must go through 2.059 and 1.978 other stakeholders to access or disseminate information. This is relatively positive number, indicating that information is travelling through the network with relative ease. This, in theory, increases the network's ability or capacity to work together, should the level of commitment increase (Ansell, 2003; Olsson, 2009).

The centralisations of the networks are 49.8% and 46.7%. That is, compared with the other two period networks, the flood recovery network are decentralised. This indicates that reliance on only a few stakeholders is not the optimal structure for resilience and long-term problem solving.

These three measures provide a useful starting point for gaining a sense of the stakeholder network. Next, the actors occupying the core and the periphery are assessed using the core-periphery, betweenness centrality and relationship-strength measures.



Network Map 7-1 Stakeholder information exchange quality for urban flood recovery



Network Map 7-2 Stakeholder interaction frequency for urban flood recovery

Core or periphery

As introduced in the Chapter 2, the core-periphery model is used to analyse the network positions of the stakeholders. It determines which stakeholders are part of a densely connected core and which are part of a sparsely connected periphery. Core stakeholders are also reasonably well connected to peripheral nodes, but the latter are not well connected to the core or to each other (Rombeach, 2014).

Table 7.4 presents the results of the core-periphery analysis for the urban flood recovery networks.

Table 7-4 Core-periphery analysis of the urban flood recovery networks

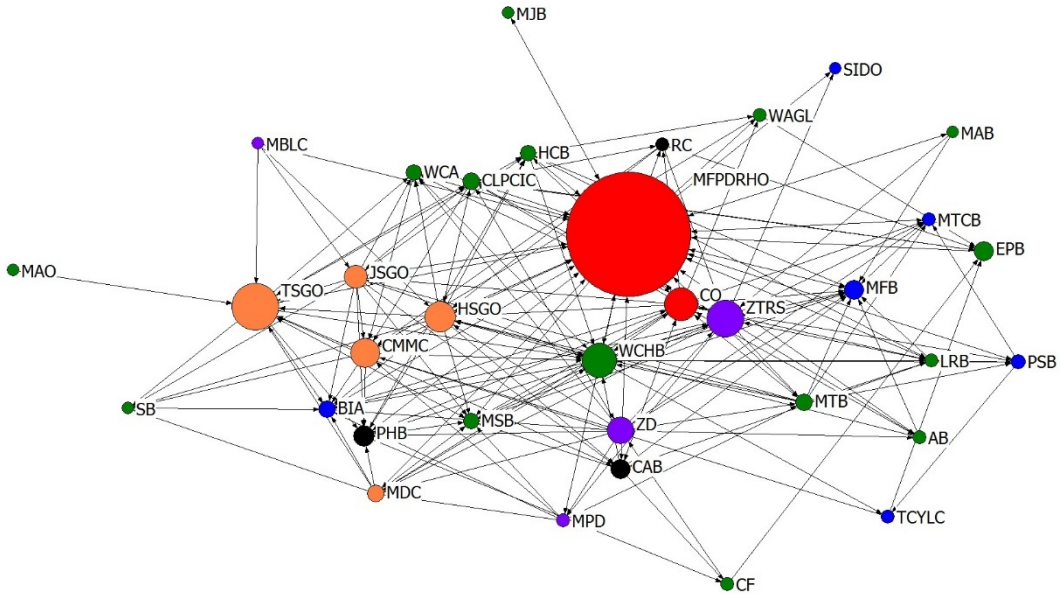
Information exchange quality		**Interaction frequency**	
Core	**Periphery**	**Core**	**Periphery**
CO JSGO TSGO HSGO MDC CMMC MFPDRHO WCHB PHB MFB MTB ZD ZTRS CLPCIC	HCB LRB CAB AB BIA MTCB PSB SIDO EPB MJB MAO SB MSB MAB MBLC MPD RC WAGL TCYLC WCA CF	CO JSGO TSGO HSGO CMMC MFPDRHO MFB CAB MTB MPD ZD ZTRS	MDC WCHB HCB LRB PHB AB BIA MTCB PSB SIDO EPB MJB MAO SB MSB MAB MBLC RC CLPCIC WAGL TCYLC WCA CF

Betweenness centrality

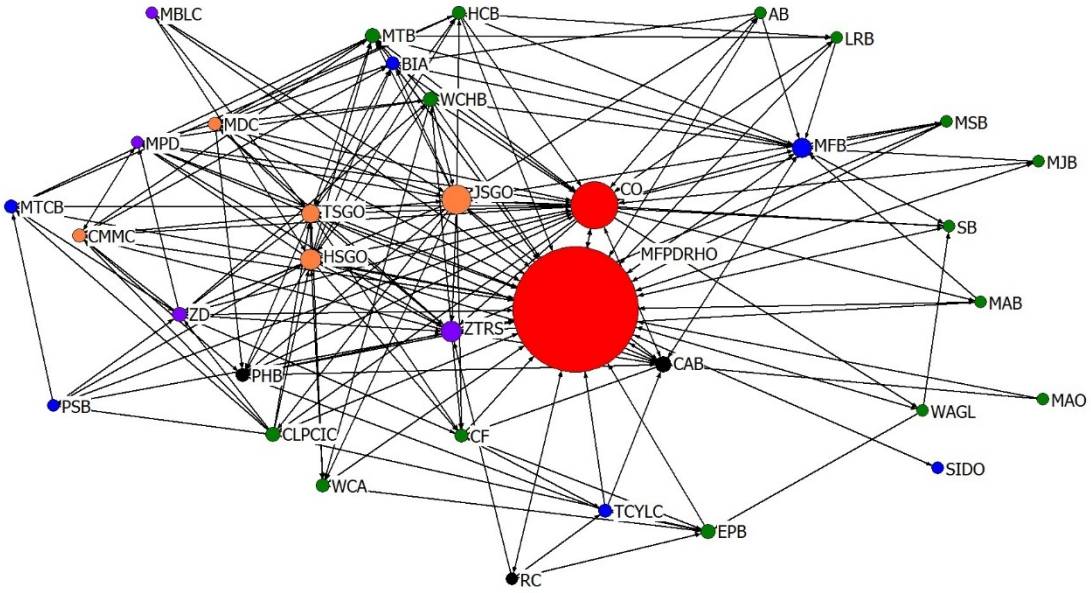
According to the previous two data analysis chapters, betweenness centrality shows how well linked an actor is within the network. The stakeholder which has the largest betweenness centrality during urban flood recovery is the MFPDRHO (see Network Maps 7.3 and 7.4). This highlights the importance of MFPDRHO for related stakeholder coordination activities during an urban flood recovery.

On the other hand, several stakeholders have a medium level of betweenness centrality. These include stakeholders like CO, TSGO, HSGO, JSGO etc. The research indicates that these are active stakeholders who clearly hold an interest during urban flood recovery in Zhuji. These stakeholders are proactively, rather than reactively, engaged with other stakeholders to gather and share information during an urban flood recovery period.

Stakeholders with a low level of betweenness centrality are SIDO, EPB, MJB, MAO, SB, MAB and MBLC (see Table 7.5). Although these stakeholders appear to have interests in certain issues around urban flood recovery in Zhuji, they are less active in engaging with other stakeholders to gather information or be part of the decision-making process.



Network Map 7-3 Information exchange network for urban flood recovery, showing network centrality in node size

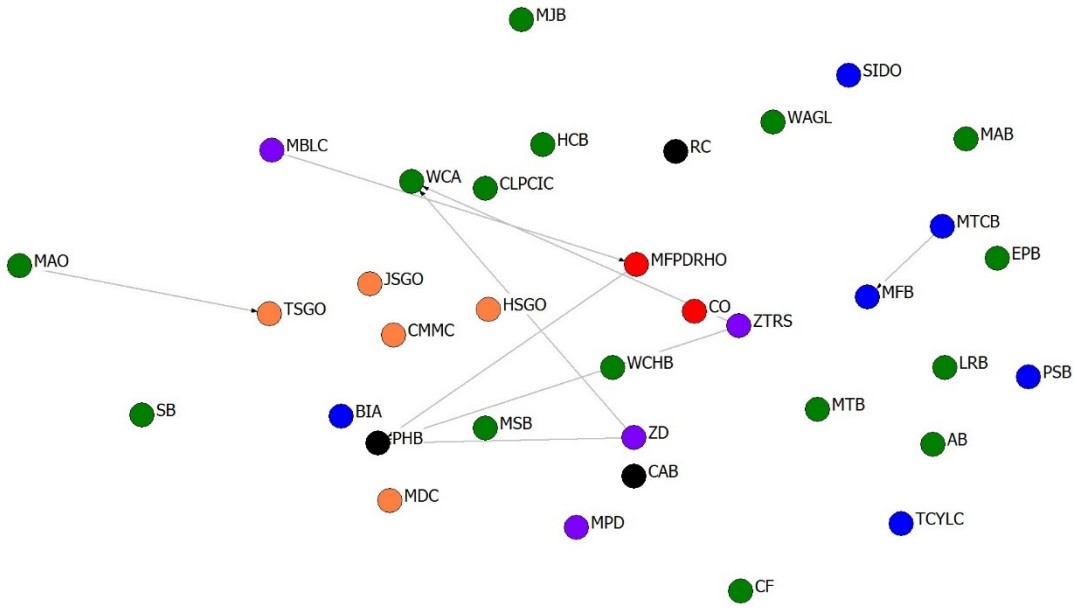


Network Map 7-4 Stakeholder interaction network for urban flood recovery, showing network centrality in node size

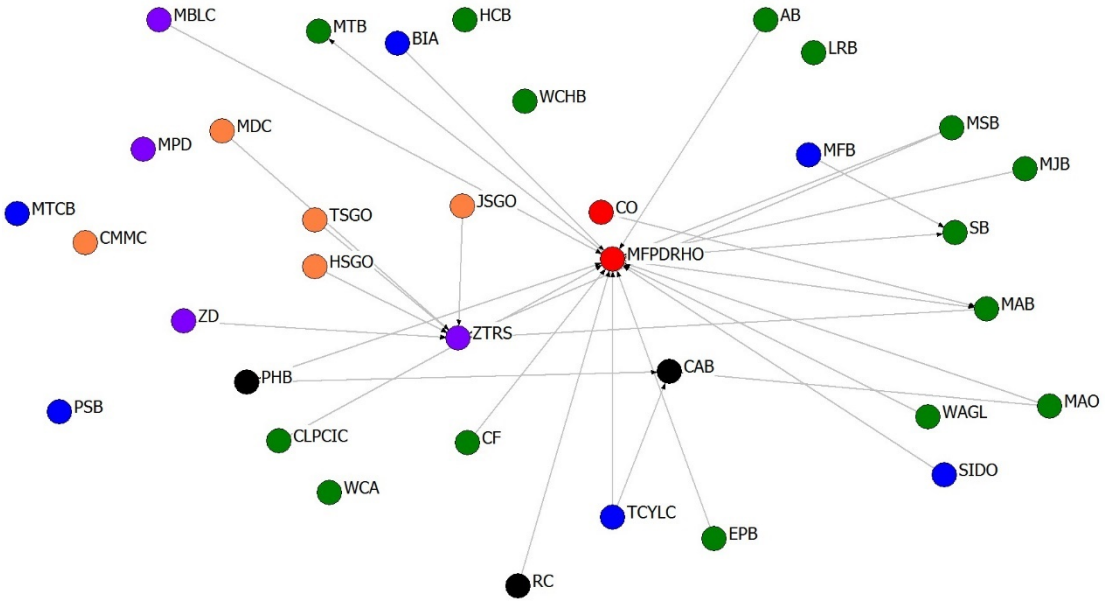
Relationship strength

In common with the process followed in the previous two flood period analyses, there are three different strengths of relationships (strong, medium and weak). The black lines represent strong relationships, with high efficiency, usefulness and trust. Green links mean a medium level of relationship, whereas grey indicates a weak link. Weak links are often caused by either antagonistic relations with low levels of trust, or relations that are perceived to be not efficient or useful. In this case, only a handful of relations are weak in the networks and the majority are grouped around the MFPDRHO (as shown in Network Maps 7.5 and 7.6). This can be easily explained by the composition of the MFPDRHs. As introduced in the Chapter 4 (Case context), MFPDRHs only includes 31 members, while some key informants indicated the stakeholders that MFPDRHs actually involved during urban flood recovery would be fewer than these 31 members (Interviews, 7 July 2015; 27 July 2015; 29 July 2015).

The patterns of connection displayed in the network maps show where certain stakeholders might want to increase their level of engagement with each other, in addition to which stakeholders have good relations and therefore have the potential to engage in quality coordination and collaboration. The analysis shows which stakeholders are important during urban flood recovery, as they hold key positions in the stakeholder engagement networks, and should be considered vital to be included in decision-making processes. Likewise, the analysis shows stakeholders that are less connected or have limited resources. This indicates where engagement strategies could be better focused to increase the position of these stakeholders in the network to have better access to information sharing.



Network Map 7-5 Information exchange network during urban flood recovery, showing weak ties



Network Map 7-6 Stakeholder interaction network during urban flood recovery, showing weak ties

7.5.2 Integrated discussion of the components and issues

Network Maps 7.7 and 7.8 integrate the two stakeholder analysis methods into one single overview. The maps show the core and periphery stakeholders in colour, salience in shape, betweenness centrality in the size of the nodes, as well as relationship strength in the colour of the lines (Figure 7.2).

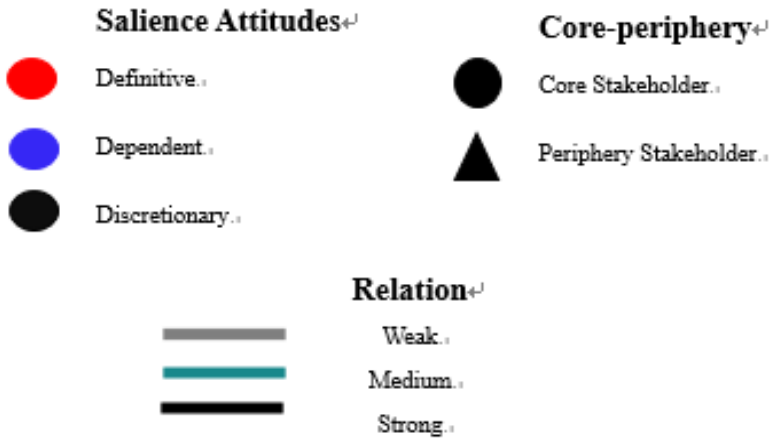
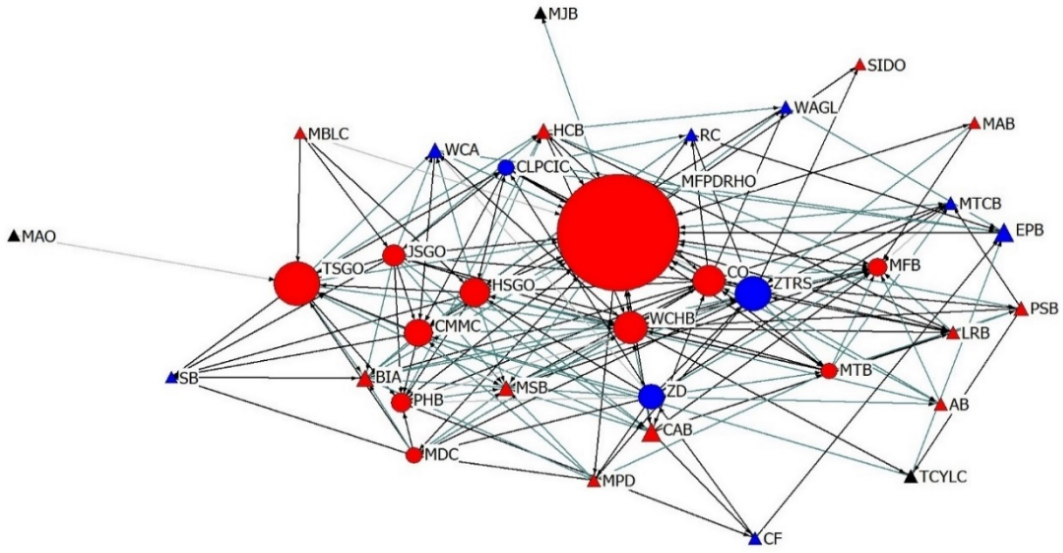
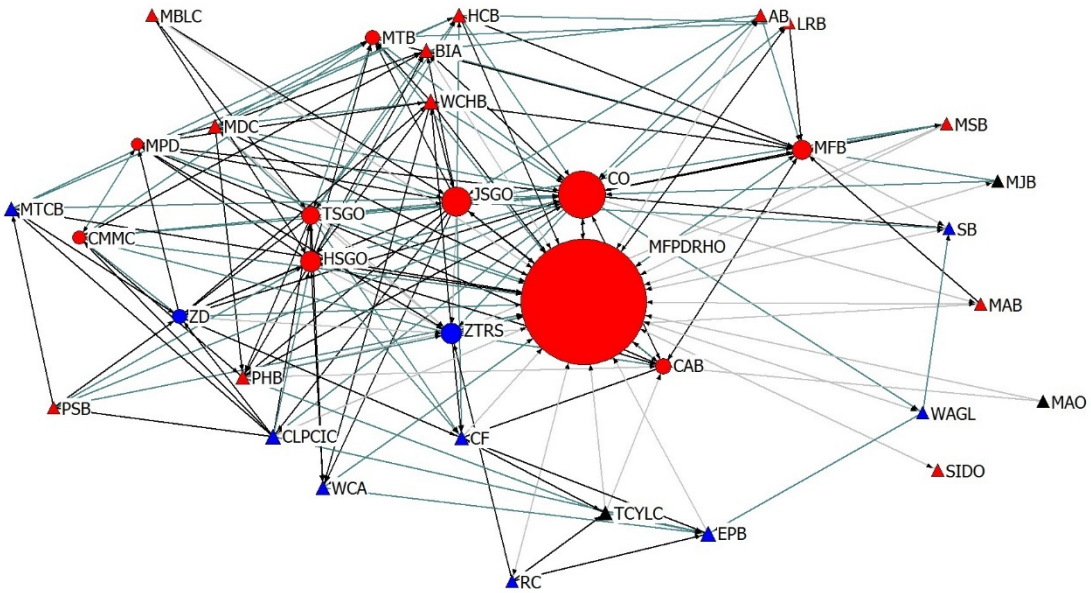


Figure7-2 Legend for the network maps as used in this chapter, showing salience attitudes



Network Map 7-7 Information exchange network during urban flood recovery, showing stakeholder salience attitudes



Network Map 7-8 Stakeholder interaction network during urban flood recovery, showing stakeholder salience attitudes

Integration of salience model and stakeholder network analysis

As presented in Network Maps 7.7 and 7.8, there are few correlations between stakeholder salience types and their positions in the network. Besides the ZTRS, ZD and CLPCIC, which belong to the Dependent salience type, all the other core stakeholders are Definitive-type stakeholders. During urban flood management, Definitive stakeholders were identified as having both power and legitimacy claims, and conveying the urgency of their claims. Thus, these stakeholders are considered to be the most important ones in the networks. Other Definitive stakeholders which are located at the periphery of the urban flood recovery networks are: AB, LRB, MSB, MAB, SIDO, PHB, PSB, MDC, WCHB, BIA, HCB and MBLC. It is important that these stakeholders enhance their engagement approaches to allow for more effective participation during urban flood recovery.

On the other hand, there is no significant correlation between stakeholder salience and betweenness centrality. Although the Definitive stakeholder MFPDRHO has the highest betweenness centrality, other stakeholders' salience attitudes have no apparent relationship with their betweenness centrality.

Nonetheless, with the combined knowledge of these two methods, engagement between the stakeholders can be developed to become more effective.

7.6 Conclusion

Table 7.5 sets out a final overview of the stakeholders identified during an urban flood recovery period in Zhuji. The main metrics are displayed in this table, these being salience, core-periphery, and betweenness centrality. The other aspects of the network measures, based on the relationships, cannot be captured in a table such as this and are therefore omitted. This is another indication of how multifaceted and complicated the data involved is. There is no relationship between either one of the main metrics. This provides evidence that the context and environment relating to the urban flood recovery stakeholder arena is indeed complex and multifaceted.

After reading this data analysis, one cannot look at the data and pick ‘the most important’ stakeholder nor ‘the least important’ stakeholder. In fact, the data is so complex that it defies categorisation. This implies that stakeholder engagement within complex and dynamic environments, such as urban flood management, requires a more contingent and indeed specialised approach, based on each stakeholder separately.

The integrated network maps are for that reason a source of reference that can be used in drafting engagement policies.

Table 7-5 Final overview of urban flood recovery stakeholders in Zhuji

Stakeholder	Sector represented	Role	Salience attitudes	Core-periphery (information exchange)	Core-periphery (interaction frequency)	Betweenness centrality (information exchange)	Betweenness centrality (interaction frequency)
CO	Municipal government	Comprehensive coordination	Definitive	Core	Core	43.499	165.979
JSGO	Sub-district government	Urban administration	Definitive	Core	Core	24.001	81.235
TSGO	Sub-district government	Urban administration	Definitive	Core	Core	62.500	23.517
HSGO	Sub-district government	Urban administration	Definitive	Core	Core	41.033	37.851
MDC	Sub-district government	Urban administration	Definitive	Core	Periphery	18.074	4.468
CMMC	Sub-district government	Urban administration	Definitive	Core	Core	60.781	12.986
MFPDRHO	Municipal government	Comprehensive coordination	Definitive	Core	Core	460.455	523.378
WCHB	Municipal government	Service operation	Definitive	Core	Periphery	73.740	14.892
HCB	Municipal government	Service operation	Definitive	Periphery	Periphery	12.273	3.483
LRB	Municipal government	Service operation	Definitive	Periphery	Periphery	4.986	0.617
PHB	Municipal government	Emergency rescue and mitigation	Definitive	Core	Periphery	39.065	2.783
MFB	Municipal government	Logistics supply	Definitive	Core	Core	15.335	22.510
CAB	Municipal government	Emergency rescue and mitigation	Definitive	Periphery	Core	16.362	15.574

MTB	Municipal government	Service operation	Definitive	Core	Core	25.382	11.369
AB	Municipal government	Service operation	Definitive	Periphery	Periphery	4.048	0.200
BIA	Municipal government	Logistics supply	Definitive	Periphery	Periphery	33.739	7.505
MTCB	Municipal government	Logistics supply	Dependent	Periphery	Periphery	1.036	7.150
PSB	Municipal government	Logistics supply	Definitive	Periphery	Periphery	8.732	0.292
SIDO	Municipal government	Logistics supply	Definitive	Periphery	Periphery	0.000	0.000
EPB	Municipal government	Service operation	Dependent	Periphery	Periphery	25.751	0.000
MJB	Municipal government	Service operation	Discretionary	Periphery	Periphery	0.000	0.000
MAO	Municipal government	Service operation	Discretionary	Periphery	Periphery	0.000	0.000
SB	Municipal government	Service operation	Dependent	Periphery	Periphery	0.000	3.200
MSB	Municipal government	Service operation	Definitive	Periphery	Periphery	15.699	0.167
MAB	Municipal government	Service operation	Definitive	Periphery	Periphery	1.110	0.000
MBLC	Municipal government	Community mobilisation	Definitive	Periphery	Periphery	0.000	0.000
MPD	Municipal government	Community mobilisation	Definitive	Periphery	Core	3.048	12.692
ZD	Public sector	Community mobilisation	Dependent	Core	Core	26.985	13.826

ZTRS	Public sector	Community mobilisation	Dependent	Core	Core	43.751	34.291
RC	NGO	Emergency rescue and mitigation	Dependent	Periphery	Periphery	6.853	18.822
CLPCIC	Public sector	Service operation	Dependent	Core	Periphery	53.179	37.619
WAGL	Public sector	Service operation	Dependent	Periphery	Periphery	7.549	5.994
TCYLC	Voluntary organisation	Logistics supply	Discretionary	Periphery	Periphery	3.981	2.000
WCA	CBO	Service operation	Dependent	Periphery	Periphery	14.889	8.201
CF	Municipal government	Service operation	Dependent	Periphery	Periphery	6.164	24.401

8. Cross-period analysis

The previous three chapters have presented in detail the outcomes of the application of the two different stakeholder analysis methods to the three urban flooding periods. An evaluation regarding how the three periods compare to each other and whether the findings can be generalised is dealt within the following sections. This is an important step in validation of the two stakeholder analysis methods, as it confirms the consistency and flexibility of the measures, thereby making them suitable for application in different periods of urban flood management. Furthermore, both urban flood management and water resource management have highlighted the importance of effective stakeholder engagement, indicating this to be crucial to their success. Thus, it is important for the stakeholders, which include government institutions, public and private sector actors, NGOs, CBOs and voluntary organisations, to develop the quality of their relationships and enhance their stakeholder engagement activities during urban flood management.

This chapter is divided into four sections. The first section focuses on stakeholder identification across the three urban flood periods. The second section discusses the stakeholders' salience attitudes based on the key variables power, legitimacy and urgency during the different flood periods, while the third section specifically looks at relationships between the key stakeholders. The final part of this chapter integrates these two stakeholder analysis methods, and indicates potential relationships between them.

The next section explains stakeholder identification across the three different urban flood periods.

