PROCUREMENT AND CONTRACTUAL ARRANGEMENTS
FOR
POST-DISASTER RECONSTRUCTION

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Abstract

Disaster reconstruction management requires a different response to ordinary construction. One of the key factors to consider is the development of an appropriate and efficient procurement framework for rebuilding following a disaster event. The major aim of this research is to review, analyze and recommend procurement and contractual arrangements for disaster reconstruction. Two major research methods are used to achieve the research objective, namely, literature review and case studies.

The theoretical framework of various procurement paths, which comprises procurement systems, contractual models and standard contracts, is firstly identified and analyzed for construction projects under normal time. The characteristics and suitability of each procurement path are summarized at the end of the first part of the literature review. The theme of disaster reconstruction is introduced subsequently including different disaster reconstruction theories, relevant guidelines and regulations, contractual models for reconstruction in New Zealand and overseas. The suitability of procurement systems to post-disaster reconstruction situations is then examined in theory and it is found that the integrated and management-orientated procurement systems are more suitable to be used for reconstruction.

Five case studies on reconstruction processes after natural disasters are carried out with particular focus on their procurement and contractual arrangements, time, cost, quality considerations, and relevant guidelines and regulations. These studies include the reconstruction after two recent New Zealand floods in 2004 and 2005, Indonesian Banda Aceh reconstruction after 2004 Indian Ocean Tsunami, 1998 Yangtze River Floods and 2008 Wenchuan Earthquake reconstructions in China. The case studies confirm the suitability of the desirable procurement paths for reconstruction identified in the literature review. Conclusions on the overall research results and consequent recommendations are made at the end of the thesis for practical application of the procurement paths identified in this research for reconstruction.
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Acronyms and Abbreviations