8.1 Stakeholder identification across the flood periods

According to the literature review (Chapter 2) and 13 key informant interviews, there were 50 stakeholders identified under the urban flood management in Zhuji. However, some of these stakeholders may not actually be involved in urban flood management during a certain period. Based on the stakeholder salience analysis, these stakeholders were identified as: 31 for urban flood preparedness, 40 for

emergency response, and 35 for urban flood recovery. Although the Zhuji Water Conservancy Bureau (2013) describes the functions of the Safety Inspection Bureau (SIB) and the Zhuji Branch of the People's Bank of China (BPBC) during urban flood management in Zhuji, none of the 13 key informants mentioned their importance during urban flooding. Thus, these two stakeholders were perceived to be non-stakeholders during urban flood management in Zhuji. Table 8.1 presents the stakeholders associated with each urban flood period.

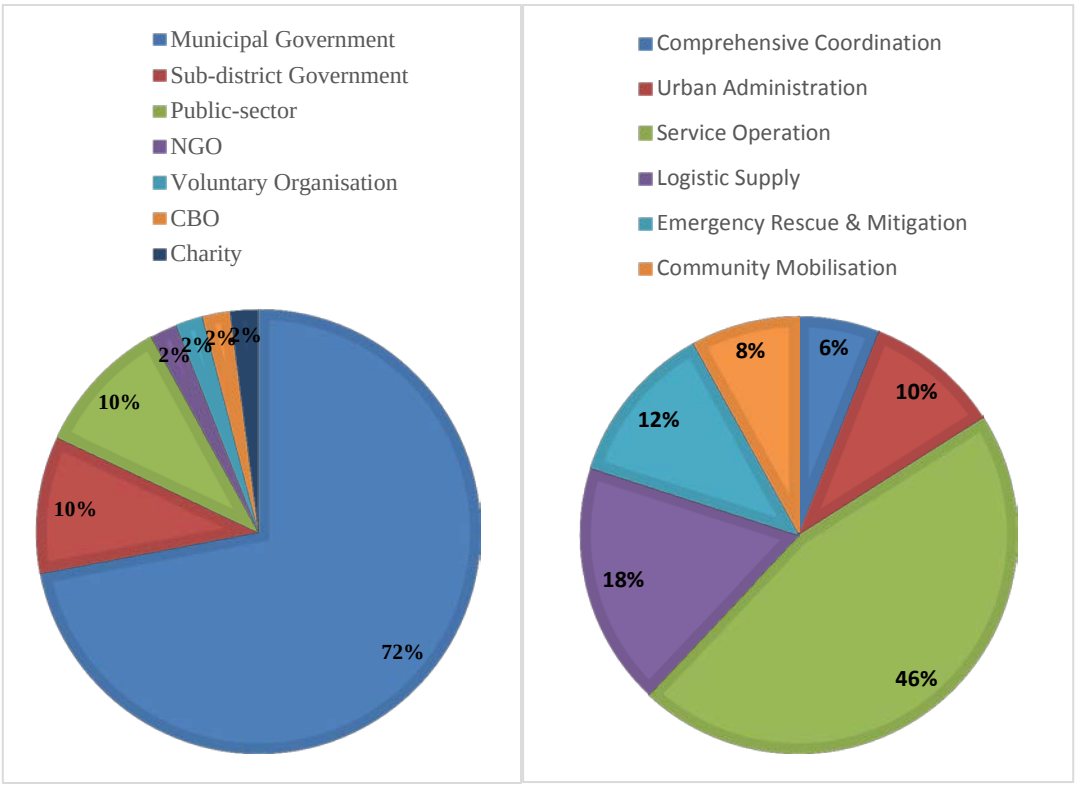


Figure 8-1 Stakeholder groups during the urban flood management in Zhuji

As represented in the Figure 8.1, not quite 18% of the urban flood management stakeholders came from a non-government body. This indicates that there is little non-government input into the urban flood management in Zhuji. As the deputy director of WCHB highlighted (Interview, 23 June 2015), this is one of the major challenges for stakeholder engagement in China. Traditional government-based flood management in China is the cause of the limited contributions from non-government stakeholders. The director of MFCDRHO explained this as:

"the government did more, the local community did less" (Interview, 29 July 2015)

Meanwhile, nearly half the stakeholders (46%) provided a variety of urban flood services. These included urban planning, water-resource management, land-use management, traffic management and environment protection etc. This provides evidence that the context and environment relating to the urban flood management stakeholder arena is indeed complex and multifaceted.

Table 8-1 Stakeholder identification across the three urban flood periods

Stakeholder	Sector represented	Focus of stakeholder	Flood preparedness	Flood response	Flood recovery
CO	Municipal government	Comprehensive coordination	■	■	■
JSGO	Sub-district government	Urban administration	■	■	■
TSGO	Sub-district government	Urban administration	■	■	■
HSGO	Sub-district government	Urban administration	■	■	■
MDC	Sub-district government	Urban administration	■	■	■
CMMC	Sub-district government	Urban administration	■	■	■
MFPDRHO	Municipal government	Comprehensive coordination	■	■	■
EMO	Municipal government	Comprehensive coordination	■	■	
WCHB	Municipal government	Service operation	■	■	■
HCB	Municipal government	Service operation	■	■	■
LRB	Municipal government	Service operation	■	■	■
MB	Municipal government	Service operation	■	■	
PHB	Municipal government	Emergency rescue and mitigation		■	■
MFB	Municipal government	Logistics supply	■	■	■
CAB	Municipal government	Emergency rescue and mitigation		■	■
MTB	Municipal government	Service operation	■	■	■
AB	Municipal government	Service operation		■	■
BIA	Municipal government	Logistics supply	■	■	■
MFMB	Municipal government	Service operation		■	■
MTCB	Municipal government	Logistics supply	■	■	
PSB	Municipal government	Logistics supply	■	■	■
SIDO	Municipal	Logistics supply	■	■	■

	government				
EPB	Municipal government	Service operation			
TB	Municipal government	Service operation			
MFSB	Municipal government	Logistics supply			
MEB	Municipal government	Service operation			
MJB	Municipal government	Service operation			
MAO	Municipal government	Service operation			
ETB	Municipal government	Service operation			
DRB	Municipal government	Service operation			
PB	Municipal government	Service operation			
SIB	Municipal government	Service operation			
SB	Municipal government	Service operation			
MSB	Municipal government	Service operation			
MAB	Municipal government	Service operation			
MPSB	Municipal government	Emergency rescue and mitigation			
FB	Municipal government	Emergency rescue and mitigation			
PAFD	Municipal government	Emergency rescue and mitigation			
MUMB	Municipal government	Service operation			
MBLC	Municipal government	Community mobilisation			
MPD	Municipal government	Community mobilisation			
ZD	Public sector	Community mobilisation			
ZTRS	Public sector	Community mobilisation			
RC	NGO	Emergency rescue and mitigation			
BPBC	Public sector	Logistics supply			
CLPCIC	Public sector	Logistics supply			
WAGL	Public sector	Service operation			
TCYLC	Voluntary Organisation	Logistics supply			
WCA	CBO	Service operation			
CF	Charity	Service operation			

8.2 Stakeholder salience across the periods

The first stakeholder analysis method applied was stakeholder salience. Several authors, such as Freeman (2008), Friedman (2009) and Andriof and Waddock (2002), have demonstrated that identifying stakeholders' salience is important with respect to defining how to engage with stakeholders. As introduced in the Chapter 2 (Literature review), the salience of stakeholders is derived from a combination of power, legitimacy and urgency. By analysing the salience attributes, stakeholders can be classified into eight types: Definitive, Dominant, Dormant, Discretionary, Dependent, Dangerous, Demanding and non-stakeholder. Across the three study periods, besides the non-stakeholder types, the urban flood management stakeholders in Zhuji could be divided into five salience types: Definitive (PLU), Dominant (PL), Dormant (P), Discretionary (L) and Dependent (LU). The remaining two stakeholder salience types – Dangerous and Demanding – were found to be absent during urban flood management in Zhuji.

This section compares the salience classifications of stakeholders across the urban flooding periods, and assesses whether the outcomes reflect the urban flood management context identified in the literature and desktop analysis.

Focusing on the salience classification, Figure 8.2 presents the distribution of stakeholder salience types for each urban flood period. As indicated by the thick red border in Figure 8.2, the Definitive, Discretionary and Dependent stakeholder types were common to all three urban flood periods. The Definitive-type stakeholders were strongly represented within all the three flooding periods (52% for flood preparedness, 75% for flood response and 63% for flood recovery). The Dormant stakeholder type only existed during urban flood preparedness, while the Dominant stakeholder type was identified as being absent during flood recovery. This indicates that stakeholder participation during urban flood management, especially during flood response and recovery in Zhuji, mainly depends on the stakeholders' legitimate claims. Furthermore, there are more Dependent-type stakeholders during flood recovery than the other two flooding periods. This means there are more stakeholders who achieve their objectives by leveraging the power of other stakeholders during urban flood recovery. For example, some of the key informants (Interviews, 17 July

2015 a and b; 27 July 2015) mentioned that throughout the past decade, the Water Conservancy Association (WCA) has been more like an agency of the Water Conservancy and Hydropower Bureau (WCHB) than an independent organisation.

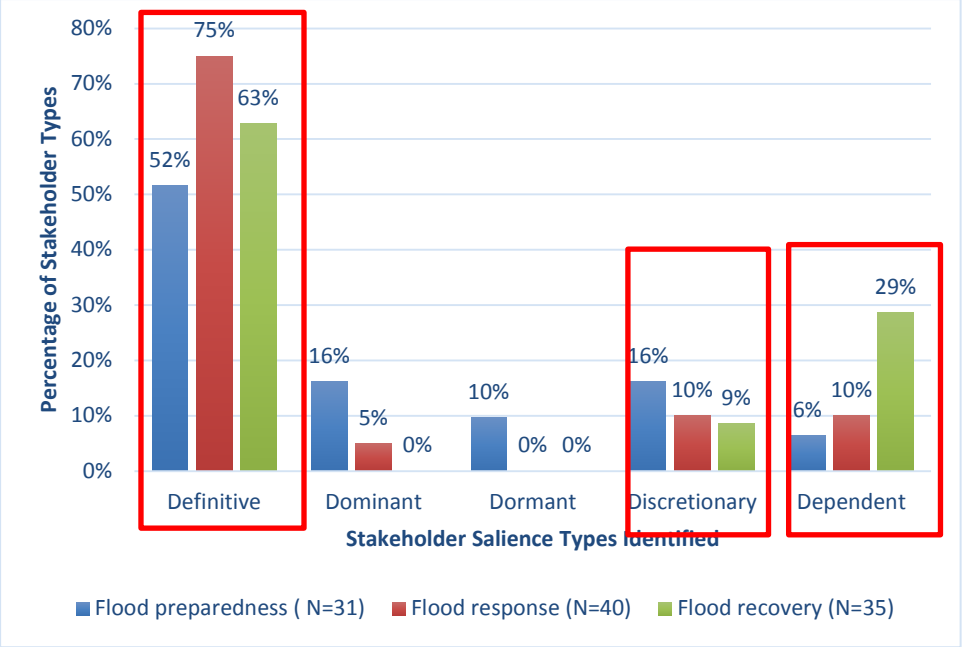


Figure 8-2 Distribution of stakeholder salience types identified for each urban flood period

Across the three urban flood management periods, some stakeholders were represented in all the periods, while some stakeholders were unique to a particular period. The main group of stakeholders identified across all the urban flood periods were the municipal government departments. The groups of stakeholders with a high similarity across the flood periods were the comprehensive coordination and urban administration stakeholders, with nearly all of these identified as Definitive across the three urban flood periods. One irregularity in this was observed with the Emergency Management Office (EMO) in the context of urban flood recovery. All 13 key informants perceived EMO to be a non-stakeholder during urban flood recovery. This is understandable, since MFCDRHs leads the whole urban flood management process in Zhuji, and most urban flood recovery works are actually carried out by MFCDRHO.

The list of stakeholders is grouped in Table 8.2 to indicate the salience for each of the stakeholders during the three urban flood periods. Besides the urban administration

and comprehensive coordination groups, the salience classifications of the other four types of stakeholders are variable across the three urban flood periods. The major differences come from service operation, logistics supply, emergency rescue and flood mitigation, and community mobilisation, which are highlighted in Table 8.2.

Table 8-2 Cross-period stakeholder salience distribution

Focus of stakeholder	Stakeholder	Flood preparedness	Flood response	Flood recovery
Urban administration	JSGO	Definitive	Definitive	Definitive
	TSGO	Definitive	Definitive	Definitive
	HSGO	Definitive	Definitive	Definitive
	MDC	Definitive	Definitive	Definitive
	CMMC	Definitive	Definitive	Definitive
Service operation	WCHB	Definitive	Definitive	Definitive
	HCB	Definitive	Definitive	Definitive
	LRB	Definitive	Definitive	Definitive
	MB	Definitive	Definitive	
	MTB	Definitive	Definitive	Definitive
	AB		Definitive	Definitive
	MFMB		Dominant	
	EPB	Discretionary	Definitive	Dependent
	TB		Definitive	
	MEB	Dependent	Definitive	
	MJB			Discretionary
	MAO			Discretionary
	ETB	Dominant	Definitive	
	DRB	Dominant	Discretionary	
	PB	Dominant		
	SIB			
	SB		Definitive	Dependent
	MSB			Definitive
	MAB			Definitive
	MUMB	Dormant	Definitive	
	WAGL	Dominant	Dependent	Dependent
	WCA	Dependent	Dependent	Dependent
	CF			Dependent
Logistics supply	MFB	Dominant	Dominant	Definitive
	BIA	Dormant	Definitive	Definitive
	MTCB	Definitive	Definitive	Dependent
	PSB	Definitive	Definitive	Definitive
	SIDO	Definitive	Definitive	Definitive
	MFSB		Discretionary	
	BPBC			
	CLPCIC	Discretionary		Dependent
	TCYLC		Discretionary	Discretionary
Emergency rescue and mitigation	PHB		Definitive	Definitive
	CAB		Definitive	Definitive
	MPSB		Definitive	

	FB		Definitive	
	PAFD		Definitive	
	RC		Discretionary	Dependent
Comprehensive coordination	CO	Definitive	Definitive	Definitive
	MFPDRHO	Definitive	Definitive	Definitive
	EMO	Definitive	Definitive	
Community mobilisation	MBLC	Dormant		Definitive
	MPD	Discretionary	Definitive	Definitive
	ZD	Discretionary	Dependent	Dependent
	ZTRS	Discretionary	Dependent	Dependent

As the largest stakeholder group during urban flood management, service operation stakeholders provide the various types of flood control and prevention services. Hence, the service operation stakeholders can be regarded as the most complex stakeholders, and a variable salience distribution for them during urban flooding is to be expected. Among them, only WCHB, HCB, LRB, MTB and WCA were identified as keeping the same salience attitudes across the three urban flood management periods. Besides WCA, all the other 13 stakeholders were identified as being Definitive stakeholders across the whole urban flood period. This indicates that these stakeholders are the most important ones during urban flood management, since they are identified as Definitive ones in each of the urban flood periods. In contrast, WCA was classified as a Dependent stakeholder in each of the three urban flood periods. Most of the key informants perceived it as being less powerful than the other stakeholders during urban flood management. This might be because of its non-government background within a highly government-based urban flood management environment. Furthermore, some of the key informants (Interviews, 27 July 2015; 29 July 2015) mentioned that WCA has been more like an agency of WCHB than an independent organisation in recent years; this might also weaken its power and influence. On the other hand, it was observed in the period studies (Table 8.2) that the salience classifications for the other 18 service operation stakeholders were quite different, with all five salience classifications observed across the board. These differences were to be expected, as the specific context of each flooding period heavily influences the outcomes.

Among the nine logistics supply stakeholders, the Power Supply Bureau (PSB) and the Service Industry Development Office (SIDO) were unique in being consistently classified as ‘Definitive’ stakeholders during flooding. This clearly indicates that

PSB and SIDO are the most important logistics supply stakeholders for urban flood management in Zhuji. This also means that materials and electricity supply are the two most important resources during urban flooding in Zhuji.

Emergency rescue and flood mitigation stakeholders were only identified as stakeholders during and immediately after the flooding. As represented in the Table 8.2, most of these were classified as 'Definitive' stakeholders. The unique exception was the Red Cross (RC). This is understandable given its non-government background. Most of the key informants demonstrated (Interviews, 13 July 2015 a, b and c; 17 July 2015 a and b; 27 July 2015) RC's low influence during urban flood management in Zhuji.

Community mobilisation stakeholders include the municipal media and public consultation departments, and the mass media. Based on Table 8.2, it is obvious that the two municipal government departments (MBLC and MPD) are more powerful than the two mass media (ZD and ZTRS) organisations. Among them, it seems that MPD leads community mobilisation works during urban flood management in Zhuji. This can also be proved by the key informant interviews (Interview, 13 July 2015).

Overall, the salience analysis has delivered reliable outcomes for the municipal stakeholders when compared across the three urban flooding periods. The methodology applied to perform the salience analysis has not undergone major changes compared to the original methodology proposed by Mitchell et al. (1997). The main difference in application within this research has been the differentiation of salience per flooding periods, following the argument that a stakeholder might have different salience based on its interests in each different urban flooding period. The reason for this was based on the fact that salience is composed of power, legitimacy and urgency. The application of the salience analysis to the three flooding periods shows that salience can indeed be different for different issues in different flooding periods, all of which demonstrates the validity of the original argument. This outcome shows that assuming a 'single level' of salience for a stakeholder might be an unwarranted assumption. It is therefore important to assess salience over the three urban flooding periods. A more detailed assessment then provides greater confidence

in the outcomes for those stakeholders that are more context specific in nature, as will be discussed next.

The classification based on salience across all urban flooding periods is different with the distinction of traditional stakeholder groups (municipal and sub-district government departments, NGOs, CBOs, voluntary organisations, public and private sector actors) compared to the focus of the stakeholders (comprehensive coordination, urban administration, service operation, emergency rescue and flood mitigation, and community mobilisation). There are three main aspects to the stakeholder salience, perceived to be power, legitimacy and urgency. None of these has any significant distribution in a certain classification within the traditional stakeholder groups or within the focus of the stakeholders. Thus, the salience classification has been demonstrated to be a reliable method: since it considers individual stakeholders, it allows for sufficient flexibility to classify context-specific stakeholders. It allows the analyst to differentiate a stakeholder not only by their perceived power, but also according to the legitimacy and urgency the stakeholder holds for each of the issues. This allows for more specific stakeholder engagement, where stakeholders are only involved in matters that are important to them. Salience methods also strengthen the traditional stakeholder grouping that is often applied: clustering stakeholders by perceived power and interest.

8.3 Network analysis across the periods

The application of network analysis to the three urban flood periods has shown that creating network maps leads to an examination of the stakeholder network that is different to the salience approach. Network analysis is used because it can extract core and periphery stakeholders, and by quantitatively visualising relations between stakeholders, network measures – such as density, average path distance and degree centralisation – provide information on the effectiveness of the entirety of relations between the stakeholders. Table 8.3 compares the results of these measures during urban flooding.

Table 8-3 Results of the network analysis measures during urban flooding

	Type of network	Preparedness	Response	Recovery
Density	Information exchange	0.237	0.203	0.177
	Interaction frequency	0.232	0.210	0.177
Average path distance	Information exchange	1.86	1.928	2.059
	Interaction frequency	1.828	1.847	1.978
Degree centralisation	Information exchange	74.5%	75.8%	0.498
	Interaction frequency	64.3%	69.6%	0.467

As represented in Table 8.3, the average densities of both the information exchange quality and interaction frequency networks are relatively lower than expected. This is especially during the urban flood response period, where more stakeholders are involved, but with less active relationships. On the other hand, the average path distance of these two types of networks show relatively positive numbers, which demonstrates that information can travel through the network with relative ease. These two network measures indicate that although information exchange and stakeholder interaction are relatively easy during urban flooding, the number of active stakeholders is limited. This is especially during urban flood recovery, when only 17.7% of relationships were active.

Furthermore, the high degree of centralisation of the urban flood preparedness and response networks illustrates the highly centralised network environments that exist during these two urban flooding periods. One exception is the centralisation (49.8% and 46.7%) during flood recovery. This means the urban flood recovery network is more decentralised than the other two period networks, which indicates that a reliance on only a few stakeholders is not the optimal structure for resilience and long-term problem solving.

As discussed in the previous three chapters, the core-periphery model analyses the network position of the stakeholder, by determining which stakeholders are part of a densely connected core and which are part of a sparsely connected periphery. Core

stakeholders are also reasonably well connected to peripheral nodes, but the latter are not well connected to the core or to each other (Rombeach, 2014). Combining both the information exchange quality network and interaction frequency network, Table 8.4 presents the core and periphery stakeholders during the three urban flood periods.

Table 8-4 Core and periphery stakeholders during the three urban flood periods

	Network position	
	Core	***Periphery***
Urban flood preparedness	CO JSGO TSGO HSGO MFPDRHO EMO WCHB HCB LRB MB BIA, MPD ZD	MDC CMMC MFB MTB MTCB PSB SIDO EPB MEB ETB DRB PB MUMB MBLC ZTRS CLPCIC WAGL WCA
Urban flood response	CO JSGO TSGO HSGO MFPDRHO EMO WCHB MB MFB CAB BIA MEB FB MPD ZTRS HCB LRB MTB MTCB	MDC CMMC PHB AB MFMB PSB SIDO EPB TB MFSB ETB DRB SB MPSB PAFD MUMB ZD RC WAGL TCYLC WCA
Urban flood recovery	CO JSGO TSGO HSGO MDC CMMC MFPDRHO WCHB PHB MFB MTB ZD ZTRS CLPCIC CAB MPD	HCB LRB AB BIA MTCB PSB SIDO EPB MJB MAO SB MSB MAB MBLC RC WAGL TCYLC WCA CF

The core stakeholders which are common to the three flooding periods are CO, JSGO, TSGO, HSGO, MFPDRHO, WCHB and MPD, which are highlighted in Table 8.4. This indicates that these seven stakeholders are the actual key stakeholders within the whole urban flood management process in Zhuji. Besides them, there are few stakeholders that are uniquely important within each of the urban flooding periods. Overall, the proportions of the core stakeholders are 42% for the preparedness stakeholders, 47.5% for the response stakeholders and 45.7% for the recovery stakeholders. This indicates that nearly half the stakeholders during each period are isolated from the urban flood management in Zhuji. Thus, it is important for these core stakeholders to reconsider their stakeholder engagement methods to make sure they are linking with other stakeholders during urban flood management.

To confirm this fact, the betweenness centrality of these stakeholders was also measured. Betweenness centrality aims to measure how well linked a stakeholder is within the network. Among the urban flood management stakeholders in Zhuji, MFPDRHO was unique in that it had a significantly high betweenness centrality

within each of the three urban flood management periods. This is not surprising given its stakeholder coordination and decision-making roles during urban flood management in Zhuji. On the other hand, although stakeholders like the City Office (CO), the Meteorology Bureau (MB) and EMO also had relatively high betweenness centrality during certain flood management periods, most of the other stakeholders demonstrated low betweenness centralities. The detailed results are shown in Tables 5.6, 6.6 and 7.6.

Finally, the network analysis method also uncovers the many relations that exist between the stakeholders, and shows on what level stakeholders interact and how well the relationship is perceived. This analysis has shown a significant positive correlation between three interaction variables: 1) how well the relationship is regarded; 2) the frequency with which stakeholders interact; and 3) the quality of information exchange between stakeholders. These three variables are all positively correlated to each other. With the current level of information, however, it cannot be determined whether there is a causal relationship between the variables. From the evidence, it is assumed that stronger relations are likely to be facilitated by frequent and high-quality information exchanges in relation to problem solving and planning.

8.4 Integration of the stakeholder analysis

The previous three sections have compared the individual components across the flooding periods so as to establish confidence in the analysis. In order to demonstrate the full strength of the analysis as a methodology to examine stakeholders within the context, a period study of urban flood preparedness is selected. To be specific, the analysis will investigate the relationships between four stakeholders: the Municipal Flood Control and Drought Relief Headquarters Office (MFPDRHO), the Water Conservancy and Hydropower Bureau (WCHB), the Water Conservancy Association (WCA) and the Zhuji Television and Radio Station (ZTRS). Network Maps 8.1, 8.2 and 8.3 represent the triangular relationship between these four stakeholders, while Tables 8.5, 8.6 and 8.7 represent the outcomes on all the components in each of the three urban flooding periods. All figures have been reduced to show only the information relevant for these four stakeholders. For full information on the whole network, refer to Chapter 5.

Table 8-5 General stakeholder classification and salience attitudes for MFPDRHO, WCHB, ZTRS and WCA

	Sector represented	Role	Salience attitudes		
			Preparedness	Response	Recovery
MFPDRHO	Municipal government	Comprehensive coordination	Definitive	Definitive	Definitive
WCHB	Municipal government	Service operation	Definitive	Definitive	Definitive
ZTRS	Public sector	Community mobilisation	Discretionary	Dependent	Dependent
WCA	Community-based organisation	Service operation	Dependent	Dependent	Dependent

Table 8-6 Identification of core and periphery stakeholders of MFPDRHO, WCHB, ZTRS and WCA

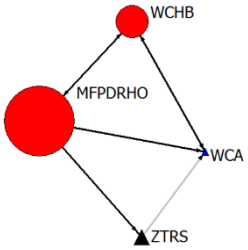
	Preparedness		Response		Recovery	
	IE	IF	IE	IF	IE	IF
MFPDRHO	Core	Core	Core	Core	Core	Core
WCHB	Core	Core	Core	Core	Core	Periphery
ZTRS	Periphery	Periphery	Core	Core	Core	Core
WCA	Periphery	Periphery	Periphery	Periphery	Periphery	Periphery

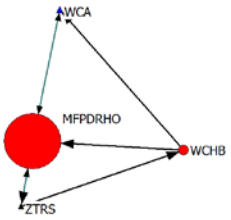
IE + IF? – info exchange & info frequency

Table 8-7 Betweenness centrality of MFPDRHO, WCHB, ZTRS and WCA

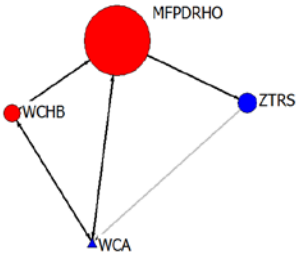
	Preparedness		Response		Recovery	
	IE	IF	IE	IF	IE	IF
MFPDRHO	222.106	474.350	482.943	794.409	460.455	523.378
WCHB	71.498	21.774	52.767	37.683	73.740	14.892
ZTRS	5.717	7.769	45.980	19.141	43.751	34.291
WCA	11.985	13.367	12.948	11.421	14.889	8.201

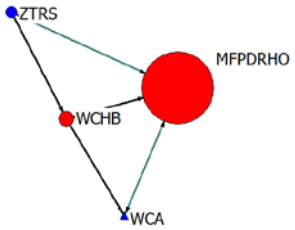
IE + IF? – info exchange & info frequency



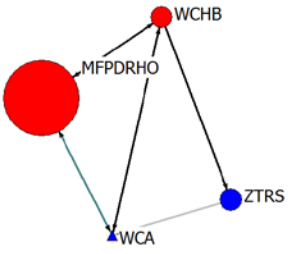


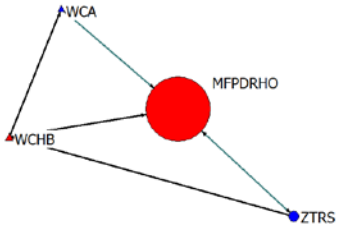
Network Map 8-1 Filtered preparedness networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency)





Network Map 8-2 Filtered response networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency)





Network Map 8-3 Filtered recovery networks for MFPDRHO, WCHB, WCA and ZTRS (left for information exchange, right for interaction frequency

First, it is immediately visible that the relationship between these four stakeholders during the three urban flood periods is similar. It is also obvious that the relationship between WCA and ZTRS is sub-optimal, while the relationships between WCHB, MFPDRHO and WCA are excellent. The black lines indicate that there is either frequent interaction or high information exchange quality. The green lines between WCA and MFPDRHO, and ZTRS and MFPDRHO indicate that the information exchange quality is medium level, while the grey line between ZTRS and WCA shows that there is only infrequent interaction.

From the background research, it was found that MFPDRHO and WCHB are the two major urban flood management stakeholders in Zhuji. While WCHB is responsible for municipal water resource management, MFPDRHO is more like an agency of WCHB, especially in terms of flood management. Furthermore, as the key informants identified, the community-based organisation WCA is also perceived to be an agency of WCHB. Thus, it is understandable that the relationships among these three stakeholders are better than those with ZTRS.

As the routine office of the MFPDRHs, MFPDRHO is perceived to be a Definitive stakeholder across all urban flood periods. At the same time, it was also identified as being a core stakeholder, with significant betweenness centrality across the urban flood management process. This indicates that this stakeholder is not only well linked, but also the most important stakeholder for urban flood management in Zhuji. On the other hand, although MFPDRHs is a municipal headquarters, MFPDRHO is actually located in WCHB. Thus, most of the direct links among the MFPDRHO, ZTRS and WCA were identified as being of medium strength. It seems that some of the interactions between MFPDRHO and ZTRS, and MFPDRHO and WCA should go through WCHB, which highlights the importance of WCHB.

WCHB was another Definitive stakeholder during the whole urban flood management process in Zhuji. As indicated in Network Maps 8.1, 8.2 and 8.3, almost all the links between WCHB and the other three stakeholders were perceived to be strong ones. This can be explained by its critical role during the decision-making process. As the Municipal Flood Control Plan explains, WCHB is the major water

resource management stakeholder at the municipal level, and is responsible for the daily work of MFPDRHs. Besides MFPDRHO, WCHB is in a core position within most of the network maps, and had a relatively higher betweenness centrality when compared to the other two stakeholders. This result also shows that WCHB has a coordination role within this four-stakeholder network.

Major problems come from ZTRS and WCA, with both perceived to be interested in urban flood preparedness, but not seeming to have sufficient power to influence the decision-making processes. Both are non-government bodies. Between these two stakeholders, ZTRS is better linked than WCA, and has been identified as a core stakeholder during flood response and recovery. This may fit with its municipal mass media role, which heightened its urgency requirements during a flood emergency. The relationship between ZTRS and MFPDRHO is almost at a medium level, which means that – with some effect – this relationship could be raised to a higher level.

On the other hand, the salience model classified WCA to be a Dependent stakeholder across urban flood management. This indicates that WCA is not given sufficient power during the flood decision-making processes. Furthermore, the ties between WCA and ZTRS indicate that the relationship between them is not very good. This means that WCA overlooks the influence of ZTRS. If WCA can improve its relationship with ZTRS, it may achieve a higher value in urban flood management in Zhuji.

It is not the intention of this research to predict exactly what might happen between these stakeholders during a flood event; however, the above description of the situation around these four stakeholders indicates how the analysis, when taken to the individual level, can assist researchers in interpreting the situation to help shape future engagement strategies.

8.5 Summary

This chapter presents a cross-period analysis of the municipal stakeholders during urban flood management in Zhuji. As a typical medium-sized city in China which suffers from urban flooding, Zhuji faces significant planning and stakeholder

engagement challenges while implementing integrated urban flood management. On top of the complexity created by the multiple, and different, stakeholders, the urban flood management stakeholder arena is also highly dynamic: stakeholders' power, interests and connections with other stakeholders are variable over time, and can change rapidly before, during and after a flood. On account of this complexity and the dynamism of the urban flood management stakeholder arena, this has been seen as a 'worst-case' scenario for stakeholder engagement.

The overviews of the integrated components, as shown in the network maps, show that the stakeholder arena in each of the three urban flood periods is indeed complex, dynamic and has a wide variety of stakeholders. This is not simply a statement of the obvious, but a confirmation of one of the original assumptions at the start of this thesis. Although the three study period contexts were identified as complex, the application of the multi-dimensional research approach into these stakeholder arenas allowed the stakeholders to be analysed effectively. It also extracted their salience attributes and their positions within the stakeholder networks in relation to each other.

One of the most important outcomes of this integrated approach is that, in the end, it has not been possible to find significant correlations in analysis outcomes between the two components: stakeholder salience and stakeholder networks. This means that each research component might separately be able to simplify the set of stakeholders by making a (one-dimensional) stakeholder classification but, in doing so, the reduction leads to a significant loss of information. The combination of two components – as proposed, applied and demonstrated in this research – shows that a better insight into, and understanding of, each stakeholder is possible by integrating the results. Each component by itself fails to identify important information that is required for successful development of stakeholder engagement approaches, yet the combination of these two components provides significant additional value, and a reliable foundation for future stakeholder engagement.

The three study periods show that a stakeholder arena for urban flood management can indeed be so complex that grouping stakeholders using only one research

component is undesirable, and would provide outcomes of dubious overall utility to the analyst, together with other interested parties. At the same time, this means that engagement practices undertaken cannot be unified and used for all the stakeholders, since not only are all stakeholders different and need to be engaged in different ways, but also not all stakeholders are involved in all three flooding periods and, in fact, might not have to be engaged at all.

Traditional stakeholder analysis does not consider the dynamic environment of a stakeholder arena (Rowley, 2000; Reed et al., 2009; Bryson et al, 2011). In addition, traditional stakeholder analysis has insufficient depth to capture the complexity of both the environment and the stakeholder appropriately.

The main problem with urban flood management lies in the various issues of such management during the different periods of flooding. Generally, urban flood management can be divided into three periods: flood preparedness, flood response and flood recovery. Different stakeholders are particularly involved in a certain period. Each of these stakeholders will also be specifically interested in different issues during these periods. Given the large number of urban flood management issues, it is impossible to classify these stakeholders by their interests in urban flooding. Furthermore, tradition stakeholder analysis usually classifies the stakeholders as government-based organisations, NGOs, voluntary organisations, or public or private sector actors; yet most stakeholders in China in the present context are from a government body. In this case, it does not make sense to use this kind of traditional stakeholder classification. Thus, the integrated research approach – which has been proposed and tested in this study – has provided, through a relatively simple process, the required depth of analysis that is essential for the design and implementation of stakeholder engagement policies and practices.

Furthermore, the proposed research approach, through its special data gathering, can be applied to other government-based research contexts in China. This creates a more effective and successful data collection method for highly hierarchical, government-based scenarios.

9. Discussion of findings

9.1 Introduction

Chapter 8 has presented and analysed the data collected across the three urban flooding periods, without much discussion or comparison with extant literature. This is in line with the traditional practice in scientific reporting, where presentation of results is separated from discussion of their significance in order to preserve objectivity (Perry, 2002). The current chapter discusses the findings emerging from the analysis carried out in the previous chapter.

This chapter is divided into four sections:

1) The first section summarises the findings of current stakeholder analysis methods used at the international level, and discusses them within the context of this research and the extant literature.
2) Section two summarises the findings relating to the focus of stakeholder identification, and discusses them within the context of this and prior research.
3) The third section discusses the findings relating to the application of stakeholder salience analysis in this research, drawing comparisons with the original stakeholder salience model.
4) Section four summarises the findings relating to the stakeholder analysis, drawing comparisons with relevant research that has investigated the relationships between the stakeholders.
5) Section five summaries the findings relating to the proposed two-dimensional stakeholder analysis method, drawing comparisons with relevant research that has used other methods to analyse stakeholders.
6) The final section concludes the chapter and presents a revised research model, illustrating the relationships supported by the empirical data.

9.2 Stakeholder analysis methods in urban flood management

In most countries around the world, the stakeholder environment for urban flood

management is represented as being complex (APFM, 2006; Jha et al., 2012; CORFU, 2014). This complexity comes from the multi-stakeholder arena and the perceived dynamic nature of it. The results displayed in Chapter 8 indicate that the specific political system and traditional urban flood management have created a huge, complex and highly hierarchical urban flood management stakeholder system in China. Compared with large cities, the stakeholder arenas for urban flood management in medium-sized cities are not simplified. The case study provides empirical support that there are still hundreds of stakeholders that will influence and be influenced by urban flood management in a medium-sized city in China.

Furthermore, following the traditional management approach, stakeholders of urban flood management in most developing countries are usually classified as government departments, public sector actors, private sector actors, NGOs, CBOs, voluntary organisations and the community. However, as represented in this case study, almost all flood-related stakeholders in a medium-sized Chinese city are from the municipal government. And each municipal government department has its own unique role during a flooding event. The study has proved that traditional differentiation and categorisation methods are unrealistic and unpractical.

Various researchers have highlighted this complexity in urban flood management (Cheng and Chen, 2011; Kobayashi and Porter, 2012; CORFU, 2014). Yet, as some of these have discussed, the complexity and interconnectedness of the flood-related stakeholders has only been theorised and not empirically tested (Mainardes et al., 2011; Evers et al., 2012; Liu, 2012). For example, as Liu and Sun (2012) presented, the theory lacks the production of knowledge able to explain the complex and multi-faced social relationships between the related stakeholders. In the literature, various models have been created to analyse this complexity – for example, using interest-influence matrices (Lindenberg & Crosby, 1981), cooperation and competition (Freeman, 1984), cooperation and threat (Savage, et al., 1991), salience (Mitchell et al., 1997; Mitchell et al., 2011), and social network analysis (Rowley, 1997, 2000). However, most of these researches only focus on a specific purpose and reveal some aspects, all the while overlooking, or at least not highlighting, others (Reed et al., 2009; Bryson et al., 2011).

Therefore, for such a complex stakeholder arena, various researchers have suggested combining different types of one-dimensional stakeholder analysis methods (Reed et al., 2009; Liu, 2012; Beach, 2013; Kivits, 2013). As Reed et al. (2009) have advised, an integrated stakeholder analysis method should both differentiate between and categorise stakeholders, and investigate relationships between stakeholders. Since then, various researchers have tested multi-dimensional stakeholder analysis methods. For example, Liu and Sun (2012) analyse the stakeholders for water resource management in China, by using both the stakeholder salience model and stakeholder network analysis. And Kivits (2013) combines salience, Q-method and network analysis for the stakeholder analysis of the aviation industry in Australian.

Following on from these researches, this study has applied a multi-dimensional stakeholder analysis approach to explore the complex urban flood management stakeholder arena in a medium-sized Chinese city. The findings of this research have proved that such a multi-dimensional stakeholder analysis approach can create a more nuanced insight into the stakeholder arena for urban flood management. By way of contrast, the proposed stakeholder analysis approach can create multi-dimensional understanding of urban flood management stakeholders, and allows initial problem space to be recast into a more detailed understanding of the problem presented. This improved understanding of the stakeholder arena and the related problem space provides more solid information upon which new stakeholder and community engagement practices can be developed.

9.3 The focus of stakeholder identification

To analyse the stakeholders, various researchers have identified the importance of successful stakeholder identification (Freeman, 1984; Mitchell et al., 1997). In the literature, there are three different approaches to defining stakeholders: descriptive, normative and instrumental (Donaldson and Preston, 1995). Descriptive stakeholder approaches are wide and inclusive and identify stakeholders based on their perceived organisational impact or, conversely, the extent to which they are impacted on by an organisation (Freeman, 1984). From a normative viewpoint, stakeholders are narrowly defined as those with whom the organisation has a contractual or moral

obligation (Donaldson and Preston, 1995). Occupying the middle ground, instrumental approaches are more pragmatic, narrowing the field to those stakeholders whose input is required to achieve specific organisational objectives (Mitchell et al., 1997).

In this project, the findings have provided empirical evidence that urban flood management generally follows an instrumental approach, because of the manner of general flood disaster prevention and mitigation within an urban area. As such, stakeholder identification primarily focuses on a specific group of organisations that are significant because their inputs are required to achieve milestones for urban flood prevention and mitigation. Essentially, in this case, the municipal stakeholders (both government and non-government stakeholders) are the key ones that provide various types of urban flood prevention and mitigation services in a medium-sized Chinese city.

In most countries around the world, stakeholders for urban flood management are identified as being government organisations, public and private sector actors, NGOs, CBOs and the local community (APFM, 2006). In much of the literature, research focuses on non-government bodies, especially the local community (DEFRA, 2005; Pender and Green, 2011; CH2MHILL, 2014). However, nearly all identified stakeholders in the present research project are from the municipal government. The local community does not participate, at least not directly, in urban flood management.

At the same time, the findings of this research also show that the stakeholder environment for urban flood management in a medium-sized Chinese city is highly hierarchical. In other words, the stakeholders not only include the municipal ones, but also national, river-basin, provincial and sub-district organisations. In this case, urban flood management in Zhuji not only includes municipal organisations, but also national, provincial, Shaoxin administration area and sub-district stakeholders. Due to the limited time and scope of this doctoral research, the project mainly focuses on the municipal organisations. This approach was also agreed by most of the key informants from the fieldwork.

Overall, this research project shows that the urban flood management of a medium-sized Chinese city takes an instrumental approach to identifying relevant stakeholders. Thus, municipal organisations, especially municipal government departments, are identified as the dominant stakeholders, due to their significant inputs to urban flood prevention and mitigation in a medium-sized Chinese city. Besides these, stakeholders in the national level, river-basin level, provincial level, administration level and sub-district level may also affect urban flood prevention and mitigation. From a practical perspective, urban flood management needs to be aware that ignoring stakeholders "who do not count" (Derry, 2012) may contribute to positive or negative outcomes. Such stakeholders could include, for example, the members of MFPDRHs at the provincial and Shaoxin administration levels.

9.4 Stakeholder differentiate and categorisation – stakeholder salience model

As illustrated by Reed et al. (2009), the second step of an integrated stakeholder analysis is to differentiate and prioritise the identified stakeholders. In much of the urban flood management literature, stakeholder differentiation is based on natural stakeholder groups. For example, on traditional stakeholder groups, like government-based organisations, public and private sector actors, NGOs, CBOs and the community; and stakeholder groups which are based around management issues like urban planning, urban drainage, urban administration and community engagement. This research has tested both methods. However, the results have shown none of these can explain the complexity of the urban flood management stakeholder environment in a medium-sized Chinese city. As introduced by Kivits (2013), an artificial stakeholder grouping method may be needed to prioritise the stakeholders in such a complex context. This study, therefore, proposed that urban flood management in a medium-sized Chinese city could differentiate and prioritise the stakeholders using the original three-attribute model (power, legitimacy and urgency) of stakeholder salience (Mitchell, et al., 1997).

In the literature, researchers have created some new models of stakeholder salience to fit into specific stakeholder environments. For example, Chen (2003) has

differentiated the stakeholders of a firm by combining the three salience attitudes of initiative, importance and urgency; Beach (2013) has separated the last attitude (urgency) into temporality and criticality to prioritise road construction stakeholders; while Kivits (2013) has analysed aviation stakeholders in Australia by narrowing the salience model down to two attitudes: power and urgency. However, within the context of water resource management and related flood management, various researchers believe that the original model may provide more significant results (APFM, 2006; Reed et al., 2009; Liu, 2012). The present research has found this original salience model – which uses power, legitimacy and urgency – to be more suitable than the others within such a highly hierarchical and power-based stakeholder environment.

The original salience model divided the stakeholders into seven groups: Definitive, Dominant, Dormant, Discretionary, Dependent, Dangerous and Demanding (Mitchell et al., 1997). However, the empirical application of this original salience model to this research shows that only five of the seven stakeholder types are present in the present context. The evidence also shows that there are two fewer categories in use (Dangerous or Demanding) than those originally suggested by Mitchell et al. (1997) and found by Agle et al. (1999). Furthermore, the results found the Dangerous and Demanding stakeholder types to be absent, especially during flood recovery. Both these findings confirm the results of the study by Parent and Deephouse (2007), which found that Mitchell et al.'s (1997) stakeholder salience categories are more limited than previously suggested in the literature. Figure 9.1 shows the stakeholder types found in this study.

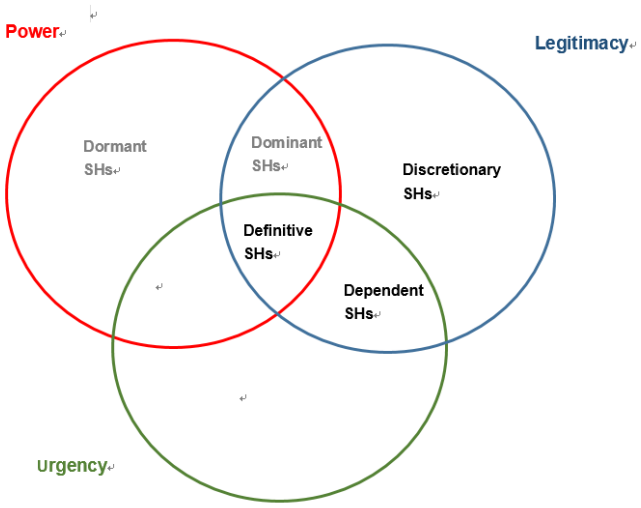


Figure 9-1 Urban flood management stakeholder types in this research project

As presented in Figure 9.1, the absence of the Dangerous (power and urgency) and Demanding (urgency) stakeholder types, and the lack of the Dormant (power) and Dominant (power and legitimacy) stakeholder types, indicate the stakeholder differentiation in this study to be highly dependent on legitimacy. This is because of the specific background of urban flood management in this case. In this research, three categories of power were identified and used from the salience literature: resource power (Jonker and Foster, 2002), formal power (Uhl-Bien et al., 2007) and social power (Frooman, 1999). The results have shown that most stakeholders identified in this research come from a government body. Most of them do have formal power. Furthermore, the nature of tradition urban flood management, which focuses on the issue of emergency response, has highlighted the urgency of stakeholder claims. Thus, neither of these attitudes are likely to provide significant differentiation results in this study. In this research, three types of legitimacy were used: pragmatic, which is linked to self-interest; moral, which is derived from normative approval; and cognitive, which incorporates the concept of 'taken-for-grantedness', all suggested by Suchman (1995). The major problem for the stakeholder environment in this case is that some of the stakeholders (the Discretionary and Dependent types) are not given enough power or attention from the decision-makers, especially during urban flood recovery.

As described by Mitchell et al. (1997), by the level of salience, the seven types of

stakeholders can also be divided into three groups: Definitive stakeholders with all the three attitudes; Expectant stakeholders with two of the three attitudes; and Latent stakeholders with the unique salience attitude. The findings of this research show most of the stakeholders to be Definitive stakeholders. This means that the stakeholder environment for urban flood management in this case is relatively stable. No stakeholder needs to be specifically monitored by the decision-makers during a flooding event. However, this stability provides little incentive for key stakeholders to extend engagement beyond the boundary and build mutually beneficial relationships with those peripheral ones (Svendsen and Laberge, 2005).

To sum up, this study makes an important contribution to the application of stakeholder salience analysis for urban flood management in China. The finding of a discrepancy between the theoretical prediction of this study and the empirical results indicates that there is little empirical support for the expansion of Mitchell et al.'s (1997) stakeholder salience model. Of the seven stakeholder types proposed by Mitchell et al. (1997), only five were present in this research. However, this confirms the nature of urban flood management in China. The results show that the major salience attitude that can differentiate the stakeholders in this case is the legitimacy of stakeholder claims. Thus, further research should pay more attention to different types of legitimacy. Moreover, the case outcomes have also proved that the salience attitudes of a stakeholder do change in such a dynamic stakeholder environment. Further research should not avoid this complexity, but rather should analyse stakeholders during different periods of urban flooding.

9.5 Investigation stakeholder relations – network analysis

A further step in understanding how urban flood management engages with stakeholders is to identify the relationship between stakeholders (Reed et al., 2009). This study therefore used network analysis to explore the interactions between the stakeholders in urban flood management. In the literature, some researchers have suggested using the network environment to keep track of interactions between stakeholders in a dynamic environment (Elias and Cavana, 2000; Rowley, 2000; Liu 2012). However, none provides enough empirical support for the application of

social network analysis in such a multifaceted context. This study used the network analysis method to explore the network environment for urban flood management in a medium-sized Chinese city, comprising the frequency of stakeholder interaction and the quality of information exchange. As a result of empirically testing these networks, this thesis makes important practical contributions on the application of stakeholder network analysis in urban flood management.

In the literature of network analysis, researchers have discussed four distinct levels of analysis for the social network method: ego network, dyadic network, triadic network and complete network perspectives (Knoke and Yang, 2008; Kivits, 2013; Scott, 2013). This research has followed a complete network perspective given its inherent focus on examining the structural relations between all the identified stakeholders of urban flood management. In each period of urban flood management, the study explores a full network with the intent of exploring the relationships between all stakeholders and their influence on urban flood decision-making processes. By using the stakeholder survey and following the sample and boundaries, as defined in Chapter 3, the researcher quantifies both the frequency of interaction and the quality of information exchange between the identified stakeholders. Moreover, three types of network characteristics were used to describe the entire networks and the individual actors in this research project.

First, the network density, average path distance and degree centralisation were used to describe the network as a whole. Although the findings show the interactions and information exchange between the stakeholders to be relatively easy during urban flooding, there were fewer active stakeholders than expected. This was especially the case during the flood recovery period, when only 17.7% of stakeholder relationships were active. This indicates that only a few stakeholders are active for urban flood management resilience and long-term problem solving.

Second, this study applied betweenness centrality and core-periphery analysis to measure the influence of individual stakeholders. Both characteristics highlighted the importance of the MFPDRHO, WCHB, CO, MPD and three major sub-district government offices, and showed their dominant roles in urban flood management.

However, the results of the core-periphery analysis indicated that more than half of the identified stakeholders were isolated in the networks, which also proved stakeholder participation to be ineffective in this case.

Finally, three different levels of tie strength (weak, medium, strong) were used to indicate the level of stakeholder interaction frequency and information exchange quality. As Sobel (2002) introduced, weakly connected stakeholders seem to be more efficient in gaining access to new information, innovative ideas or diverse actors. This research highlighted those weak ties before, during and after flooding. Most of the weak ties exist around MFCDRHO. This indicates that as a dominant actor in urban flood decision-making processes, MFCDRHO seems to ignore the importance of engagement with some other stakeholders, especially those that are non-government based. By comparing both interaction frequency and information exchange quality networks, the results show that there are more weak ties in the information exchange networks than the interaction frequency ones. This means that most stakeholder engagement activities during urban flood management rely on high-frequency, but low-quality, methods – such as information dissemination. In other words, quality relations only exist between a small number of key stakeholders.

To sum up, this study provides significant empirical contributions on the application of the social network analysis method in a complex and dynamic stakeholder environment, such as urban flood management. By using social network analysis as an approach, this study explores and presents the structural relations between urban flood management stakeholders in a medium-sized Chinese city. The results show that the stakeholder engagement for urban flood management in a medium-sized Chinese city is not as effective as expected. Although nearly 50 stakeholders were identified as participating in the decision-making process, only few were active in terms of long-term problem solving. Thus, dominant stakeholders like MFCDRHO should pay more attention to the effective involvement of peripheral stakeholders, especially those from non-government bodies.

9.6 The combination of stakeholder salience and social network analysis

Following the integrated stakeholder analysis framework which has been suggested by Reed et al. (2013), this study provides significant empirical contributions on how to implement such a framework in a complex, dynamic and interconnected stakeholder environment, such as urban flood management in China. The research shows that both the stakeholder salience and network analyses provide useful and reliable results in exploring the stakeholder arena for urban flood management in a medium-sized Chinese city.

As the major stakeholder differentiation method, the stakeholder salience analysis presents the levels of power, legitimacy and urgency stakeholders attribute to urban flood management issues. It clearly identified which stakeholders should be included and excluded in each period of urban flooding. However, only five of the seven stakeholder salience groups were found in this study. Neither power nor urgency provide significant priority results in this stakeholder environment. In other words, the research suggests that stakeholder differentiation for urban flood management in a medium-sized Chinese city is highly dependent on the second salience attitude, legitimacy. However, it still provides important inspiration to the creation and implementation of future stakeholder engagement practices and policies: more salient stakeholders will receive different attention compared to less salient ones. The results show that more salient stakeholders are likely to: i) be engaged more frequently; ii) receive higher-quality information; iii) move past information sharing into collaborative planning; and iv) participate longer in an urban flood event.

At the same time, the stakeholder network analysis presents an additional dimension to the perceived influence of a stakeholder, by computing betweenness centrality and core-periphery analysis. The position within the network brings with it a different kind of measurement of influence, which is not shown using the stakeholder salience approach. In addition, network analysis highlights the many relations that exist between stakeholders, and shows on what level stakeholders interact and how well the relationship is perceived. This analysis has found that there are no significant positive correlations between stakeholder interaction frequency and information exchange quality. This indicates that most stakeholder engagement in this context may be based on one-dimensional approaches like information dissemination.

Furthermore, as discussed by Beach (2013), there is a potential linkage between the various combinations of the stakeholder salience attributes and the structural relations between the stakeholders. Therefore, this research empirically tested this proposition by analysing the relationship between the stakeholders' salience attributes and their structural relations within interaction frequency, as well as the information exchange quality networks. However, the empirical evidence supports the results of the study by Kivits (2013), which found there to be no significant correlation between them. In other words, the position within the network brings with it a different kind of measurement of influence, which is not indicated using the stakeholder salience approach. This means that although each stakeholder analysis method may separately be able to simplify the set of stakeholders by making a (one-dimensional) stakeholder classification, by so doing, the reduction leads to a significant loss of information.

The combination of two different stakeholder analysis methods, as proposed, applied and demonstrated in this research, shows that a better insight into, and understanding of, each stakeholder is possible by integrating the results. Each method by itself fails to identify important information that is required for successful development of stakeholder engagement approaches; yet combining both these methods together provides significant additional value and a reliable foundation for future stakeholder engagement.

9.7 Conclusion

In the context of China, some decision-makers believe that urban flood management should consider the aspirations of all participants, and include as many relevant stakeholders as they can. Thus, they have promoted various stakeholder engagement projects to stimulate stakeholder participation, such as 'A Total of Five Water Treatment' and 'Building of Grassroots Flood Control System'. However, some researchers (e.g. Philips, 1997; Trevino and Weaver, 1999; Mainardes et al., 2011) generally oppose, or are at least critical of, this view. These authors perceive this to be a problem, since it is impossible to include all flood-related stakeholders and such a complex and dynamic stakeholder environment will seldom lead to unanimous

agreement (Mainardes et al., 2011). Therefore, they have highlighted the importance of stakeholder classification and priorities before applying any engagement plans.

In fact, there is no commonly accepted stakeholder analysis practice available to deal with a complex and dynamic stakeholder environment like urban flood management, although some researchers (Key, 1999; Reed et al., 2009; Mainardes et al., 2011) recommend investing in a multi-dimensional stakeholder analysis approach. Therefore, this study has set out to integrate two distinct methods, as suggested by Reed et al. (2013) – these being the stakeholder salience model and social network analysis – to create a better-integrated stakeholder analysis. The findings of this research indicate that a true stakeholder categorisation is not possible, and should not even be desired in such a complex, dynamic and interconnected environment. The results show that stakeholders in urban flood management should be identified as unique groups. They can overlap and be grouped following each of the individual methods, but could then be completely different if another approach is followed.

These methods, when combined, do not generate a single categorisation, but rather allow categorisation of the stakeholders on multiple levels by using several variables. This ability advances traditional thinking, according to which stakeholders are often considered from a rigid, fixed categorisation, to a more flexible grouping that depends closely on the context. The main goal of creating the desired categorisation was to assist in the development of future stakeholder engagement policies and strategies. The data from this combined stakeholder analysis therefore serves as an extensive source of information. From this information and subsequent analysis, future stakeholder engagement policies and strategies can be developed.

At the end of this research project, the research outcomes for both the salience model and network analysis were collated and presented on the stakeholder network maps. These maps display stakeholder-relevant information, as discussed in the each of the flooding period studies. The stakeholder maps allow differentiation of the stakeholders by salience, based on Mitchell et al.'s (1997) research. The five salience group types (Definitive, Dormant, Discretionary, Dominant and Dependent) indicate whether a stakeholder is perceived to have the power to influence the urban flood

decision-making process and whether a stakeholder's claims are perceived to be legitimate and urgent.

From the social network perspective, the maps differentiate stakeholders based on their position in a network, such as their core-periphery position (Rombeach, 2014), and their level of betweenness centrality (Borgatti et al., 2002). The core-periphery model analyses the network position of the stakeholder, by determining which stakeholders are part of a densely connected core and which are part of a sparsely connected periphery. Core stakeholders are also reasonably well connected to peripheral nodes, but the latter are not well connected to the core or to each other (Rombeach, 2014). Betweenness centrality describes the extent to which a stakeholder lies on paths between other ones. Within a network, a stakeholder with a high betweenness centrality indicates that it links across disconnected segments of the network and has the most holistic view of the network activities. A high betweenness centrality also represents the ability to mobilise and diffuse information to the other members within the network. By contrast, a stakeholder with a low betweenness centrality can feel constrained or torn between two or more positions (Hoppe and Reinelt, 2010). In addition, the network maps display the directly visible relations between stakeholders, which include both interaction frequency and information exchange quality.

Overall, by combing both the stakeholder salience model and social network analysis, this research not only provides an in-depth database of information, but also allows this information to be distributed visually. Following the commonly accepted stakeholder analysis framework, which is proposed by Reed et al. (2013), this research project overarches the models identified in the literature. Therefore, this two-combined stakeholder analysis method should be considered as the most functional and practical model currently available in the context of urban flood management in China.

10. Conclusions and applications

10.1 Introduction

Chapter 9 has summarised and discussed the main findings of this study. By using Zhuji as a single case, this research has examined the viability and applicability of this new research framework – before, during and after flooding – and has developed a new way to classify and analyse the relevant stakeholders within a Chinese medium-sized city context. This final chapter concludes the key findings based on the research questions and introduces the major contributions of this thesis on stakeholder theory in urban flood management and practices in China. To do so, this chapter is divided into four main sections. It starts with the conclusions to the research aim and the five specific research objectives. The second section demonstrates the theoretical contributions and the contributions to practice and policy, suggesting how these can stimulate or improve stakeholder analysis, stakeholder engagement and stakeholder management for urban flood management in a typical medium-sized Chinese city. Following on, the limitations of the research are discussed. Finally, a personal appreciation of the research reflecting on the future studies is set out.

10.2 Conclusions about the research questions

This research project aims to improve stakeholder participation in urban flood management. Based on the knowledge gaps identified in the literature, the main research question was broken down into five sub-research questions which formed the basis for data collection. As a way of summing up the entire research effort, this section draws conclusions on the five sub-research questions and the main research question.

Specific research objective 1: *What existing stakeholder analysis methods worldwide can be adapted to the urban flood management of a medium-sized Chinese city?*

The findings from this research show that the stakeholder environment for urban flood management in medium-sized cities of China is indeed complex and dynamic.

One-dimensional stakeholder analysis methods, such as interest-influence matrices (Lindenberg & Crosby, 1981), cooperation and competition (Freeman, 1984), cooperation and threat (Savage, et al., 1991), salience (Mitchell et al., 1997; Mitchell et al., 2011) and social network analysis (Rowley, 1997; 2000), as discussed in this study, have proved to be an over-simplification of reality and do not provide sufficient information. More importantly, the findings also suggested the use of a multi-dimensional stakeholder analysis approach, which followed the commonly accepted stakeholder analysis framework – stakeholder identification, stakeholder differentiation and categorisation, and stakeholder relationship analysis – to create a more nuanced insight into the stakeholder arena for urban flood management.

Specific research objective 2: *What is the focus of stakeholder identification during the urban flood management of a medium-sized Chinese city?*

The findings of the research suggest that the urban flood management of a medium-sized Chinese city should takes an instrumental approach to identify the relevant stakeholders. Thus, municipal organisations, especially municipal government departments, are identified as the dominant stakeholders due to their significant inputs to urban flood prevention and mitigation in a medium-sized Chinese city.

Specific research objective 3: *How can the stakeholders of urban flood management in a medium-sized Chinese city be differentiated and categorised?*

The findings of this research show that traditional stakeholder differentiation – based on the natural stakeholder groups, like government-based organisations, the public and private sectors, NGOs, CBOs and the community, and the stakeholder groups that are based on management issues like urban planning, urban drainage, urban administration and community engagement – cannot effectively categorise the stakeholders for urban flood management. More importantly, the findings suggest that the use of an artificial stakeholder grouping method should be applied in urban flood management to prioritise stakeholders, such as the stakeholder salience model.

Furthermore, the finding of a discrepancy between the theoretical predictions for this

study and the empirical results also indicates that there is little empirical support for the expansion of Mitchell et al.'s (1997) stakeholder salience model. Of the seven stakeholder types proposed by Mitchell et al. (1997), only five were present in this research. However, this does confirm the nature of urban flood management in China. The results show that the major salience attitude that can differentiate the stakeholders in this case is the legitimacy of stakeholder claims. Thus, the findings of this research suggest that more attention should be paid to different types of legitimacy. Moreover, the case outcomes have also proved that the salience attitudes of stakeholders tend to change in such a dynamic stakeholder environment. Further research should not avoid this complexity, but should rather analyse stakeholders during different periods of urban flooding.

Specific research objective 4: *How can the structural relations between the stakeholders of urban flood management in a typical medium-sized Chinese city be explored?*

The findings of this research suggest the use of the social network analysis method, and following a complete network perspective to investigate the structural relations between stakeholders in a complex and dynamic stakeholder environment such as urban flood management. Furthermore, three types of network characteristics should be used to describe the entirety of the networks and the individual actors in urban flood management. These are the use of network density, average path distance and degree centralisation to describe the network; the use of betweenness centrality and core-periphery analysis to measure the influence of individual stakeholders; and the use of strength of ties to indicate the relationship quality between the stakeholders.

Specific research objective 5: *To what extent can a multi-dimensional stakeholder analysis framework explore the current stakeholder arena of urban flood management in a medium-sized Chinese city?*

The findings of this research suggested combining both stakeholder salience and networking analysis to create a multi-dimensional stakeholder analysis framework to explore the stakeholder arena for urban flood management in a medium-sized Chinese city. After identifying all potential stakeholders, the stakeholder salience

model is suggested to differentiate and categorise them. By using such an artificial stakeholder grouping method, it is possible to prioritise the stakeholders based on their power to influence urban flood management, and the legitimacy and urgency of their claims. At the same time, stakeholder network analysis is suggested to present an additional dimension to explore the relationships between stakeholders.

The findings also suggest that there is no significant correlation between the stakeholder salience groups and the structural relations between them. This indicates that either the stakeholder salience model or network analysis by itself fails to provide sufficient information for successful development of the detailed stakeholder engagement strategies. However, combining both these methods together provides significant additional value and a reliable foundation for future stakeholder engagement.

Main research question: *How can a multi-dimensional stakeholder analysis approach inform the stakeholder analysis of urban flood management in a typical medium-sized Chinese city, so that stakeholders can be effectively categorised?*

Effective stakeholder analysis is commonly recognised to be an important step before development of detailed stakeholder engagement strategies. Based on the foregoing conclusions about each sub-research question, a firm conclusion can be made about the two-dimensional stakeholder analysis method proposed in this research – i.e. that it can create a more nuanced insight than the current one-dimensional stakeholder analysis approaches into the stakeholder arena for urban flood management.

The findings of this research also suggest that this two-dimensional stakeholder analysis can enhance the data beyond one-dimensional visual representations to create a dynamic and interactive process. Such enhancement not only better assists policy-makers in developing new and improved engagement practices, but also allows engagement practitioners to educate stakeholders and interactively improve understanding of the situation among them. In turn, this understanding is assumed to facilitate collaborative problem solving and improve stakeholder participation in urban flood management.

10.3 Conclusions to knowledge

This thesis provides significant theoretical, practice and policy contributions to the knowledge on stakeholder analysis and stakeholder engagement for urban flood management in a medium-sized Chinese city. These contributions are discussed in the following three sections, beginning with contributions to theory.

10.3.1 Contributions to theory

First, the research provides empirical evidence to show that traditional one-dimensional stakeholder analysis methods cannot provide in-depth understanding of a complex and dynamic stakeholder arena, such as urban flood management. By the way of contrast, the proposed stakeholder analysis approach, which combined both of stakeholder salience and network analysis, can create a multi-dimensional understanding of urban flood management stakeholders and allows the initial problem space to be recast into a more detailed or more nuanced understanding of the problems presented. This improved understanding of the stakeholder arena and the related problem space provides a more solid information foundation upon which new stakeholder and community engagement practices can be developed.

Second, the literature review of stakeholder salience has proposed various types of stakeholder salience attitudes. For example: power, legitimacy, and urgency (Mitchell et al., 1997; Reed et al., 2009; Liu, 2012); initiative, importance and urgency (Chen, 2003); power, legitimacy, temporality and criticality (Beach, 2013); and power and urgency (Kivits, 2013). Within the context of water resource management, several researchers believe that the original stakeholder salience model (power, legitimacy and urgency) may provide more significant results (APFM, 2006; Reed et al., 2009; Liu, 2012). Therefore, the present research adapted this original stakeholder salience model to differentiate and categorise the relevant urban flood management stakeholders in China. However, only five of the total seven stakeholder salience groups were found in this research project. Neither the Dangerous nor the Demanding stakeholder groups were found to be present. This indicates that the

ordinal stakeholder salience model experiences limitations in practice. The stakeholder arena for urban flood management in a medium-sized Chinese city is highly dependent on legitimacy.

Third, the literature has discussed that there is a potential correlation between stakeholders' salience attributes and the structural relations between them (Beach, 2013). However, the findings in this thesis have provided empirical evidence to indicate that there is no significant correlation between them. This supports Kivits' (2013) argument.

Finally, this thesis contributes additional evidence to stakeholder engagement theory by showing that there is a linkage between frequency of engagement (Leach et al., 2005) and the quality of information exchange.

10.3.2 Contributions to practice

In the introduction chapter, it was postulated that the Chinese government has recognised the importance of an in-depth stakeholder analysis process before designing and approaching detailed stakeholder engagement strategies for urban flood management. However, there is no commonly accepted stakeholder analysis practice available for a complex, dynamic and interconnected environment such as that of urban flood management. One of the reasons identified is the fact that there are so many variables. Each of the analysis methods identified only examines a small and different subset of what constitutes 'the stakeholder'. Hence, there is a lack of uniformity in both the literature and practice on methods and key measurements.

In the literature review, two major stakeholder analysis methods were identified, these being the stakeholder salience model and stakeholder network analysis. The introduction of the two-dimensional stakeholder analysis is the first known attempt to unify these existing approaches. This approach is specifically useful for urban flood management in China. The following two examples show how this much more holistic and integrated approach overcomes the inadequacies of using a one-dimensional approach.

A stakeholder analysis process focusing on only one of these two methods – as, for example, Mitchell et al.'s (1997) frequently used salience framework using power, legitimacy and urgency does – consistently ignores the relationships between stakeholders. During the three urban flood management periods in Zhuji, Mitchell et al.'s salience analysis identified the Housing and Construction Bureau (HCB) as a definitive stakeholder. If left at that level of analysis, the HCB could be regarded as one of the most important stakeholders during an urban flooding event. From the network perspective, however, it is discovered that the HCB has relatively low betweenness centrality and a peripheral position in the urban flood recovery network. This indicates that HCB is not well connected after a flood takes place. In other words, the HCB is not an important stakeholder during the urban flood response period. The conclusion garnered from combing these results is: 1) that the HCB should be brought closer to the flood recovery network, and 2) that it would probably be productive for the Municipal Flood Control and Drought Relief Headquarters (MFCDRHs) to improve relations with the HCB during flood recovery – for a stakeholder kept well informed through a good relationship is less likely to cause significant trouble in the future, as opposed to an uninformed stakeholder that might hold misconceptions about future developments.

A second example is afforded by the Municipal Flood Control and Drought Relief Headquarters Office (MFCDRHO). From a salience perspective, the MFCDRHO is a definitive stakeholder during the whole urban flood management period. From a network perspective, the MFCDRHO also holds a core position and the highest betweenness centrality. This highlights that MFCDRHO is the most important stakeholder during urban flood management in Zhuji. However, numerous weak ties exist around MFCDRHO, indicating that many of the MFCDRHO's relationships are poor. In other words, the MFCDRHO should improve relations with other stakeholders to improve long-term decision-making.

When implementing an integrated urban flood management approach in medium-sized cities, the pressing question for decision-makers in China is how to deal with the relevant stakeholders. The first step to answering that question is to have a stakeholder analysis method to hand that can help decision-makers to identify

effectively and efficiently who their stakeholders are and what they think about urban flood management. In most medium-sized cities in China, many stakeholders can influence and be influenced by urban flood management. Most of these come from the multi-layered and highly hierarchal government system. Therefore, it is necessary to create a more nuanced and directed approach that allows decision-makers to deal with urban flood management stakeholders in a more targeted fashion, e.g., allowing for individually specified stakeholder engagement approaches, a matter which, of course, is beyond the remit of this thesis.

An additional problem with respect to current stakeholder engagement practices in urban flood management is the lack of a suitable platform by an authority with input from the actual stakeholders. Such analysis is performed without input from the stakeholders, so when it is presented to them, it is likely to invite scepticism and criticism. This scepticism towards the analysis, in turn, results in a reduced willingness on the part of the stakeholders to cooperate in further discussions.

The research presented creates a platform that uses active input from all the stakeholders in the development stage, and afterwards allows all the stakeholders to examine all the information. This ensures that the stakeholders understand how the information has been gathered and used. The method, by its acceptance of the decision-maker as being part of a network of stakeholders, rather than simply the central component, is more likely to obtain cooperation from the stakeholders. This is because the stakeholders that are included have the potential to develop a sense of ownership of the analysis, and because the results stemming from it will be useful to all the stakeholders identified, and not just the decision-maker (as would be the case with a more traditional approach to stakeholder analysis). The in-depth information provided thus helps stakeholders to have a better-informed understanding of the positions they have in the stakeholder network, and their relationships with other stakeholders.

10.3.3 Contributions to policy

Beyond operational issues, the findings of this research also have implications for policy-makers in urban flood management in a medium-sized Chinese city. First, the research demonstrates how good understanding of stakeholders and their structural relations provides useful insights into stakeholder engagement for urban flood management. Such knowledge can inform decisions on the development of detailed stakeholder engagement strategies and improve current stakeholder participation in urban flood management in China.

Second, the qualitative and quantitative evidence gathered in this research suggests that decision-makers for urban flood management in China, especially from the Flood Control and Drought Relief Headquarters, should identify the 'real' key stakeholders during the urban flood management process. Currently, most of the stakeholder identification process is based on experience. This leads to too many government departments involved, and fewer involved from industry and non-government bodies. Thus, this study suggests that decision-makers should stop including more stakeholders, but should instead be choosing the right ones, especially from non-government bodies.

Third, the findings of this study also suggest that decision-makers should pay more attention to urban flood preparedness. According to the network data collected in this research, there are only a few stakeholders active during the urban flood preparedness period. However, urban flood prevention and preparedness is usually considered to be the most important stage among the three flood management periods.

Finally, this study suggests that government departments and institutions should hand over their power in urban flood management to non-government bodies, such as the Water Conservancy Association. Both qualitative and quantitative evidence collected in this research illustrate the fact that strong government influence can obstruct the development of stakeholders from non-government groups.

10.4 Limitations of the research

Although this research was carefully designed and implemented, there were three main unavoidable limitations to it.

The first limitation came from the length of the timeframe inherent in doctoral research. Although this research followed a robust framework, it could only represent the situation of urban flood management networks at that moment in time. Not only the stakeholder environment, but also the whole urban flood management system, are dynamic. Stakeholder roles and functions, as well as the relationships between them, could change over time. Therefore, it is important to provide a continuous assessment of the stakeholders.

Second, due to the limitations of the snowball sampling method used in data collection, some key stakeholders, such as industries or universities, were not identified in this research.

Each data collection method has its own limitations. To minimise these, the study used a mixed-method strategy. The major advantage of this strategy is that it allows data triangulation and validation.

10.5 Future directions for the research

This thesis proposed an integrated stakeholder analysis framework in a typical Chinese medium-sized city – Zhuji – and it was empirically demonstrated to work for urban flood management in that typical medium-sized city in China. The direct way forward would be to apply this research to other Chinese cities, those with similar or different sizes. At the same time, this research could also possibly be applied to other infrastructure areas, such as water resource management, environmental management and construction management. A widespread application would inform the validation of a generalisation to other paradigms.

In addition, this research has mentioned the importance of the empirical link between stakeholder analysis and stakeholder engagement. Therefore, another future direction for this research would be to investigate the empirical application of this proposed

stakeholder analysis framework, especially the link between this model and the potential stakeholder engagement strategies.

Furthermore, this research has created a platform to look at the stakeholder arena with appropriate neutrality. Such a platform could be developed more visible using technology such as the iPad. Decision-makers or other stakeholders would then be able to identify and monitor their key stakeholders, and to improve their stakeholder engagement strategies.

References and Bibliography

Aaltonen, K., (2010). *Stakeholder managmeent in international projects*, s.l.: doctoral dissertation.

Abbott, J., Davies, P. and Simkins, P., (2013). Creating water sensitive places – scoping the potential for Water Sensitive Urban Design in the UK. *Ciria*, pp.55-61.

Abell, P., (2009). A Case for Cases: Comparative Narratives in Sociological Explanation. *Sociological Methods and Research*, 38(1), pp.38-70.

Achterkamp, M. and Vos, J., (2007). Critically Identifying Stakeholders. *Systems Research and Behavioral Science,* 24(1), pp.3-14.

Agle, B., Mitchell, R. and Sonnenfeld, J., (1999). Who Matters to CEOs? An Investigation of Stakeholder Attributes and Salience, Corporate Performance, and CEO Values. *The Academy of Management Journal,* 42(5), pp.507-525.

Agle, B.R., Donaldson, T., Freeman, R.E., Jensen, M.C., Mitchell, R.K., &Wood, D.J. (2008). *Dialogue: Toward Superior Stakeholder Theory,* s.l.: s.n.

Aid, A., (2006). *Unjust Water – Climate change, flooding and the protection of poor urban communities: experiences from six African cities.* London, UK: Action Aid Report.

Alphen, J.V. and Beek, E.V., (2005). From flood defence to flood mangement – prerequisites for sustainable flood management. In: J.V. Alphen, E.V. Beek and M. Taal (eds.), *Flood, from defence to management.* London: Taylor and Francis Group plc, pp.11-18.

Amaeshi, K.M., & Crane, A. (2006). Stakeholder Engagement: A Mechanism for Sustainable Aviation. *Corporate Social Responsibility and Environmental Management*, 13(5), p.245260.

Andjelkovic, I., (2001). *Guidelines on no-structural measures in urban flood managmeent.* Paris: UN Educational, Scientific and Cultural Organisation (UNESCO).

Andriof, J. and Waddock, S., (2002). Unfolding Stakeholder Engagement. In: J. Andriof, S. Waddock, B. Husted and S. Rahman (eds.), *Unfolding Stakeholder Thinking: Theory, Responsibility and Engagement.* Sheffield: Greenleaf Publishing, pp.19-42.

Ansell, C., (2003). Community Embeddedness and Collaborative Governance in the San Francisco Bay Area Environmental Movement. In M. Diani & D. McAdam (eds.) *Social Movements and Networks: Relational Approaches to Collective Action.* New York: Oxford University Press, p.123-146.

Anthropologie du présent, (2011a). *Anthropologie du présent.* [Online] Available at: http://berthoalain.com/2011/01/15/emeute-du-logement-a-hangzhou-%E6%9D%AD%E5%B7%9E-zhejiang-%E6%B5%99%E6%B1%9F-8-janvier-2011/ [accessed 11 June 2013].

Anthropologie du présent, (2011b). *Riot housing in Hangzhou.* [Online] Available at: http://berthoalain.com/2011/01/15/emeute-du-logement-a-hangzhou-%E6%9D%AD%E5%B7%9E-zhejiang-%E6%B5%99%E6%B1%9F-8-janvier-2011/ [accessed 11 June 2013].

Apel, H., Kreibich, H., Aronica, G. and Thieken, A., (2009). Flood risk analyses – how detailed do we need to be? *Natural Hazards*, 49(1), pp.79-98.

Associated Programme on Flood Management (APFM), (2004). *Integrated Flood Management – Concept Paper.* Geneva, Switzerland: World Meteorological Organisation.

APFM, (2006). *Social Aspects and Stakeholder Involvement in Integrated Flood Management,* Geneva, Switzerland: World Meteorological Organisation.

Arksey, H. and Knight, P., (1999). *Interviewing for Social Scientists.* London: Sage.

Arksey, H. and Malley, L.O., (2005). Scoping Studies: Towards a Methodological Framework. *Social Research Methodology,* Vol. 8, pp.19-32.

Arnstein, S.R., (1969). A Ladder of Citizen Participation. *AIP Journal,* 35(4), pp.216-224.

Ashley, R., Blanksby, J., Chapman, J. and Zhou, J., (2007). Towards Integrated Approaches to Reduce Flood Risk in Urban Area. In: R. Ashley, A. Vassilopoulos, E. Pasche, & S. Garvin (eds.), *Advances in Urban Flood Management.* London: Taylor and Francis, pp.415-432.

Babbie, E.R., (1973). *Survey Research Methods,* Belmont, US: Wadsworth Publishing Company Inc.

Barry, J. and Proops, J., (1999). Seeking Sustainability Discourses with Q methodology. *Ecological Economics,* 28(3), pp.337-345.

Beach, S., (2009). Who or What Decides how Stakeholders are Optimally Engaged by Governance Networks Delivering Public Outcomes? Paper presented at the International Research Society for Public Management XIII, Copenhagen: s.n.

Beach, S., (2013). *Stakeholder Engagement by Government Networks,* Queensland: Queensland University of Technology.

Biggs, S. and Matsaert, H., (1999). An Actor-oriented Approach for Strengthening Research and Development Capabilities in National Resource Systems. *Public Administration and Development,* 19(3), pp.231-262.

Blaxter, L., Hughes, C. and Tight, M., (2006). *How to research.* New York: RefineCatch Limited.

Blind, P.K., (2006). *Building Trust in Government in the Twenty First Century: Review of Literature and Emerging Issues.* Vienna, Austria: UN Department of Economic and Social Affairs (UNDESA).

Borgatti, S.P., Everett, M.G. and Freeman, L.C., (2002). *UCINET 6 version 6.232: Software for Social Network Analysis,* Natick: Analytic Technologies.

Bourner, T., (1996). The research process: four steps to success. In: T. Greenfield (ed.), *Research methods: guidance for postgraduates.* London: Arnold.

Brace, L., (2004). *Questionnaire Design.* s.l.: Kogan Page.

Bradshaw, T. K., (2000). Complex Community Development Projects: Collaboration, Comprehensive Programs, and Community Coalitions in Complex Society. *Community Development Journal,* Vol. 35, pp.133-145.

Brand, R. and Gaffikin, F., (2007). Collaborative Planning in an Uncollaborative World. *PlanningTheory,* 6(3), pp.282-313.

Brown, R.R., (2005). Impediments to Integrated Urban Stormwater Management: The Need for Institutional Reform. *Environmental Management,* 36(3), pp.455-468.

Brown, R., Farrelly, M. and Keath, N., (2009). Practitioner Perceptions of Social and Institutional Barriers to Advancing a Diverse Water Source Approach in Australia. *Water Resources Development,* 25(1), pp.15-28.

Brugha, R. and Zsuzsa, V., (2000). Stakeholder Analysis: A Review. *Health Policy and Planning,* 15(3), pp.239-246.

Bryson, J.M., Patton, M.Q. and Bowman, R., (2011). Working with Evaluation Stakeholders: A Rationale, Step-wise Approach and Toolkit. *Evaluation and Program Planning,* Vol. 34, pp.1-12.

Bunn, M., Savage, G. and Holloway, B., (2002). Stakeholder Analysis for Multi-Sector innovations. *Journal of Business and Industrial Marketing,* 17(2/3), pp.181-203.

Burrell, G. and Morgan, G., (1979). *Sociological Paradigms and Organisational Analysis.* Hampshire: Ashgate.

Caniato, M., Vaccari, M., Visvanathan, C. and Zurbrugg, C., (2014). Using social network and stakeholder analysis to evaluate infectious waste management: A step towards a holistic assessment. *Waste Management,* pp.938-951.

Cap-Net, (2011). *Intergrated Urban Flood Management,* Pretoria: International Network for Capacity Building in Integrated Water Resources Management.

Caspar, R. and Peytcheva, E., (2011). *Pretesting.* s.l.: s.n.

Central Intelligence Agency, (2010). *The World Factbook.* [Online] Available at: https://www.cia.gov/library/publications/the-world-factbook/fields/2212.html [accessed 6 September 2013].

CH2MHILL, (2014). *Taihu Basin Climate Change and Flood Risk Management.* [Online] Available at: www.ch2m.com/corporate/water/climate-risk-resilience/flood-risk-china.asp#.VGf1Y_QW18F [accessed 23 October 2014].

Chalmers, A.F., (1999). Theories as structures I: Kuhn's paradigms. In: Milton Keynes (eds), *What is this thing called science?* Maidenhead, Berkshire: Open University Press, pp.104-109.

Chanan, A. and Woods, P., (2005). Introducing total water cycle management in Sydney: A Kogarah Council Initiative. *Desalination,* Vol. 187, pp.11-16.

Chen, H., (2003). *Theoretical and Empirical Research on Stakeholders of the Firm,* Hangzhou: Zhejiang University of China.

Cheng, X., (2006). *Recent progress in flood management in China.* Bejing: Wiley InterScience.

Cheng, X., (2014). *Evolution of Urban Pluvial Flood Risks and Approaches to Urban Flood Resilience.* Hong Kong: DSD.

Cheng, W. and Chen, J., (2011). Future Flood Risk and Adaptive Framework for Integrated Flood Management. *Journal of Yangtz River Scientific Research Institute,* 28(12), pp.93-97.

Cheng, X.T., Evans, E.P., Wu, H.Y., Thorne, C.R., Han, S., Simm, J.D. and Hall, J.W. (2013). A framework for long-term scenario analysis in the Taihu Basin, China. *Journal of Flood Risk Management,* 6(1), pp.3-13.

Cheong, F. and Cheong, C., (2011). *Social Media Data Mining: A Social Network Analysis of Tweets During the 2010-2011 Australian Floods.* s.l.: PACIS.

China Institute for Water Resources and Hydropower Research, (2010). *People's Republic of China: Implementing the National Flood Management Strategy.* Beijing: Asian Development Bank.

Christoplos, I., (2008). *Incentives and Constraints to Climate Change Adaption and Disaster Risk Reduction – a Local Perspective.* s.l.: Commission on Climate Change and Development, available at: http://www.ccdcommission.org/.

ClimChAlp, (2008). *Changement climatique, impact.* s.l.: ClimChAlp.

Cole, R.E., (1998). Introduction. In: *California Management Review* 45, pp.15-21.

Coleman, J., (1990). *Foundations of Social Theory.* Cambridge: Harvard University Press.

Committee for Economic Development of Small and Medium Sized Cities of the China Society of Urban Economy, (2010). *Green Book of Small and Medium-Sized Cities.* Beijing: Social Sciences Academic Press (China#).

Collaborative Research on Flood Resilience in Urban areas, (2014). *Flood Risk Management in China.* Beijing: s.n.

Cornell, S., (2006). *Improving stakeholder engagement in flood risk management decision making and delivery.* Bristol: Environmental Agency.

Costanza, R., Gar, A., Daly, H.E., Joshua, F., Carol, F., Tim, J., Ida, K., Juliet, S. and Peter, V. (2000). Managing Our Environmetnal Portfolio. *BioScience*, 50(2000), pp.149-155.

Creswell, J.W., (2003). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Crocker, J., (2007). *Organisational Arrangements for the Provision of Cross-Boundary Transport Infrastructure and Services.* Georgia: Georgia Institute of Technology.

Cui, P., Han, Y. and Ge, Y., (2013). *China Strategy of flood mitigation: from control to management.* Beijing: China Journal Electronic Publishing House.

Dale, A. P., & Lane, M. B. (1994). Strategic Perspectives Analysis: A Procedure for Participatory and Political Social Impact Assessment. Society and Natural Resources, 7, 253-267.

Dawson, R.J., Speight, L., Hall, J.W., Djordjevic, S., Savic, D. and Leandro, J. (2008). Attribution of flood risk in urban areas. *Journal of Hydroinformatics*, pp.275-288.

De Bruijin, H. and ten Heuvelhof, E., (2004). Process Arrangements for Variety, Retention, and Selection. *Knowledge, Technology, and Policy,* 16(4), pp.91-198.

De Kok, I.M., Habbema, J.D., Van Rosmalen, J. and Van Ballegooijen, M., (2011). Would the effect of HPV vaccination on non-cervical HPV-positive cancers make the difference for its cost-effectiveness. *Eur Journal of Cancer,* 47(3), pp.428-435.

De Lopez, T., (2001). Stakeholder Management for Conservation Projects: A Case Study of Ream National Park, Cambodia. *Environmental Management,* 23(5), pp.47-60.

Deng, Y., (2012). *Status of China's Flood Risk Management and case studies.* Beijing: The Office of State Flood Control and Drought Relief Headquarters P.R. China.

Denscombe, M., (2001). *The good research guide: for small-scale social research projects.* Buckingham, UK: Open University Press.

Denzin, N.K. and Lincoln, Y.S., (1994). *Handbook of Qualitative Research.* Thousand Oaks, CA: Sage Publications.

Department for Environment, Food and Rural Affairs (DEFRA), (2005). *Managing flood risk through effective stakeholder engagement.* Bristol: Environment Agency.

Department for Environment, Food & Rural Affairs(2010). Climate Change Plan. [Online] Available at: http://www.defra.gov.uk/environment/climate/index.htm [accessed 24 September 2013].

Department of Water Resources of Zhejiang Province, (2003). *Water Resources in Zhejiang.* [Online] Available at: slt.zj.gov.cn [accessed 23 September 2013].

Department of Water Resources of Zhejiang, (2008). *Department of Water Resources of Zhejiang.* [Online] Available at: http://slt.zj.gov.cn/ [accessed 11 June 2013].

Derry, R. (2012). Reclaiming Marginalised Stakeholders. Journal of Business Ethics, 111(2), 253-264. doi: 10.1007/s10551-012-1205-x.

Donaldson, T., (2002). The Stakeholder Revolution and the Clarkson Principles. *Business Ethics Quarterly,* 12(2), pp.107-111.

Donaldson, T. and Preston, L.E., (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *Academy of Management Review,* 20(1), pp.65-91.

Eden, C. and Ackermann, F., (1998). *Making Strategy: The journey of strategic management.* London: Sage Publications.

Edmondson, A.C. and McManus, S.E., (2007). Methodological Fit in Management Field Research. *Academy of Management Review,* 32(4), pp.1155-1179.

Edwards, M., (2008). *Participatory Governance.* Canberra: University of Canberra.

Elias, A.A. and Cavana, R.Y., (2000). *Stakeholder Analysis for Systems Thinking and Modelling. Public Management.* [Online] Available at: http://portals.wi.wur.nl/files/doc/ppme/BobCavana.pdf.Retrieved [accessed 5 August 2014].

Elias, A. A., Cavana, R. Y., & Jackson, L. S. (2002). Stakeholder Analysis for R&D Project Management. R&D Management, 32(4), 301-310.

Etzioni, A., (1964). *Modern Organisations.* Englewood Cliffs, N.J.: Prentice-Hall.

European Commision, (2000). *Water Framework Directive.* European Commision Brussels: European Commision.

European Commision, (2007). *Flood Directive.* s.l.: European Commision.

Evans, E., Hall, J., Penning-Rowsell, E., Sayers, P., Thorne, C. and Watkinson, A. (2006). Future flood risk management in the UK. *Proceedings of the ICE – Water Management,* 159(1), pp.53-61.

Evers, M., Jonoski, A. and Maksimovic, C., (2012). Collaborative modelling for actrive involvement of stakeholders in urban flood risk management. *Natural Hazards and Earth System Sciences,* pp.2821-2842.

Fang, L., Yu, L., Wu, I. and Chen, H., (1997). Analyses of Water Log Cause and Disaster Reduction Countermeasures in Hangzhou City. *Teconology,* 13(3), pp.137-142.

Fassin, Y., (2008). Imperfections and Shortcomings of the Stakeholder Model's Graphical Representation. *Journal of Business Ethics,* 80(879-888), pp.1-10.

Finch, H. and Lewis, J., (2003). Focus Groups. In: J. Ritchie and J. Lewis (eds.), *Qualitative Research Practice.* London: Sage Publications, pp.170-198.

FLOODsite-Consortium, (2005). *Language of Flood Risk.* [Online] Available at: www.flood site.net [accessed 5 August 2013].

FLOODsite-Consortium, (2008). *Flooding in urban areas.* [Online] Available at: http://www.floodsite.net/juniorfloodsite/html/en/teacher/thingstoknow/hydrology/urbanfloods.html [accessed 26 August 2013].

Folke, C., (2006). Resilience: The emergence of a perspective for social-ecological system analyses. *Global Environmental Change,* 16(3), pp.253-267.

Fox, T., Ward, H. and Howard, B., (2002). Public Sector Roles in Strengthening Corporate Social Responsibility: A Baseline Study. *Coporate Social Responsibility Practice,* pp.1-35.

Freeman, R.E., (1984). *Strategic Management: A Stakeholder Approach.* Boston: Pitman.

Freeman, R.E., (2008). Ending the socalled 'FriedmanFreeman' Debate. In: B.R. Agle, T. Donaldson, R.E.Freeman, M.c.Jensen, R.K. Mitchell & D.J. Wood (eds.) *Dialogue: Toward Superior Stakeholder Theory.* s.l.: Business Ethics Quarterly, pp.154-190.

Freeman, R. and McVea, J., (2001). A Stakeholder Approach to Strategic Management. In: M. Hitt, R. Freeman and J. Harrison (eds), *The Blackwell Handbook of Strategic Management.* Oxford: Blackwell Business, pp.189-207.

Freeman, R.E., Harrison, J. S., Wicks, A. c., Parmar, B.L., & de Colle, S. (2010). *Stakeholder Theory: The State of the Art.* Cambridge: Cambridge Univeristy Press.

Frick, A., Ludwig, A. and Mehldau, H., (1995). A Fast Adaptive Layout Algorithm for undirected Graphs. In: R. Tamassia and I. Tollis (eds), *Lecture Notes in Computer Science.* Berlin: Springer, pp.388-403.

Friedman, A. and Miles, S., (2002). Developing Stakeholder Theory. *Journal of Management Studies,* 39(1), pp.1-21.

Friedman, A.L. and Miles, S., (2006). *Stakeholders: Theory and Practice.* New York: Oxford University Press.

Friedman, M., (2009). Two Views on the social Responsibility of Business. *Social Education,* 73(2), p.89.

Frooman, J., (1999). Stakeholder Influence Strategies. *Academy of Management Journal,* Vol. 24, pp.191-205.

Gillham, B., (2000). *Developing A Questionnaire.* London: Continuum.

Global Water Partnership, (2011). *From flood control to integrated flood management.* [Online] Available at: http://futurewewant.org/portfolio/from-flood-control-to-integrated-flood-management/ [accessed 24 August 2013].

Gomm, R., (2004). *Social Research Methodology.* New York: Palgrave MacMillan.

Gong, H., (2011). *A P-R-P intergrative analysis model of stakeholder pressures-organisation responsiveness-environment performance.* Hangzhou: Commerce of Zhejiang University.

Google Maps, (2014). *Google Maps.* [Online] Available at: https://maps.google.co.uk/ [accessed 10 August 2014].

Graham, S. and Healey, P., (1999). Relational Concepts of Space and Place: Issues for Planning Theory and Practice. *European Planning Stuides,* 7(5), pp.623-646.

Greenwood, M., (2007). Stakeholder Engagement: Beyond the Myth of Corporate Responsibility. *Journal of Business Ethics,* 74(4), pp.315-327.

Grunewald, P., (2015). *South-South knowledge intermediation: approaches to triangular cooperation in knowledge for development,* Loughbourgh, UK: Loughbourgh University.

H&E Research Institution, (2013a). *Flood risk mapping in Zhejiang.* Hangzhou: H&E Research Institution.

H&E Research Institution, (2013b). *The guidelines for flood risk mapping in Zhejiang Province.* Hangzhou: H&E Research Institution.

Hansson, K., Danielson, M. and Ekenberg, L., (2008). A framework for evaluation of flood management strategies. *Journal of Environmental Management,* Vol. 86, pp.465-480.

Hare, M. and Pahl-Wostl, C., (2002). Stakeholder Categorisation in Participatory Integrated Assessment Processes. *Integrated Assessment,* 3(1), pp.50-62.

Hart, C., (1998). *Doing a literature review: releasing the social science research imagination.* London: Sage Publications.

Head, B., (2011). Australian experience: Civic engaement as symbol and substance. *Public Administration and Development,* 31(2), pp.102-112.

Henderson, V.J., Logan, J.R. and Choi, S., (2005). Growth of China's Medium-Size Cities. *Urban Affairs,* pp.263-303.

Higgitt, D. and Lam, D., (2012). *Managing for Extremes: Reframing Flood Mitigation in Asian Cities.* Canberra: River Basin Management Society.

Hill, C. and Jones, T., (1992). Stakeholder-Agency Theory. *Journal of Management Studies,* Vol. 29, pp.131-154.

Hillman, A. and Keim, G., (2001). Shareholder Value, Stakeholder Management, and Social Issues: What is the Bottom Line? *Strategic Management Journal,* Vol. 22, pp.125-139.

Hoppe, B. and Reinelt, C., (2010). Social network analysis and the evaluation of leadership networks. *The Leadership Quarterly,* Vol. 21, pp.600-619.

Hosmer, W.D. and Lemeshow, S., (2000). *Applied Logistic Regression.* Hoboken: A Wiley-Interscience Publication.

Hu, X., Wang, H. and Ma, S., (2008). A New Flood Risk Management Mode in Chinese City: Government, Market, Public Partnership. *East China EconomicManagement,* 22(9), pp.121-125.

Intergovernmental Panel on Climate Change, (2007). Intergovernmental Panel on Climatge Change. In: M. Parry, O. Canziani and J. Palutikof (eds.), *Climate Change 2007: Impacts, Adaptation and Vlunerability, Contribution of Working Group II to the Forth Assessment Report of the Intergovernmental Panel on Climatge Change.* Cambridge: Cambridge Uniersity Press, pp.7-22.

Ison, R. and Collins, K., (2008). Public Policy that does the Right Thing rather then the Wrong Thing Righter. Paper presented at the Analysing Collaborative and Deliberative Forms of Governance. Canberra: The Australian National University.

Information Science and Earth Observation (2004). *Hazard, vulnerability and risk analysis.* [Online] Available at: http://www.itc.nl/ilwis/applications/application01.asp [accessed 05 August 2013].

Jha, A.K., Bloch, R. and Lamond, J., (2012). *Cities and flooding – a guide to integrated urban flood risk management for the 21st Centry.* Washington DC: The World Bank.

Johnston, C. and Buckley, K., (2001). Communities: parochial, passionate, committed and ignored. *Historic environment,* 15(12), pp.88-96.

Jones, T.M. and Wicks, A., (1999). Convergent stakeholder theory. *Academy of Management Review,* 24(2), pp.206-221.

Jones, T., Wicks, A. and Freeman, R., (2002). Stakeholder Theory: The State of Art. In: N. Bowie (ed.) *The Blackwell Guilde to Business Ethics.* Oxford: Blakwell Publishing, pp.19-37.

Jonker, J. and Foster, D., (2002). Stakeholder Excellence? Framing the Evolution and Complexity of a Stakeholder Perspective of the Firm. *Corporate Social Respomsibility,* Vol. 9, pp.187-195.

Kang, Y., (2001). Status and Prospect of Hangzhou Urban Flood Control System. *Zhejiang Hydrotechnics,* 13(2), pp.27-30.

Kayaga, S.M., (2002). *The influence of customer perceptions of urban utility water services on bill payment behaviour: findings from Uganda.* Loughbourgh, UK: Loughborough University.

Keast, R.L., (2003). *Integrated Public Services: The Role of Networked Arrangements.* Brisbane: Queensland Univeristy of Technology.

Keast, R.L. and Hampson, K., (2007). Building Constructive Innovation Networks: Role of Relationship Management. *Journal of Construction Engineering and Management,* 133(5), pp.364-373.

Keast, R. L., Waterhouse, J., Brown, K. A., & Murphy, G. (2008). *Closing Gaps and Opening Doors: The Function of an Integarted Homelessness Service System.* Brisbane: Queensland Department of Communities.

Kerssens, P., Furen, J. and Ximin, Y., (2012). *Eu-China River Basin Management Programme.* s.l.: s.n.

Key, S., (1999). Toward a New Theory of the Firm: A Critique of Stakeholder 'Theory'. *Management Decision,* 37(3/4), p.317.

Kivits, A.R., (2013). *Multi-dimensional sakeholder analysis: a methodology applied to Australian capital city airports.* Lismore, NSW: Southern Cross Univerity.

Knoke, D. and Yang, S., (2008). Data Collection. In: *Social Network Analysis.* s.l.: Sage Publications, pp.15-23.

Kobayashi, Y. and Porter, J.W., (2012). *Flood Risk Management in the People's Republic of China.* Manila: Asian Development Bank.

Kroesen, M. and Broer, C., (2009). Policy Discourse, People's Internal Frames, and Declared Aircraft Noise Annoyance: An Application of Q-Methodology. *Journal of the Acoustical Society of America,* 126(1), pp.195-207.

Kron, W., (2005). Flood risk= hazard·values·vulnerability. *Water International,* 30(1), pp.58-68.

Kumar, R., (2011). *Research Methodology – A Step-By-Step Guide for Beginners.* London: Sage Publications Ltd.

Kundzewicz, Z.W., (2002). Non-structural Flood Protection and Sustainability. *Water International,* 27(1), pp.3-13.

Kundzewicz, Z.W. and Samuels, P.G., (1997). *Real-time Flood Forecasting and Warning. Conclusions from Workshop and Expert Meeting. Proceedings of Second RIBAMOD Expert Meeting.* s.l.: DG XII, European Commission.

Laplume, A.O. and Sabatier, P., (2005). To Trust an Adversary: Integrating Rational and Psychological Models In Collaborative Policymaking. *American Political Science Review,* 99(4), pp.491-504.

Laplume, A.O., Sonpar, K. and Litz, R.A., (2008). Sakeholder theory: Reviewing a Theory That Moves Us. *Journal of Management,* 34(6), pp.1152-1189.

Laumann, E., Marsden, P. and Prensky, D., (1983). The boundary specification problem in network analysis. In: R.S. Burt and M.J. Minor (eds.), *Applied network analysis: A methodological introduction.* London: Sage Publications, pp.18-34.

Leach, W. D., & Sabatier, P. A. (2005). To Trust an Adversary: Integrating Rational and Psychological Models in Collaborative Policymaking. American Political Sxience Review, 99(4), 491-504.

Levac, D., Colquhoun, H. and O'Brien, K.K., (2010). *Scoping studies: advancing the methodology.* s.l.: Implementation Science.

Lienert, J., Schnetzer, F. and Ingold, K., (2013). Stakeholder analysis combined with social network analysis provides fine-grained insights into water infrastructure planning processes. *Journal of Environmental Management,* Vol. 15, pp.134-148.

Lindenberg, M. and Crosby, B., (1981). *Managing Development: the Political Dimension.* West Harford, CT: Kumarian Press.

Lintangah, W.J., (2013). *Stakeholder analysis in sustainable forest management in Sabah, Malaysia.* Sabah: Technishe University Dresen.

Li, S., (2012). *Study on urban flood risk management and pratical technology – a case study of Fuzhou city.* Bejing: China Institute of Water Resources and Hydropower Research.

Liu, F., (2012). *Research on the Dynamic Governance Relationships among Project Stakeholders.* Shandong, China: University of Shandong.

Liu, F. and Sun, H., (2012). Dynamic Social Network Analysis on Water Resources Project Governance. *China Population, Resources and Environment,* pp.144-149.

Liu, R. and Liu, N., (2002). Flood area and damage estimation in Zhejiang, China. *Journal of Environmental Management,* Vol. 66, pp.1-8.

Liu, X., (2013). Stakeholder engagement of the higher vocational education. *Teaching Forum,* 5(1), pp.39-43.

Liu, Z., (2005). *Strategies and Countermeasures for Integrated Urban Flood Management in China.* Beijing: s.n.

Liu, Z., (2009). *Strategies and Countermeasures for Integrated Urban Flood Management in China,* Beijing: Bureau of Hydrology, Ministry of Water Resources.

Locke, E.A., (1996). Motivation through conscious goal setting. *Applied and Preventive Psychology,* Vol. 5, pp.117-124.

Lowndes, V., & Sullivan, H. (2004). Like a horse and carriage or a fish on a bicycle: how well do local partnerships and public participation go together? Local Government Studies, 30(1), 51-73. doi: org/10.1080/0300393042000230920.

Mainardes, E. W., Alves, H. and Raposo, M., (2011). Stakeholder Theory: Issues to resolve. *Management Decision, 49(2),* pp.225-252.

Manojlovic, N., Hodgin, S. and Manheimer, J., (2012). *Adaptive Flood Risk Management Planning.* s.l.: AWA.

Marsden, P. V., (1990). Network Data and Measurement. In: W.R. Scott and J. Blake (eds.), *Annual Review of Sociology.* Palo Alto, CA: Annual Reviews, pp.435-463.

Martin, J., (2003). Great Expectations – But Whose? Stakeholder Theory and its Implications for Ethical Behaviour in Public Organisations. In: P. Bishop, C. Connors and C. Sampford (eds.), *Management, Orgnisation and Ethics in the Public Sector.* Aldershot, UK: Ashgate, pp.43-66.

Martin, S., (2010). From new public management to networked community governance? Strategic local public serive networks in England. In: S. Osborne (ed.) *The New Public Governance? Emerging perspectives on theory and practice of public governance.* Abingdon: Routledge, pp.337-348.

Martinez-Moyano, I. J., Samsa, M. E., Baldwin, T. E., Willke, B. J., & Moore, A. P. (2008). *Investigating the Dynamics of Trust in Government: Drivers and Effects of Policy Initiatives and Government Action*. Washington: Argonne National Laboratory, U.S. Department of Energy Office of Science Laboratory.

Matczak, P., Flachner, Z. and Werners, S.E., (2007). Institutions for Adapting to Climate Change in the Tisza River Basin. *Earth System Governance,* pp.1-10.

Mattingly, J.E. and Greening, D.W., (2002). Public-interest Groups as Stakeholder: A 'Stakeholder Salience' Explanation of Activism. In: J. Andriof, S. Waddock, B. Husted and S. Rahman (eds.), *Unfolding Stakeholder Thinking: Theory, Responsibility and Engagement.* Sheffield, UK: Greenleaf Publishing, pp.266-279.

Mayer, I., Edelenbos, J. and Monnikhof, R., (2005). Interactive Policy Development: Undermining or Sustaining Democracy? *Public Administration,* 83(1), pp.179-199.

Mays, N., Roberts, E. and Popay, J., (2001). Synthesising reseach evidence. In: N. Fulop, P. Allen, A. Clarke and N. Black (eds.), *Studying the organisation and delivery of health services: Research method.* London: Routledge, pp.188-219.

McDaniel, J. and Miskel, C., (2002). Stakeholder Salience: Business and Educational Policy. *Teachers College Record,* 104(2), pp.325-356.

Meadowcroft, I.C., Hall, J.W., Sayers, P.B. and Bramley, M.E., (2003). Intergrated Flood Risk Management in England and Wales. *Natural Hazard Review,* 4(3), pp.126-135.

Meene, S.v.d., Brown, R.R. and Fattelly, M.A., (2011). Towards understanding governance for sustainable urban water management. *Global Environmental Change,* pp.1117-1127.

Mendelow, A., (1991). Proposed Model on Stakeholder Ranking. Paper presented at the Second International Conference on Information System. Cambridge, MA.

Meng, M. and Dabrowski, M., (2016). *The governance of flood risk planning in Guangzhou, China: using the past to study the present.* Delft, 17th IPHS Conference.

Menzei, L. and Kundzewicz, Z.W., (2003). *Non-Structural Flood Protection – A Challenge. International conference, T*owards natural flood reduction strategies, Warsaw, 6-13 September, pp 1-5.

Mertens, D.M., (2005). *Research and Evaluation in Education and Psychology: Integrating Diversity with Quantitative, Qualitative and Mixed Methods* (2nd ed). Thousand Oasks: Sage Publications.

Messner, F. and Meyer, V., (2006). *Flood damage, vulnerability and risk perception – challenges for flood damage research.* s.l.: Springer.

Miao, Q., Chen, X., Yu, B., Pan, W. & Song, J., (2012). Risk division of rainstorm flooding disasters in Hangzhou city. *Resources and Environment in the Yangtze Basin,* 21(22), pp.163-168.

Miles, M. and Hubermann, A., (1994). *Qualitative Analysis: An Expanded Sourcebook.* Thousand Oaks, CA: Sage Publications.

Ministry of Water Resources of the People's Republic of China, (2013a). *Institutions.* [Online] Available at: http://www.mwr.gov.cn/zwzc/jgjs/zsdw/ [accessed 24 September 2013].

Ministry of Water Resources of the People's Republic of China, (2013b). *Local Water.* [Online] Available at: http://www.gov.cn/slzx/dfss/
[accessed 28 August 2013].

Ministry of Water Resources of the People's Republic of China, (2013c). *State Flood Control and Drought Relief Headquarters.* [Online] Available at: http://www.mwr.gov.cn/zwzc/jgjs/jgsj/#12 [accessed 13 September 2013].

Mitchell, R.K., Agle, B.R. and Wood, D.J., (1997). Toward a theory of stakeholder identification and salience. *Academy of Management Review,* 22(4), pp.853-886.

Mitchell, R. K., Agle, B. R., Chrisman, J. J., & Spence, L. J. (2011). Toward a Theory of Stakeholder.

Salience in Family Firms. *Business Ethics Quarterly, 21*(2), 235-255.Mitchell, V.G., (2006). Applying Intergrated Urban Water Management Concepts: A Review of Australian Experience. *Environmental Management,* 37(5), pp.589-605.

Monette, D.R., Sullivan, T.J. and DeJong, C.R., (2002). *Applied Social Research: Tool for the Human Services.* Harcourt: s.n.

Morgan, G. and Smircich, L., (1980). The Case for Qualitative Research. *The Academy of Management Review,* 5(4), pp.491-500.

Moser, S.C. and Kalton, G., (1971). *Survey Methods in Social Investigation.* Hants: Gower.

Muir, J. and Rhodes, M.L., (2008). Vision and Reality: Community Involvement in Irish Urban Regeneration. *Policy and Politics,* 36(4), pp.497-520.

Municipal Government of Zhuji, (2008). *Water conservancy annals.* Zhuji: Fangzhi Press.

Murray, W.E. and Overton, J., (2003). Designing Development Research. In: R. Scheyvens and D. Storey (eds.), *Development Fieldwork.* London: Sage Publications, pp.17-36.

Naess, L.O., Bang, G., Eriksen, S. and Vevatne, J., (2003). *Institutional adaptation to climate change: Flood responses at the municipal level in Norway.* Oslo: CICERO, Centre for International Climate and Environmental Research.

Nissen, M.E. and Levitt, R.E., (2004). Agent-based modelling of knowledge dynamics. *Knowledge Management Research and Practice,* Vol. 2, pp.169-183.

Noland, J., & Philips, R. (2010). Stakeholder Engagement, Discourse Ethics and Strategic Management. *International Journal of Management Reviews,* 12(1), pp.39-49.

North, D.C., (1991). *Institutions, Institutional Change and Economic Performance.* Cambridge: Cambridge University Press.

Office of the United Nations Disaster Relief Coodinator (UNDRO), (1991). *Mitigating natural disasters: phenomena, effects and options, A Manual for Policy Makers and Planners.* New York: United Nations.

Olfert, A. and Schanze, J., (2005). *Identification and ex-post evaluation of existing pre-flood measures and instruments – A theoretical framework.* Dresden: FLOODsite Report NO.t12-05-01, Leibniz Institute of Ecological and Reginonal Development (IOER).

Olsson, A.R., (2009). Relational Rewards and Communicative Planning: Understanding Actor Motivation. *Planning Theory,* 8(3), pp.263-281.

Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological Transformation for Ecosystem Management: The Development of Adaptive Comanagement of a Wetland Landscape in Southern Sweden. *Ecology and Society,* 9(4), p.1-26.

Organisation for Economic Co-operation and Development (OECD), (2001). *Strategies for Sustainable Development.* [Online] Available at: http://www.oecd.org/dac/environment development/strategiesforsustainabledevelopment.htm.

Overseas Development Administration - social development department, (1995). *Guidance note on how to do stakeholder analysis of aid projects and programmes.* [Online]
Available at: http://www.oneworld.org/euforic/gb/stake1.htm

Parent, M. and Deephouse, D., (2007). A Case Study of Stakeholder Identification and Prioritisation by Managers. *Journal of Business Ethics,* 75(1), pp.1-23.

Parliamentary Office of Science and Technology, (2007). *Urban Flooding,* London: Parliamentary Office of Science and Technology.

Pei, H., Cao, S. and Wang, H., (2008). *Urban Flood Risk Management and Disaster Compensation.* Beijing: China Water Conservancy and Hydropower Press.

Pender, G. and Green, C., (2011). Stakeholder Engagement in Flood Risk Management. In: G. Pender and H. Faulkner (eds.), *Flood Risk Science and Management.* s.l.: Blackwell Publishing Ltd, pp.372-385.

Penning-Rowsell, E. and Peerbolte, B., (1994). Concepts, Policies and Research. In: P. Edmund and M. Fordham (eds.), *Floods across Europe. Flood Hazard Assessment. Modelling and Management.* London: Middlesex University Press, pp.1-17.

People's Republic of China, (1997). *Flood Control Law.* Beijing: The People's Republic of China.

Peräkylä, A., Antaki, C., Vehviläinen, S., & Leudar, I. (2008). *Conversation Analysis and Psychotherapy* (1st edn). Cambridge: Cambridge University Press.

Perry, C., (2002). A stuctured approach to presenting theses; A note for students and their superviosrs. Available at: http://www.scu.edu.au/schools/gcm/art/cperry.pdf [accessed 27 March 2014].

Phillips, R.A., (1997). Stakeholder Theory and a Principle of Fairness. *Business Ethics Quarterly,* 7(1), pp.51-66.

Phillips, R., (2003). *Stakeholder Theory and Orgnisational Ethics.* San Francisco: Berrett-Koehler Publishers.

PICC-Disaster Research Center, (2012). *Urban flood risk management.* Beijing: PICC.

Pistrika, A. and Tsakiris, G., (2007). Flood Risk Assessment: A Methodological Framework. Water Resources Management: New Approaches and Technologies. Chania, Crete, Greece: European Water Resources Association.

Plate, E.J., (2002). Flood risk and flood management. *Journal of Hydrology,* Vol. 267, p.3.

Poonamallee, L., (2009). Building Grounded Theory in Action Research Through the Interplay of Subjective Ontology and Objective Epistemology. *Action Research,* 7(1), pp.69-83.

Porter, J.W., (2010). Intergrated Flood Risk Management in China. *Flood Defence and Drought Relief in China,* pp.60-63.

Pottier, N., Rowsell, E.P., Tunstall, S. and Hubert, G., (2005). Land use and flood protection: contrasting approaches and outcomes in France and in England and Wales. *Applied Geography,* Vol. 25, pp.1-27.

Prell, C., Hubacek, K. and Reed, M., (2009). Stakeholder Analysis and Social Network Analysis in Natural Resource Management. *Society and Natural Resources: An International Journal,* Vol. 22, pp.501-518.

Puchta, C. and Potter, J., (2004). *Focus Group Practice.* London: Sage Publications.

Reed, M. S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J. (2009). Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management,* 1949(90), p.1933.

Reed, M.S., Fazey, I., Stringer, L.C., Raymond, C.M., Akhtar-Schuster, M., Begni, G., Bigas, H., Brehm., S., Briggs, J., Bryce, R., Buckmaster, S., Chanda, R., Davies, J., Diez, E., Essahli, W., Evely, A., Geeson, N., Hartmann, I., Holden, J., Hubacek, K., Ioris, I., Kruger, B., Laureano, P., Philipson, J., Prell, C., Quinn, C.H., Reeves, A.D., Seely, M., Thomas, R., van der Werff Ten Bosch, M.J., Vergunst, P. and Wagner, L., (2013). Knowledge management for land degradation monitoring and assessment: an analysis of contemporary thinking. *Land Degradation & Development*, 2013(4), pp. 307-322.

Remenyi, D., Williams, B., Money, A. and Swartz, E., (1998). *Doing Research in Business and Management: An Introduction to Process and Method*, London: Sage Publications.

Rombeach, M.P, (2014). Cor-periphery Structure in Networks. *Society for Industrial and Applied Mathematics,* pp.167-190.

Rijke, J., Brown, R. and Zevenbergen, C., (2012). Fit-for-purpose governance: A framework to make adaptive governance operational. *Environmental Science and Policy,* pp.73-84.

Ring, P.S., (1994). Fragile and Resilient Trust and their Roles in Cooperative Inter-organisational Relationships. In: J. Pasquero and D. Collins (eds.), *Proceedings of Fourth Annual Meeting of the International Association for Business and Society.* San Diego: s.n., pp.107-113.

Roloff, J., (2008). Learning from Multi-Stakeholder Networks: Issue-Focussed Stakeholder Management. *Journal of Business Ethics*, 82(1), pp.233-250.

Rowe, G., and L.J. Frewer, (2004). Evaluating public participation exercises: A research agenda. *Science, Technology, and Human Values* 29(4), pp.512-556.

Rowley, G., (1997). Mergers in Higher Education: A Strategic Analysis. *Higher Education Quarterly,* 51(3), pp.251-263.

Rowley, T.J., (2000). Does Relational Context Matter? An Empirical Test of a Network Theory of Stakeholder Influences. In: J. Logsdon, D. Wood and L. Benson (eds.), *Research in Stakeholder Theory, 1997-1998: The Sloan Foudation minigrant.* Toronto: The Sloan Foundation Minigrant Project, Clarkson Centre for Business Ethics.

Savage, G., Bunn, M., Gray, B., Xiao, Q., Wang, S., Wilson, E., & Williams, E. (2010). Stakeholder Collaboration: Implications for Stakeholder Theory and Practice. *Journal of Business Ethics,* 96(Supplement 1), pp.21-26.

Savage, G., Nix, T., Whitehead, C. and Blair, J., (1991). Strategies for assessing and managing organisational stakeholders. *Academy of Management Executive* 5, pp.61-75.

Sayers, P., Li, Y., Gerry, G., Edmund, P., Shen, F., Wen, K., Chen, Y. & Tom, Q., (2013). *Flood Risk Management: A Strategic Approach.* Mandaluyong City: Asian Development Bank.

Scandura, T.A. and Williams, E.A., (2000). Research Methodology in Management: Current Practices, Trends and Implications for Future Research. *Academy of Management Journal,* 43(6), pp.1248-1264.

Schanze, J., (2004). Flood Risk Management – A Basic Framework. In: J. Schanze, E. Zeman and J. Marsalek (eds.), *Flood Risk Management – Hazards, Vulnerability and Mitigation Measures.* Ostrov, Czech Republic: Springer, pp.1-20.

Schanze, J., Zeman, E. and Marsalek, J., (2004). Terms and Comcepts. In: J. Schanze, E. Zeman and J. Marsalek (eds.), *Flood Risk Management – Hazards, Vulnerability and Mitigation Measures.* Ostrov, Czech Republic: Springer, pp.2-20.

Scott, J., (2000). *Social Network Analysis: A Handbook.* London: Sage Publications.

Scott, J., (2013). *Social Network Analysis* (3rd edn.) London: Sage Publications.

Shandas, V. and Messer, W.B., (2008). Fostering Green Communities Through Civic Engagement: Community-Based Environmental Stewardship in the Portland Area. *Journal of the American Planning Association,* 74(4), pp.408-418.

Shapiro, S., (2008). Does the Amount of Participation Matter? Public Comments, Agency Responses and the Time to Finalise a Regulation. *Policy Sciences,* 41(1), pp.33-49.

Shi, P., Ge, Y., Yuan, Y. and Guo, W., (2005). Integrated Risk Management of Flood Disasters in Metropolitan Areas of China. *International Journal of Water Resources Development,* 21(4), pp.613-627.

Shipley, R., & Utz, S. (2012). Making it count: A review of the value and techniques for public consultation. *Journal of Planning Literature, 27*(1), 22-42. doi: 10.1177/0885412211413133.

Silveira, A., (2001). *EU-China River Basin Management Programme.* s.l.: Minsitry of Water Resources in China.

Silveira, A., (2011). *EU-China River Basin Management Programme.* s.l.: Ministry of Water Resources and Ministry of Environmental Protection.

Smith, A.E. and Humphrey, M.S., (2006). Evaluation of Unsupervised Semantic Mapping of Natural Language with Leximancer Concept Mapping. *Behavior Research Method*, 38(2), pp.262-279.

Smith, K., (2013). *Environmental Hazards: Assessing Risk and Reducing Disaster.* New York: Rouledge.

Sobel., J. (2002). Can We Trust Social Capital? Journal of Economic Literature, 40(1), 139-154.

Song, P., (2015). *Urban flood management of the small and medium-size cities in China.* Jinan: Shandong University of China.

Stake, R.E., (2000). Case Studies. In: N.K. Denzin and Y.S. Lincoln (eds.), *Handbook of Qualitative Research.* Thousand Oaks, CA: Sage Publications, pp.435-454.

State Government of Victoria, (2013). *Stakeholder Analysis.* [Online] Available at: http://www.dse.vic.gov.au/effective-engagement/toolkit/tool-stakeholder-analysis-stakeholder-matrix [accessed 28 September 2014].

Suchman, M., (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review,* 20(3), pp.571-610.

Sullivan , H., (2008). *Meta-evaluation of the Local Government Modernisation Agenda, The State of Governance of Places: Community Leadership and Stakeholder Engagement.* Executive Summary, retrieved from Department for Communities and Local Government website. [Online] Available at: http://www.communities.gov.uk/publications/localgovernment/metaevaluationplaces

Svendsen, A.C. and Laberge, M., (2005). *Convening Stakeholder Networks – A New Way of Thinking, Being and Engaging,* Centre for Sustainable Community Development, Canada: Greenleaf Publishing.

Tichy, N.M., Tushman, M.L. and Fombrun, C., (1979). Social Network Analysis For Organisations. *Academic Management Review,* 4(4), pp.507-519.

Trevino, L.K. and. Weaver, G.R., (1999). The Stakeholder Research Tradition: Converging Theorists – Not Convergent Theory. *Academy of Management Review,* 24(2), p.222-227.

Tritter, J.Q. and McCallum, A., (2006). The snakes and ladders of user involvement: Moving beyong Arnstein. *Health Policy,* 76(2), pp.156-168.

Uhl-Bien, M., Marion, R., & McKelvey, B. (2007). Complexity Leadership Theory: Shifting Leadership from the Industrial Age to the Knowledge Era. *The Leadership Quarterly – Leadership and Complexity,* 18(4), pp.298-318.

United Nations, (2013). *Guidelines on participatory planning and management for flood mitigation and preparedness.* New York: United Nations.

University of California, (2013). *Write a literature review.* [Online] Available at: guides.library.ucsc.edu/write-a-literature-review [accessed 25 August 2013].

van Beek, E., (2004). *Consensus building in IWRM in the Netherlands.* Tokyo: International Conference on Integrated Water Resource Management.

Van de Riet, O., (2003). *Policy Analysis in Multi-Actor Policy Settings: Navigating Between Negotiated Nonsense and Superfluous Knowledge* (1st edn.), Delft: Eburon Publishers.

Van Eeten, M.J.G., (2001). Recasting Intractable Policy Issues: The Wider Implications of the Netherlands Civil Aviation Controversy. *Journal of Policy Analysis and Management,* 20(3), pp.391-414.

Van Huijstee, M. and Glasbergen, P., (2008). The Practice of Stakeholder Dialogue Between Multinationals and NGOs. *Corporate Social Responsibility and Environment Management,* 15(5), pp.298-310.

Vaus, D.D., (2001). *Research Design in Social Research.* London: Sage Publications.

Veeneman, W., Dicke, W. and De Bruijne, M., (2009). From Clouds to Hailstorms: A Policy and Administrative Science Perspective on Safeguarding Public Values in Networked Infrastructures. *International Journal of Public Policy,* 4(5), pp.414-434.

Verdini, G., Wang, Y. and Zhang, X., (2016). *Urban China's Fringe: Actors, Dimensions and Management Challenges.* s.l.: Routledge.

Vidaver-Cohen, D. and Brugha, R., (2008). Corporate Citizenship and Managerial Motivation: Implications for Business Legitimacy. *Business and Social Review,* 112(4), pp.441-475.

Vredenburg, H. and Hall, J., (2005). Managing stakeholder ambiguity. *MIT Sloan Management Review,* 47(1), pp.11-13.

Wasserman, S. and Faust, K., (1994). *Social network analysis: methods and applications.* Cambridge: Cambridge University Press.

Water Conservancy Bureau of Zhuji, (2013). *Urban flood risk planning.* Zhuji, China: The Water Conservancy Bureau of Zhuji.

WBGU (Wissenschaftlicher Beirat der Bundesregierung, Globale Umweltver-¨anderungen, (1999). *Welt im Wandel: Strategien zur Bew¨altigung globaler Umweltrisiken,* Berlin: Jahresgutachten 1998.

Wellman, B. and Gulia, M., (1997). *Net Surfers Don't Ride Alone: Virtual Communities as Communities.* Toronto, Canada: Department of Sociology and Centre for Urban and Community Studies.

Wicks, A., Berman, S. and Jones, T., (1999). The structure of optimal trust: moral and strategic implications. *Academy of Management Review,* 24(1), pp.99-116.

Williams, P., (2002). The Competent Boundary Spanner. *Public Administration,* 80(1), pp.103-124.

Willis, J.W., (2007). *Foundations of Qualitative Research: interpretive and critical approaches.* Thousand Oaks, CA: Sage Publications.

Woods-Ballard, B., Kellagher, R. and Dou, V., (2017). *UK SuDS and Chinese Sponge Cities: solving the problems of urban flood risk management? In: Flood & Coast 2017, 28-30 March 2017,* Telford, UK.

World Bank, (2010). *Natural Hazards, Unnatural Disasters: The Economics of Effective Prevention.* Washington, DC: The International Bank for Reconstruction and Development, World Bank.

World Bank, (2013a). *China Urban Flood Risk Management Workshop.* [Online] Available at: http://www.worldbank.org/en/events/2013/12/04/china-urban-flood-risk-management-workshop [accessed 23 12 2016].

World Bank, (2013b). *Institutional Perception Mapping.* [Online] Available at: http://siteresources. worldbank.org/EXTTOPPSISOU/Resources/1424002-1185304794278/4026035-1185375653056/4028835-1185375938992/2_Insti_perception_mapping.pdf [accessed 4 September 2013].

World Meteorological Organisation (WMO), (2006). Social Aspects and Stakeholder involvement in Intergrated Flood Management. APFM Technical Document No.4. Flood Management Policy Series, Geneva: World Meteorological Organisation.

WMO, (2008). *Urban Flood Risk Management – A tool for integrated flood managmenet.* Geneva: The World Meteorological Organisation.

Wu, C. and Wang, H., (2007). China: Seeking meaningful decentralisation to achieve sustainability. In: A. Breton, G. Brosio, S. Dalmazzon and G. Garrone (eds.), *Environmental Governance and Decentralisation.* Massachusetts: Edward Elgar Publishing Limited, pp.397-435.

Wu, N., (2008). On Urban Flood Control in Zhejiang. *J. Zhejiang Wat. Cons and Hydr. College,* 20(4), pp.51-58.

Wu, Q., (1998). Urban flood hazard in China in the 21st century and reducation contermeasures. *Journal of Catastrophology,* 13(2), pp.89-94.

Xinhuanet, (2013). *Global Times.* [Online] Available at: http://www.globaltimes.cn/content/816552.shtml [accessed 23 August 2016].

Yin, R.K., (2002a). *Case Study Research.* Thousand Oaks, CA: Sage Publications.

Yin, R.K., (2002b). *Case Study Research: Design and Methods,* Thousand Oaks, CA: Sage Publications.

Yin, R., (2003). *Case Study Research:Design and Methods* (3 ed.). Thousand Oaks, CA: Sage Publications Limited.

Yin, R., (2011). *Applications of case study research* (3 ed.). Thousand Oaks, CA: Sage Publications, Inc.

Zevenbergen, C., Veerbeek, W., Gersonius, B. and Herk, V.S., (2008). Challenges in urban flood management: travelling across spatial and temporal scales. *Flood Risk Management,* pp.81-88.

Zhang, D., Lin, Y., Zhao, P., Yu, Xiaoding., Wang, S., Kang, H. and Ding, Y.,(2013). The Beijing extreme rainfall of 21 July 2012: 'Right results' but for wrong reasons. *Geophysical Research Letters,* Vol. 40, pp.1426-1431.

Zhang, L. and Li, Z., (2015). Urban flood risk maangement in China. *The Journal of Insurance in China,* Issue 002, p.7.

Zhang, N., (2007). *Mechanism in Farmer Participatory Management of Rural Small Water Conservancy In China.* Hangzhou: Zhejiang University.

Zhejiang Government, (2013). *Zhejiang.* [Online] Available at: english.zj.gov.cn/col/col1134/index.html [accessed 16 September 2013].

Zhou, C., (2006). Water Commission of Zhuji. *China Water Resources,* pp.35-37.

Zhuji Urban Planning Bureau, (2006). *Urban Development Plan for Zhuji (2006-2020).* Zhuji: Zhuji Urban Planning Bureau.

Zhuji Water Conservancy Bureau, (2008). *Water Conservancy Annuals.* Zhuji: Zhuji Water Conservancy Bureau.

Appendixes

A. Stakeholder roles

B. Scoping phase interviews questions

C. Key informant interview questions

D. Stakeholder survey

E. Stakeholder groups of flood emergency management in Zhuji

F. Network maps-Gephi

F.1 Urban flood Preparedness (Information exchange quality)

F.2 Urban flood Preparedness (Interaction frequency)

F.3 Urban flood emergency response (Information exchange)

F.4 Urban flood emergency response (Interaction frequency)

F.5 Urban flood emergency response (Information exchange)

F.6 Urban flood emergency response (Interaction frequency)

A. Stakeholder roles

Stakeholder	Preparedness	Respond	Recovery	Role
Agricultural Bureau				1) Protect farming and animal husbandry against flood and typhoon; help resume post-disaster production; offer technical guidance; (2) Direct and help farmers protect agriculture and animal husbandry against flood and typhoon; direct farmers to timely harvest of mature crops; 3) Participate in investigating and verifying disasters; timely report losses within its system incurred by flood and typhoon to Municipal Flood Prevention and Drought Resistance Headquarters.
Building Industry Authority				Supervise and manage the safety of construction sites against flood and typhoon.
Civil Affairs Bureau				1) Organise, coordinate the disaster relief and rescue work in the course of flood and typhoon; manage, allocate funds and materials from the central government, Zhejiang provincial government and Shaoxing municipal government for the purposes of disaster relief; inspect and supervise their usage; 2) Organise, direct and carry out donation and other work for disaster relief; 3) Collect information on disasters in various areas; organise the verifying of disasters; timely report disasters caused by flood and typhoon to Municipal Flood Prevention and Drought Resistance Headquarters; 4) Assist town governments and neighbourhood committees in placing transferred personnel and guaranteeing their living; 5) Build and manage shelter centres (sites) in rural and urban areas, towns and communities.
Commerce Mail				Organise and manage all flood or geologic disaster-related activities in the Commerce Mail areas.

Management Committee				
Development and Reform Bureau				1) Coordinate among the review, approval and investment plans of relevant projects against flood and typhoon and non-engineering projects; coordinate among related departments to give priority to emergency projects; coordinate the work of reconstructing and reinforcing infrastructure after disasters; 2) Supervise and direct the work of protecting municipal key construction projects from flood and typhoon.
Economic and Trade Bureau				To engage with the local companies.
Emergency Management Office				Edit the emergency response plans and organise the related emergency drills.
Environmental Protection Bureau				To prevent related environmental pollution events.
Fire Brigade				Emergency rescue
Forestry Bureau				Direct the work of protecting forestry against flood and typhoon and post-disaster recovery of production and reconstruction; investigate and verify losses of forestry.
Housing and Construction Bureau				1) Supervise and protect municipal infrastructure and buildings from flood and typhoon; 2) Supervise drainage of flood in the city, direct the transfer of residents and migrant workers etc. in dilapidated buildings in urban and rural areas, contemporary sheds, low-lying areas and dangerous areas; 3) Direct, supervise and urge departments in charge of property management companies to make efforts for the purposes of flood control, drainage of flood and typhoon control in residential areas; 4) Organise the survey of typhoon-prevention capability of residential buildings; direct the construction planning and quality control of residential buildings; provide information on damage to the construction system during flood and typhoon.
Huandoing Sub-District Government Office				Organise and manage all flood or geologic disaster-related activities in its administration areas.

Jiyang Sub-District Government office				Organise and manage all flood or geologic disaster-related activities in its administration areas.
Land Resource Bureau				1) Prevent and defend geological disasters; direct, supervise and urge the inspection, monitoring and release of early warnings of geological disasters and transfer of people in dangerous areas; 2) Provide in timely manner Municipal Flood Prevention and Drought Resistance Headquarters with updates and warnings of geological disasters.
Meteorology Bureau				1) Monitor the whole process of typhoon; update the real-time information of the path, wind and rain and forecast the trend; release early warnings; 2) Provide in timely manner Municipal Flood Prevention and Drought Resistance Headquarters with weather forecasts in the short, medium and long term; monitor and forecast short-term rainstorms; release rainstorm warnings.
Municipal Agricultural Office				Organise and coordinate the post-disaster reconstruction of rural buildings. We should pay more attention on water-logging disasters.
Municipal Auditing Bureau				Auditing the flood-related construction projects.
Municipal Bureau for Letters and Calls				To receive the claims of the local community.
Municipal Development Committee				Organise and manage all flood or geologic disaster-related activities in the economic development zone.
Municipal Education Bureau				1) Supervise and manage the work of protecting schools in the city from flood and typhoon; direct, supervise and urge schools to promulgate damages caused by natural disasters like typhoon and flood, as well as measures for disaster prevention and alleviation; 2) Supervise and direct schools to suspend classes and avoid danger during the emergency in accordance with pre-plans and orders from Municipal Flood Prevention and Drought Resistance Headquarters.
Municipal Finance				Raise funds for maintenance of damaged projects and flood and typhoon control; timely allocation of relief funds

Bureau				and supervise their use.
Municipal Flood Prevention and Drought Resistance Office				Inspect, supervise, coordinate and communicate with the relevant stakeholders to carry out the urban flood emergency management activities.
Municipal Food Bureau				1) Manage and inspect the work of protecting food reserves of the city from flood and typhoon; 2) Organise, supply and allocate processed grains during flood and typhoon periods; ensure food supply in disaster areas.
Municipal Justice Bureau				Promulgate relevant state laws and regulations; timely dealing with relevant disputes.
Municipal Publicity Department				1) Coordinate and supervise coverage in the disaster relief and rescue work during flood and typhoon; organise reports on people and things specified by Municipal Flood Prevention and Drought Resistance Headquarters; 2) Organise relevant departments and news media to promulgate preventative measures against flood and typhoon via various forms; 3) Review agencies outside the city for making interviews, arrange the interview route, provide background information, organise and coordinate related work; 4) Organise coverage about rescue and relief work during flood and typhoon; supervise and direct news media for timely release of information in accordance with Guide for Public Defence; 5) Direct relevant departments to cope with public opinions towards rescue and relief work during flood and typhoon; 6) Supervise and urge owners, managing departments and departments with key protection role of public and other populated places to hang emergency signs.
Municipal Statistical Bureau				Follow the headquarters ’orders and prepare the disaster statistics data.
Municipal Urban Management Bureau				1) Supervise the safety of outdoor advertising boards and store signs during the period of flood and typhoon; 2) Timely organisation of the clearance of garbage; clean up and resume damaged municipal facilities.
People's Armed Forces Department				Emergency rescue and moving the victims.

Planning Bureau				Following orders from the headquarters.
Power Supply Bureau				1) Guarantee the electricity supply for key water conservancy facilities and departments, like the municipal government, Municipal Flood Prevention and Drought Resistance Headquarters, People's Armed Forces Department, Public Security Bureau, broadcasting and TV stations and telecommunication enterprises in the course of flood and typhoon control, drainage of flood, and rescue and relief work; 2) Release early warnings of power blackouts; 3)Timely repairs of damaged power facilities and guarantee the power supply; 4) Release updates on power outages, emergency repair and recovery; 5) Report losses of the power system incurred by flood and typhoon.
Public Health Bureau				1) Guarantee medical treatment from emergency medical teams and related hospitals; 2) Provide medical treatment and anti-epidemic services for disaster areas; 3) Monitor epidemic situation in disaster areas; prevent the outbreak and spread of epidemics after severe disasters; timely information to Municipal Flood Prevention and Drought Resistance Headquarters on the epidemic situation in such areas, as well as preventative and control measures; 4) Organise monitoring of the quality drinking water and epidemic prevention in the course of flood and typhoon.
Public Security Bureau				1) Maintain traffic order and social order, organise and carry out necessary traffic control; 2) Crack down on illegal and criminal activities like rumours, theft, looting relief supplies and damaging facilities during flood and typhoon in accordance with the law; 3) Assist relevant municipal departments to properly cope with mass disturbances in the course of flood and typhoon control; 4) Timely understanding of information on people in danger calling the police and deploy police to help rescue and transfer them.
Red-Cross				Prepare the rescue materials and participate into the emergency rescue and recovery activities.
Safety Inspection Bureau				1) Supervise and manage the wok of protecting enterprises producing, trading (including storing) hazardous chemical substances against flood and typhoon; lead the emergency rescue work for related accidents; 2) Organise safety education on flood and typhoon control for main operators, supervisors of safety production and people engaging in special operations of production and business units.
Service Industry				Organise and manage relief supplies in rescue and relief work for the purposes of flood and typhoon control.

Development Office				
Supervisory Bureau				1) Monitor and administer the relevant stakeholders carrying out the urban flood emergency activities; 2) Organise and participate in the emergency rescue team.
Taozhu Sub-District Government Office				Organise and manage all flood or geologic disaster-related activities in its administration areas.
Telecommunication Bureau				1) Provide communication support for crucial departments in the course of flood and typhoon control; ensure smooth emergency command and communication in the course of flood and typhoon control; 2) Release early warnings for communication outages; 3) Timely repair of damaged communication networks and resume communication.
The City Office				Organise specialised meetings for the purposes of flood control and drought relief; coordinate work among relevant departments; supervise the implementation of work.
The Communist Youth League Committee				1) To manage the voluntary organisation; 2) Mobilise the local communities.
Tourism Bureau				1) Supervise and manage the safety of scenic spots and holiday resorts during flood and typhoon; direct, supervise and urge the implementation of safety precautions at such places; 2) Supervise relevant departments to shut down scenic spots and amusement facilities before weather disasters; direct the evacuation and transfer of tourists.
Transportation Bureau				1) Be responsible for the safety work against flood and typhoon at highways, waterways, docks and transportation stations (fields); 2) Protect transit projects under construction from flood and typhoon; organise and coordinate rescue work during traffic emergencies; implement water traffic control in accordance with the law; 3) Be responsible for traffic management during emergency periods against flood and typhoon; direct, supervise and urge units like stations and ports to timely rescheduling or cancelling of transport, and inform the public of such information; 4) Release early warnings of transport disruptions; 5) Organise maintenance of highways and channels damaged by flood; organise and deploy vehicles and vessels for rescue and relief work; provide information on

				damage to transport systems.
Water Conservancy Association				1) To provide local advice to the municipal government; 2) To inspect the embankments and reservoirs; 3) Organise the flood emergency rescue teams; 4) To prepare the flood emergency rescue materials.
Water Conservancy Hydropower Bureau				1) Be responsible for daily work of Municipal Flood Prevention and Drought Resistance Headquarters; organise, coordinate, supervise and direct the work of flood control in the city; 2) Be responsible for monitoring rainfall and working conditions, and water diversion among reservoirs, lakes and rivers; 3) Supervise and manage the safety of water conservancy projects; 4) Organise and direct the emergency maintenance of water conservancy projects; inspect and direct the maintenance of projects damaged by flood.
Zhuji Branch of the China Life Property and Casualty Insurance Company Limited				1) Organise and direct insurance companies to properly settle claims of insured units and residents in disaster areas; 2) Supervise and urge insured units and residents to protect their various properties against disasters and actively promote flood insurance.
Zhuji Branch of the People's Bank of China				Raise and allocate loans for disaster relief and emergency maintenance of projects.
Zhuji Charity Federation				To manage the charitable donations.
Zhuji Daily				1) Timely release of defence guidance for the public in accordance with Zhuji Guide for Public Defence Against Flood and Typhoon; 2) Promulgate updates and coverage about disaster relief work during flood and typhoon.
Zhuji TV and Radio Station				1) Timely release of defence guidance for the public in accordance with Zhuji Guide for Public Defence Against Flood and Typhoon; 2) Promulgate updates and coverage about disaster relief work during flood and typhoon.
Zhuji Water Affair Group Limited				To ensure the safety of water quality.

B. Scoping phase interviews questions

1. What has been your experience of how stakeholders are included in the urban flood emergency management?
2. Is anyone or any stakeholder in the urban flood emergency management system particularly responsible for stakeholder engagement?
3. What are the key issues that drive and obstruct the stakeholder engagement for urban flood emergency management?
4. What, in your view, should sense to engage the different stakeholders for different kinds of flood?
5. The local community as a key stakeholder in urban flood risk management. What is your opinion of its role in urban flood emergency management and how to engage with it?
6. Which stakeholder do you think will be the most suitable ones to engage the local communities? And why is that?
7. What is your opinion of the overlapping or missed responsibility between the government institutions? For example: the overlapping flood emergency management responsibilities between the Municipal Emergency Management Office and the Municipal Flood Prevent and Drought Resistance Headquarters; the overlapping urban flood risk management responsibilities between the Development and Reform Bureau, Housing and Construction Bureau and the Water Conservancy Hydropower Bureau?
8. The Water Conservancy Association as a key stakeholder in urban flood emergency management: what is your opinion of its role in urban flood risk management and how to develop its abilities?
9. The Flood Control and Drought Relief Headquarters (municipal, town and street level) as a multi-stakeholder platform in urban flood emergency management: what is your opinion of its role in urban flood emergency management and how to develop its abilities?
10. For the local flood emergency management, how does the provincial or central government influence it? What can they do for it?

C. Key informant interview questions

PROVINCIAL FLOOD CONTROL AND DROUGHT RELIEF HEADQUARTERS OF ZHUJI

Investigator: Encheng Zhou

Tel: 0086-15957519617 China

0044-7947588928 UK

Email: E.zhou@Lboro.ac.uk

Dear.....,

Invitation: **SEMI-STRUCTURAL INTERVIEW ON STAKEHOLDER ENGAGEMENT OF URBAN FLOOD EMERGENCY MANAGEMENT IN A CHINESE MEDIUM-SIZE CITY – A CASE STUDY IN ZHUJI**

You are hereby invited to participate in an interview on the stakeholder engagement of urban flood emergency management in a medium-sized Chinese city – a case study in Zhuji. The discussion will take place on_____at_____starting at _____.

This is part of the research I am undertaking with the University of Loughborough in the UK but also with the help of the Hehai University and the Zhejiang Flood Control and Drought Relief Headquarters in China. One of the thrusts of this research is improving the stakeholder engagement effectiveness of urban flood emergency management.

This invitation comes to you in view of your wide experience and knowledge of the issues affecting the urban flood emergency management in Zhuji.

The major objectives of this semi-structural interview are as follows:

1. To identify and analyse the stakeholders' roles and functions during the urban flood emergency management in Zhuji.
2. To find out your opinions about stakeholder engagement activities during the urban flood emergency management process in Zhuji.
3. To identify and analyse each stakeholder's salience types that affect the urban flood emergency management in Zhuji.

The above objectives are basically a guide of what will be discussed. Detail questions, and a potential stakeholder list will be presented for 1 hour and these will be followed by a discussion.

Yours faithfully,

Encheng Zhou

Semi-structural Interview

Part 1: Stakeholder Identification Questions

From reviewing documentation and discussions with some local flood experts, the following list of stakeholders and their roles have been identified for the urban flood emergency management system in Zhuji

1. Do you think any key stakeholder missing from the list? If so, please list them and describe their roles.
2. Do you think there are any mistakes about these stakeholders' roles?
3. How they act their roles? Any overlapping, cross, or missing responsibilities for urban flood emergency management? If so, please give your own opinions.
4. Who do you think will be the key stakeholders for the urban flood emergency management in Zhuij?

Part 2: General Questions

5. What is the major problem of urban flood emergency management in China?
6. What has been your experience of how stakeholder organisations are included in the urban flood emergency management?
7. What are the key issues that drive and obstacle the stakeholder engagement for urban flood emergency management?
8. In your organisation is there any person you think is or could be a leader regarding this urban flood emergency management topic?

7. Are there any in the system? And how they do it?

9. What has been your experience of how local community are included in the urban flood emergency management?
10. For the municipal flood emergency management, how do the prefecture-level city government and provincial government influence it?

Part 3: Stakeholder Classification

During the urban flood emergency management, the attitudes of the stakeholders can be classified as Power; Legitimacy; Criticality; Temporality. Based on these four attitudes, please compare the 52-urban flood emergency management stakeholders in Appendix one, and list the stakeholders who have each kind of attitudes. Please consider the three periods of urban flood emergency management: preparedness, response, and recovery).

- Preparedness: Activities including the design of urban flood emergency management plan, organisation planning, resource planning…
- Response: Activities including warning, alert, rescue, damage mitigation, transport system…
- Recovery: Repair, Reconstruction, strengthening of resilience…

	Preparedness	Response	Recovery
Power: a relationship in which the stakeholder can influence the urban flood emergency management system based on its position, resource, ability. Which include: • Physical resources of force, violence, restraint • Material, financial resources or incentives • Positive or negative social influence on reputation, prestige through the media and other sources			
Legitimacy: a generalised perception or assumption that the stakeholder claim is desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, definitions. Which include: • Self interest • Normative approval • Comprehensibility and 'taken for grantedness'			
Urgency: level of importance of stakeholder claim and immediate attention is paid to stakeholder claims.			

C1. List of people that were interviewed – key informant interviews

1. Interview with XXX on July 7th, 2015 at his office in Zhuji, Zhejiang Province, China.
2. Interview with XXX on July 17th, 2015 at His Office in Zhuji, Zhejiang Province, China.
3. Interview with XXX on July 13th, 2015 at his office in Zhuji, Zhejiang Province, China.
4. Interview with XXX on July 29th at his office in Zhuji, Zhejiang Province, China.
5. Interview with XXX on July 17th at her office in Zhuji, Zhejiang Province, China.
6. Interview with XXX on July 17th at his office in Zhuji, Zhejiang Province, China.
7. Interview with XXX on July 13th at his office in Zhuji, Zhejiang Province, China. .
8. Interview with XXX & XXX on July 27th at the Flood Control and Drought Relief Headquarter Office in Zhuji, Zhejiang Province, China.
9. Interview with XXX on July 14th at his office in Zhuji, Zhejiang Province, China.
10. Interview with XXX on July 13th at his office in Zhuji, Zhejiang Province, China.
11. Interview with XXX on July 13th at the Municipal Flood Control and Drought Relief Headquarter Office in Zhuji, Zhejiang Province, China.
12. Interview with XXX on June 23rd at his office in Zhuji, Zhejiang Province, China.

D. Stakeholder survey

MUNICIPAL FLOOD CONTROL AND DROUGHT RELIEF HEADQUARTERS OF ZHUJI

Dear colleague,

RE: RESEARCH INTO THE STAKEHOLDER ENGAGEMENT IN URBAN FLOOD EMERGENCY MANAGEMENT IN A CHINESE MEDIUM-SIZE CITY

This is to advise that I am undertaking a research about stakeholder engagement in urban flood emergency management in a medium-sized Chinese city. The main objective of the research is to improve the stakeholder engagement effectiveness during the urban flood emergency management processes in China. In order to help develop a clear understanding on this subject I designed a questionnaire to be filled in by senior managers from the urban flood emergency management stakeholders in Zhuji like you. I am sure that your immense experience and knowledge of the urban flood emergency management in Zhuji will contribute greatly to this research. I would therefore appreciate if you can spare a few minutes to thoughtfully answer the questions below. If you do not have much information on some of the questions do not answer them just go to the next question.

I would appreciate receiving response to the questionnaire as soon as possible but not later than 10th August 2015. You can either deliver the response to the Municipal Flood Control and Drought Relief Headquarters Office.

The responses received will be treated with utmost confidentiality and will solely be used for the research analysis purpose. No one will have access to your response except for me as the researcher and members of the faculty in their supervising my

work. If however you are interested in receiving a copy of final results, do let me know and we can make arrangements for you to receive a copy.

Thank you for your time and support

Zhuji Flood Control and Drought Relief Headquarters Office

NO.65, Bingjiangbei Road, Zhuji

Postcode: 311800

Contact Number: 0575-87012432/87014676

Fax: 87119536

Time: 30th July 2015

RESEARCH ON STAKEHOLDER ENGAGEMENT IN URBAN FLOOD EMERGENCY MANAGEMENT	
Name of respondent	
Organisation	
Position	
How long have you been involved in urban flood emergency management (XX years)	
Tel	
email	

Introduction:

In the mid-1980s, Freeman presented that organisational behaviour may be impacted by its constituencies depending on the extent to which they can affect or are affected by organisation actions (Freeman, 1984). In China, progress on stakeholder engagement has been made in the past ten years after the adoption of the principles "putting people first" and a "scientific outlook on development" (Kerssens, et al., 2012). Based on a WMO report in 2006, stakeholders in flood risk management should include **①Government ministries, departments and agencies; ②Communities; ③Scientific institutions; ④Registered NGOs & CBOs; ⑤Voluntary Organisations; ⑥The Private Sector**. T

The traditional engineering-focused flood risk management approaches implemented by strong government institutions makes these engagement processes ineffective. The communication between the relevant stakeholders is rare and passive. The local flood risk management objectives and approaches cannot satisfy each stakeholder's own needs (Cheng & Chen, 2011)..

The purpose of this questionnaire is to seek your expert views on stakeholder engagement during the urban flood emergency management in Zhuji, China. The information obtained through these questionnaires will be for the direct used of the study, and will be processed without identifying individual opinions.

The questionnaire is divided into four parts:

- Part 1: General Questions related to your experience about the urban flood

emergency management and the related stakeholder engagement process.

- Part 2: Questions related to the interactions between your stakeholder and other stakeholders during the urban flood emergency management processes.
- Appendix 1: The list of urban flood emergency management stakeholders in Zhuji

We would now like to ask you a few specific questions about your stakeholder's opinion regarding the urban flood emergency management system in Zhuji.

1) Your Stakeholder's Opinion:

1. How was your stakeholder involved in urban flood emergency management?
   a) Officially involved
   b) You felt involved

2. Which flood below do your stakeholder care most (multiple choice)?
   (a) Typhoon
   (b) Fluvial floods
   (c) Water-logging floods
   (d) Flash floods
   (e) Dam-break
   (f) Geological disasters caused by floods
   (g) Others

   If others, please explain_____

3. In your opinion, do you think who should be the leader of the urban flood emergency management in Zhuji?
   -
   -
   -

4. Have you ever heard about urban flood emergency plan? Yes/No

5. If yes, what kind of role does your stakeholder play during the urban flood emergency management?
   -
   -
   -
   -
   -

6. Do you have any opinion about your engagement of the headquarters? Please give your opinion.
   -
   -
   -

(2) Other stakeholders and their opinions: (Appendix one list 52 urban flood emergency management stakeholders in Zhuji, how does your stakeholder interact with them? Please consider the different period of urban flood emergency management: Preparedness, responds and recovery):

7. Now how do you have urban flood emergency information? Who provides this information? Please try to find their ID from the Appendix one and list them below:

For each of them, please try to say if you consider their information, quantifying from High, moderate to low.

Urban Flood Emergency Preparedness: (Activities including Land using, technical or biological measures, organisation planning, resource planning…)	
Information Quality	Stakeholder ID
High	
Moderate	
Low	

Urban Flood Emergency Response: (Activities including warning, alert, rescue, damage mitigation, transport system…)	
Information Quality	Stakeholder
High	
Moderate	
Low	

Urban Flood Emergency Recovery: (Repair, Reconstruction, strengthening of resilience…)

Information Quality	Stakeholder
High	
Moderate	
Low	

8. Does your stakeholder directly contact with the local communities?

Yes/ No

9. If no, do you think who should be responsible for the community engagements?

10. Are you in contact with the local communities for the urban flood emergency management
    Yes/ No

11. If yes, Please try to list them

For each one, state if you have: (a) Regular contacts; (b) Occasional contacts; (c) Very rare contacts;

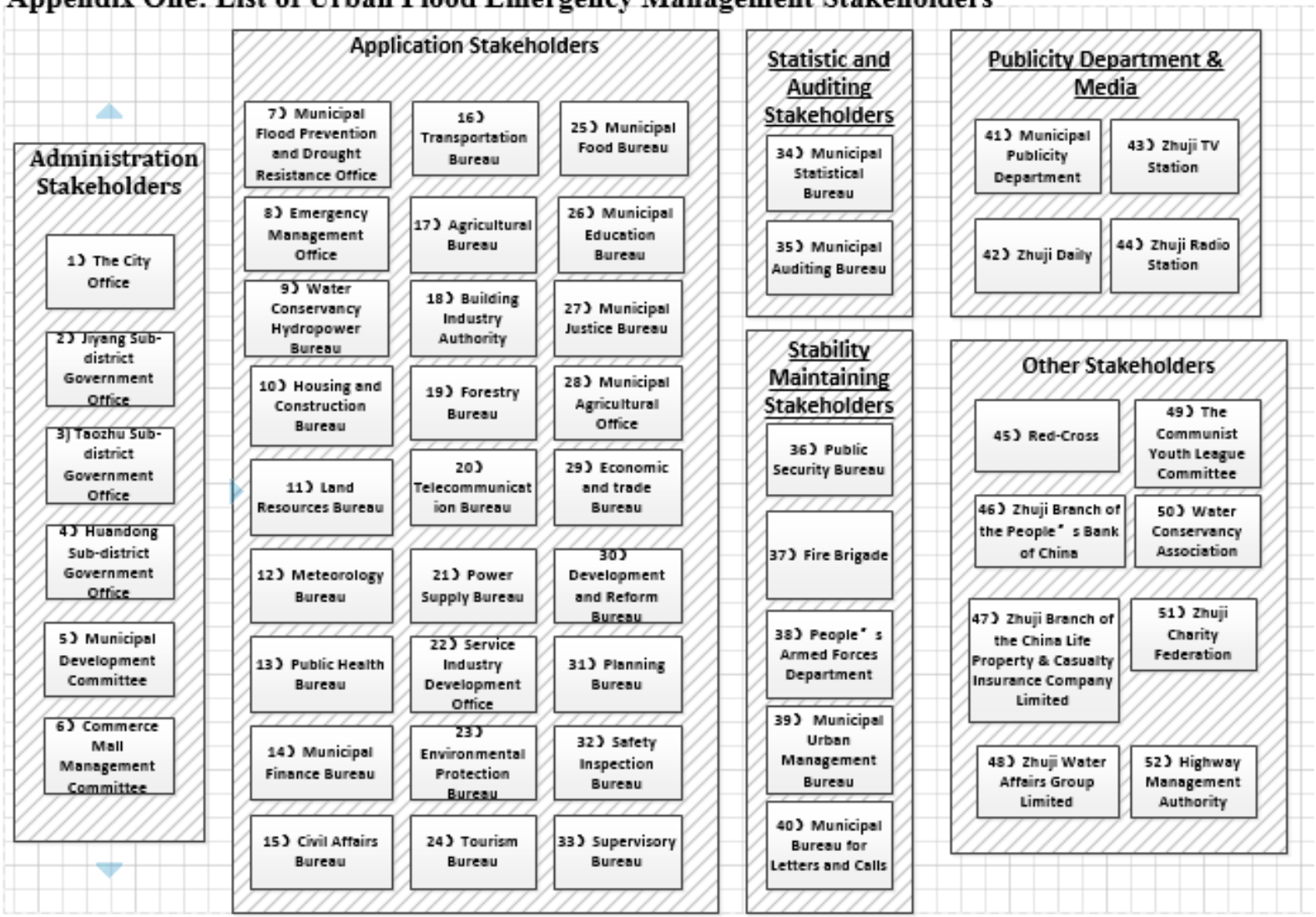
Urban Flood Emergency Preparedness: (Activities including Land using, technical or biological measures, organisation planning, resource planning…)	
Contact frequency	**Stakeholder ID**
Regular Contacts	
Occasional Contacts	

Very rare Contacts	

Urban Flood Emergency Response: (Activities including warning, alert, rescue, damage mitigation, transport system…)	
Contact frequency	**Stakeholder ID**
Regular Contacts	
Occasional Contacts	
Very rare Contacts	

Urban Flood Emergency Recovery: (Repair, Reconstruction, strengthening of resilience…)	
Contact frequency	**Stakeholder ID**
Regular Contacts	
Occasional Contacts	
Very rare Contacts	

Appendix One: List of Urban Flood Emergency Management Stakeholders



E. Stakeholder groups of flood emergency management in Zhuji

Stakeholder groups for flood emergency management in Zhuji (Levels II, III, IV)

1) General Management Group (CO, MFPDRHO)

- Review dynamics of the whole city's rescue and relief work, compile rescue and relief work bulletin based on relevant information;
- In charge of compiling documents to report to Provincial Party Committee and Government, Shaoxing Municipal Party Committee and Government, and superior Flood Control and Drought Relief Headquarters;
- Responsible for collecting, reviewing and compiling dynamics of relevant regions' and departments' flood and typhoon control work; make proposals for and coordinate the work; and
- Take the lead in determining the interviewee for media; review relevant publicity and news reports.

2) Emergency Rescue and Mitigation Group (PAFD, WCHB, PSB, HCB, CAB, MTB, LRB, AB, PHB, PSB, MTCB)

- Direct and coordinate danger removal and urgent repair of water conservancy, electricity, traffic, communications, water and gas supply, and drainage facilities, and urban and rural houses;
- Review and gather information on the status of the whole city's various emergency rescue teams, machinery, facilities and equipment; receive supporting emergency rescue teams and facilities from outside the city uniformly, and coordinate the army's participation in emergency rescue and relief;
- In charge of unified allocation of various emergency rescue teams, machinery, vehicles, facilities and equipment in rescue work;
- Urge towns (sub-districts)' evacuation of people and their shelter for security in dangerous areas, according to instructions and pre-plan demand;
- Coordinate emergency medical services for the injured; and
- Collect, review and report on the situation of the whole city's evacuation of people and personnel relocation; and guide different regions' work to guarantee the support of uniformly relocated people.

3) Propaganda Group (MPD, ZD, ZTRS, MFPDRHO)

- [AQ: Media or Publicity Group?] Coordinate publicity and report on flood and typhoon control, and rescue and relief work; organise and coordinate interviews for media and journalists from outside the city;
- Release information on the flood, disaster situation, danger, and rescue and relief work to news media and the public in due time;

- Guide relevant units' response to public opinion on the flood and typhoon rescue and relief work; and
- Coordinate the operation of the news centre.

4) Monitoring and Forecasting Group (WCHB, MB, LRB)

- Closely monitor the whole city's wind, rainfall, water level and dangerous situations; disclose real-time information in a timely and accurate manner;
- Receive information on flood and typhoon control from superior Flood Control and Drought Relief Headquarters and water resource, meteorology, and land and resources departments;
- Make proposals for early-warning information release and disclose the information based on the orders from Municipal Flood Control and Drought Relief Headquarters in good time; and
- Implement reservoir and river network operation for flood control according to water conservancy project use and control plan and orders from superior Flood Control and Drought Relief Headquarters.

5) Disaster Verifying and Auditing Group (CAB, WCHB, AB, LRB, MTB, MFPDRHO)

- Review, gather, summarise, verify and report disaster-related data on personnel, goods and materials, emergency evacuation and loss caused by disaster; and
- Invite experts to assess loss caused by the disaster after the end of disaster; and report assessment result to the municipal party committee and government and other departments concerned promptly.

6) Logistical Services Group (CO, WCHB)

- In charge of logistical support provision for Municipal Flood Control and Drought Relief Headquarters during emergency response; and
- Responsible for the reception of superior flood and typhoon control work and condolence groups; Municipal Water Conservancy and Hydropower Bureau oversees Level II and Level I emergency responses respectively.

Other Stakeholder Groups of Flood Emergency Management in Zhuji (Level I)

7) Supplies Purchasing Group (CAB, MFB, SIDO)

- Receive various rescue and relief goods and materials that come from superior units or social donation uniformly;
- In charge of purchasing various rescue and relief goods and materials; and
- Distribute rescue and relief goods and materials uniformly.

8) Emergency Medical and Health Group (PHB, HCB, EPB)

- Organise emergency response medical team to carry out emergency medical rescue; and
- Organise garbage clearance; in charge of disinfection and the monitoring, prevention and treatment of epidemic diseases in disaster area.

9) Stability Maintaining Group (PSB, PAFD)

- Responsible for maintaining public order and dealing with mass security incidents caused by flood and typhoon control; and
- Lawful crackdown on illegal activities like rumour spreading, theft, loot of flood control and typhoon relief goods and materials, and flood control installation vandalism.

10) Mobilising Group (MPD, TCYLC, RC)

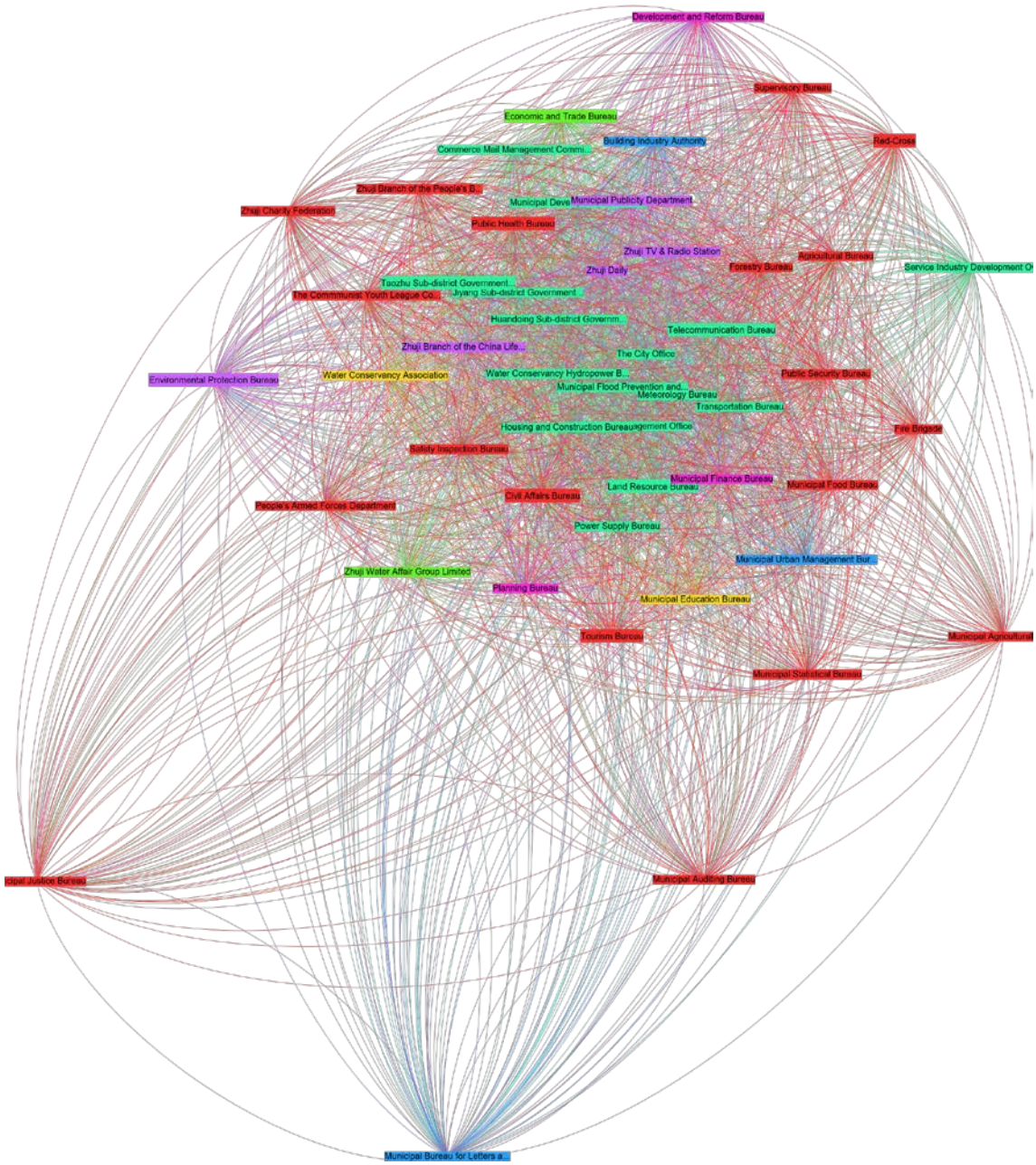
- In charge of mobilising social organisations during emergent flood season; and
- Responsible for emergency personnel deployment of party members and leading cadres.

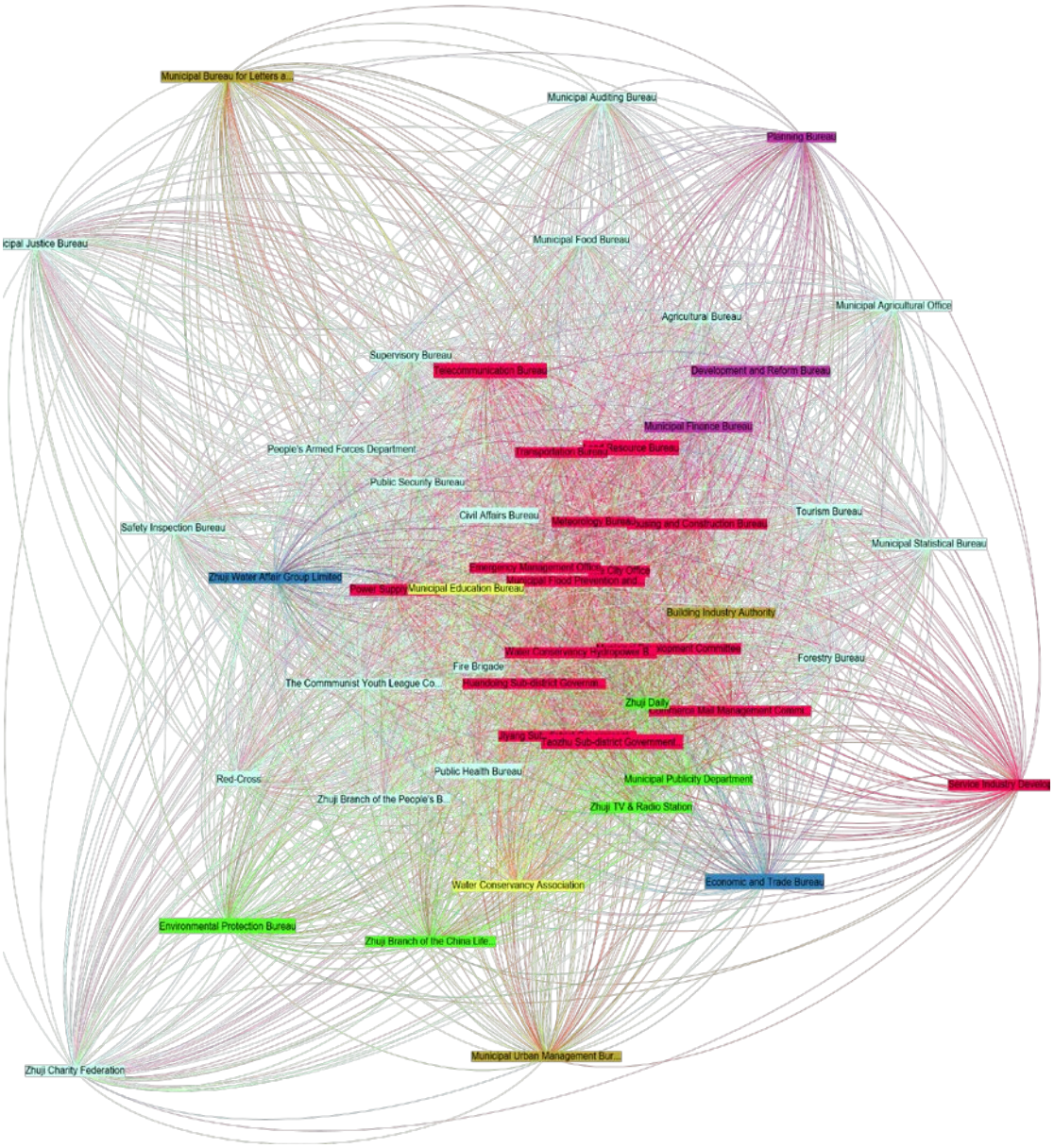
11) Discipline Monitoring Group (SB)

- Supervise and examine the enforcement of flood and typhoon control disciplines and the implementation of major measures; urge departments concerned and towns (sub-districts) to implement flood and typhoon control measures.

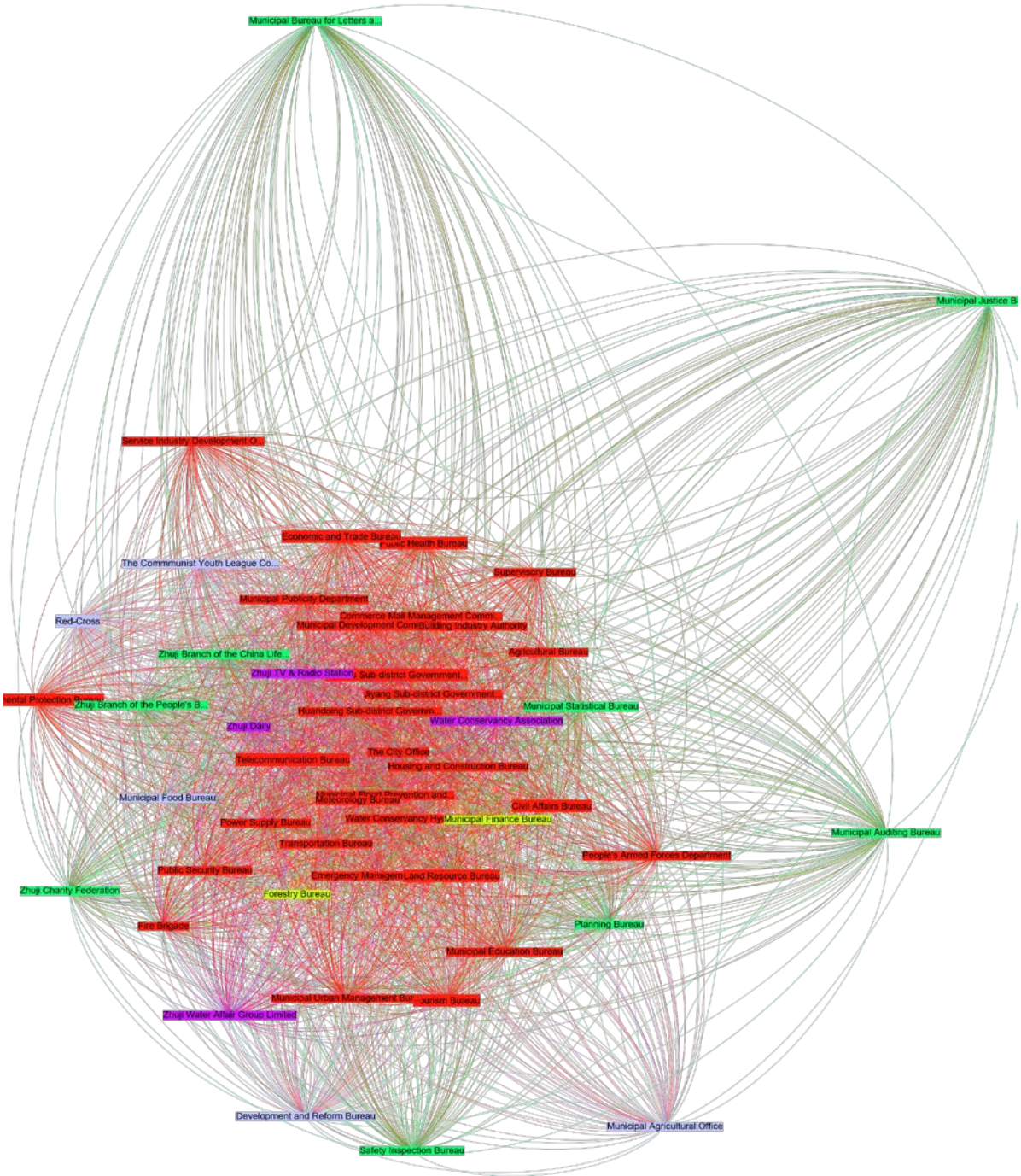
F. Network maps-Gephi

F.1 Urban flood Preparedness (information exchange quality)



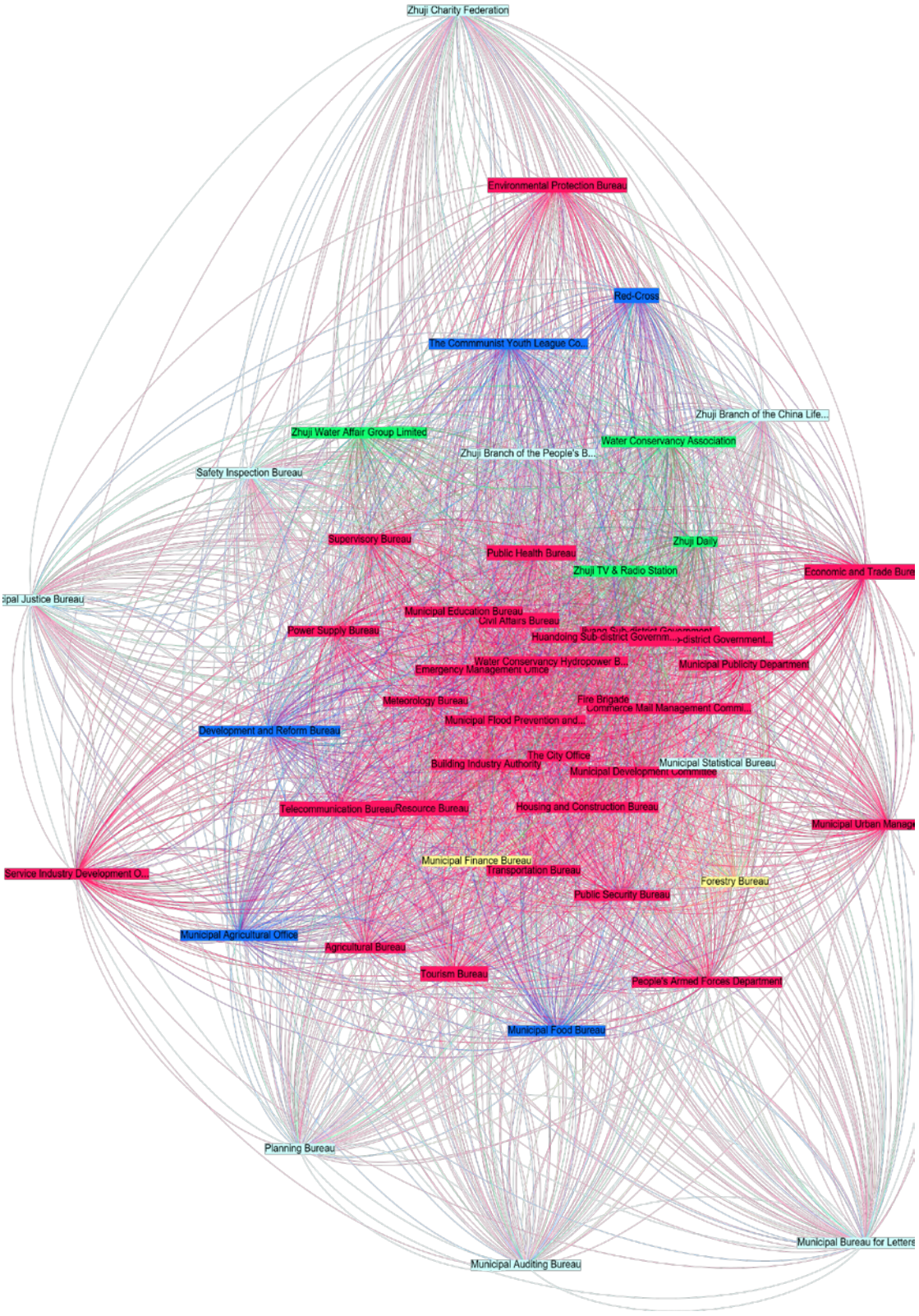


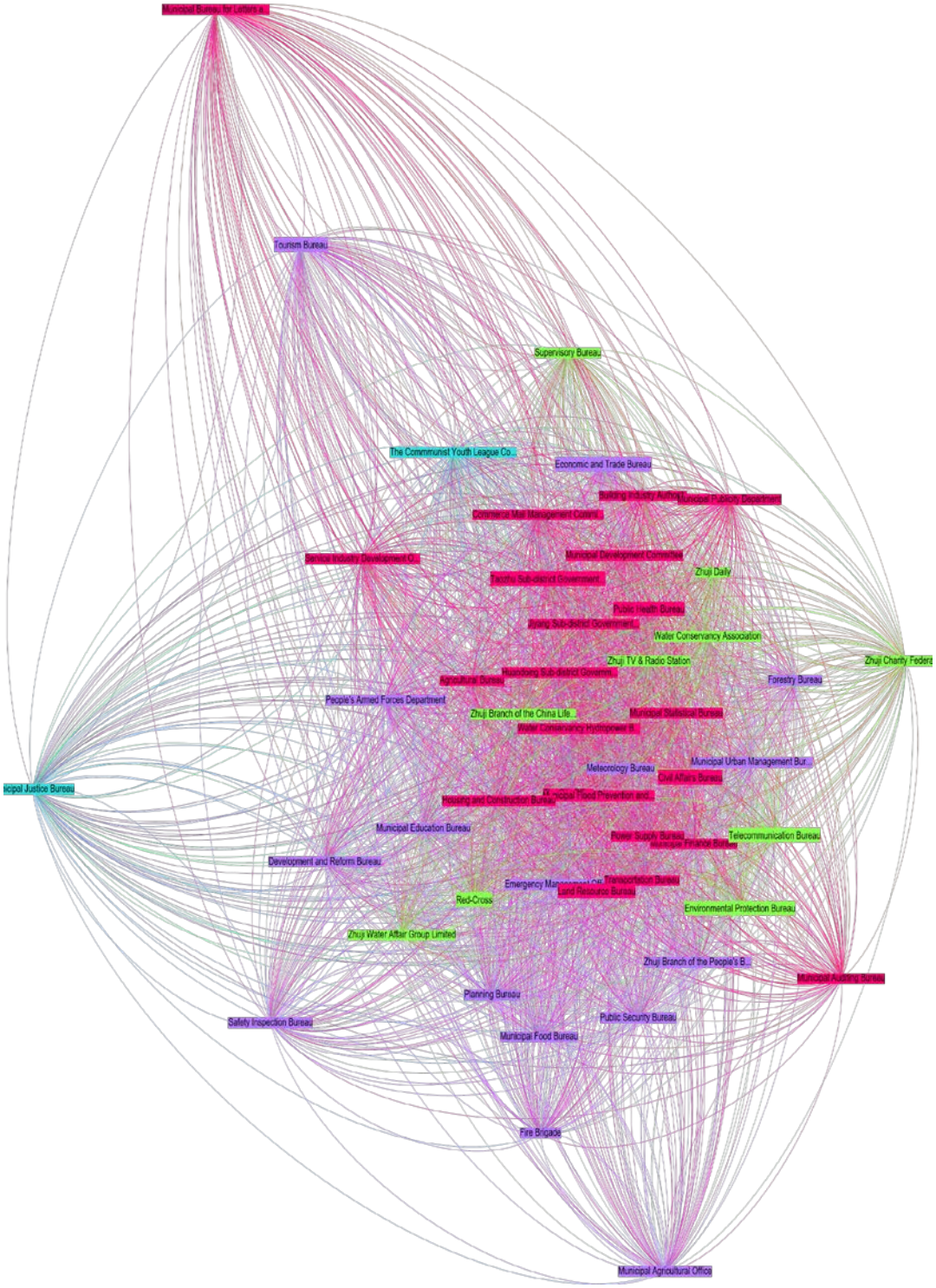
F.2 Urban flood Preparedness (interaction frequency)



F.3 Urban flood emergency response (information exchange)

F.4 Urban flood emergency response (interaction frequency)





F.5 Urban flood emergency response (information exchange)

F.6 Urban flood emergency response (interaction frequency)