AC Adjudicator's Contract (in NEC Suite of Standard Contracts)
ACENZ Association of Consulting Engineers New Zealand
ADB Asian Development Bank
AGC Associated General Contractors of America
AIA American Institute of Architects
APM Assistant Project Manager
B/L Bill of Lading
BOOT Build, Own, Operate, Transfer
BoQ Bill of Quantities
BRR Badan Rehabilitasi dan Rekonstruksi (Aceh and Nias Rehabilitation and Reconstruction Agency)
CACC Construction Agency Coordination Committee (NSW)
CDC Community Development Council
CE JCT - Constructing Excellence Contract
CECA Civil Engineering Contractor's Association
CIB Conseil International du Bâtiment (International Council on Building)
CIOB Chartered Institute of Building
CM Construction Management
CM/A Construction Management Appointment Contract (in JCT Suite of Standard Contracts)
CM/TC Construction Management Trade Contract
CWRC Changjiang (Yangtze River) Water Resources Commission (China)
D&B Design and Build
D+M Design and Management
ECC Engineering and Construction Contract (in NEC Suite of Standard Contracts)
ECS Engineering and Construction Subcontract (in NEC Suite of Standard Contracts)
ECSC Engineering and Construction Short Contract (in NEC Suite of Standard Contracts)
ECSS Engineering and Construction Short Subcontract (in NEC Suite of Standard Contracts)
EMA Emergency Management Australia
EPC Engineering, Procurement and Construction (used in FIDIC Suite of Standard Contracts)
EQC Earthquake Commission (New Zealand)
FA Framework Agreement (in JCT Suite of Standard Contracts)
FC Framework Contract (in NEC Suite of Standard Contracts)
FCEC Federation of Civil Engineering Contractors, now CECA
FEMA Federal Emergency Management Agency (US)
FIDIC Federation Internationale des Ingenieurs-Conseils (International Federation of Consulting Engineers)
FRST Foundation of Research Science and Technology (now Ministry of Science and Innovation, New Zealand)
GMP Guaranteed Maximum Price
HO Home Owner Contracts (in JCT Suite of Standard Contracts)
IAP Incident Action Plan
IC Intermediate Building Contract (in JCT Suite of Standard Contracts)
ICE Institution of Civil Engineers
ILC Irrevocable Letter of Credit
IPENZ Institution of Professional Engineers of New Zealand
<table>
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<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tr>
<td>JCT</td>
<td>Joint Contracts Tribunal</td>
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<tr>
<td>MBF</td>
<td>Master Builders' Federation</td>
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<tr>
<td>MC</td>
<td>Management Building Contract (in JCT Suite of Standard Contracts)</td>
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<tr>
<td>MCDEM</td>
<td>Ministry of Civil Defence and Emergency Management (New Zealand)</td>
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<tr>
<td>MDB</td>
<td>Multilateral Development Banks</td>
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<tr>
<td>MED</td>
<td>Ministry of Economic Development (New Zealand)</td>
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<tr>
<td>MP</td>
<td>Major Project Construction Contract (in JCT Suite of Standard Contracts)</td>
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<tr>
<td>MTC</td>
<td>Measured Term Contract (in JCT Suite of Standard Contracts)</td>
</tr>
<tr>
<td>MW</td>
<td>Minor Works (used in NZIA and JCT Suite of Standard Contracts)</td>
</tr>
<tr>
<td>NBC</td>
<td>National Building Contract (used in NZIA Suite of Standard Contracts)</td>
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<tr>
<td>NDRC</td>
<td>National Development and Reform Commission (China)</td>
</tr>
<tr>
<td>NEC</td>
<td>New Engineering Contract</td>
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<tr>
<td>NFBTE</td>
<td>National Federation of Building Trades Employers</td>
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<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
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<tr>
<td>NHM</td>
<td>Natural Hazards Management</td>
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<td>NSW</td>
<td>New South Wales</td>
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<tr>
<td>NZCIC</td>
<td>New Zealand Construction Industry Council</td>
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<tr>
<td>NZIA</td>
<td>New Zealand Institute of Architects</td>
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<td>NZS</td>
<td>New Zealand Standard</td>
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<td>NZTA</td>
<td>New Zealand Transport Agency</td>
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<td>OGC</td>
<td>Office of Government Commerce (UK)</td>
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<tr>
<td>PCC</td>
<td>Prime Cost Building Contract (in JCT Suite of Standard Contracts)</td>
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<td>PFI</td>
<td>Private Finance Initiative</td>
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<tr>
<td>PM</td>
<td>Project Management; Project Manager</td>
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<tr>
<td>PPP</td>
<td>Public Private Partnership</td>
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<tr>
<td>PPRR</td>
<td>Prevention, Preparedness, Response, Recovery (Australian)</td>
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<tr>
<td>PRC</td>
<td>People's Republic of China</td>
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<tr>
<td>PSC</td>
<td>Professional Services Contract (in NEC Suite of Standard Contracts)</td>
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<tr>
<td>PSMC</td>
<td>Performance Specified Maintenance Contract</td>
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<tr>
<td>PSU</td>
<td>Program Support Unit</td>
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<td>RedR</td>
<td>Register of Engineers for Disaster Relief</td>
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<td>RIBA</td>
<td>Royal Institute of British Architects</td>
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<tr>
<td>RICS</td>
<td>Royal Institution of Charted Surveyors</td>
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<td>RM</td>
<td>Repair and Maintenance Contract (in JCT Suite of Standard Contracts)</td>
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<td>RMA</td>
<td>Resource Management Act</td>
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<td>SCM</td>
<td>Supply Chain Management</td>
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<tr>
<td>SITREP</td>
<td>Situation Report</td>
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<td>TSC</td>
<td>Term Services Contract (in NEC Suite of Standard Contracts)</td>
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<tr>
<td>VDC</td>
<td>Village Development Council</td>
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<td>WDC</td>
<td>Whakatane District Council (New Zealand)</td>
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CHAPTER 1: INTRODUCTION

It is necessary to establish the need for the research and clearly set out the intentions of the study at the beginning of the thesis. The purpose of this chapter is to introduce the context of this research, define the aim, objectives, and principal research questions. A brief discussion of the research methods will also be presented followed by an outline introduction of the structure of this thesis.

1.1 Research background

Stepping into the first decade of the 21st century, one may realize that more and more significant disasters were experienced globally each year than what was experienced, for instance, 20 years ago. Some large scale disasters include the 2004 Indian Ocean Tsunami, the 2005 Hurricane Katrina and Pakistan Earthquake, the 2008 Sichuan Earthquake, Myanmar Cyclone, and the recent earthquakes in Haiti and Chile in 2010. The ability of organizations, communities, and the society as a whole to respond and recover effectively following a natural disaster will have a large influence on the length of time and quality of outputs of the reconstruction process post-disaster. Response and recovery arrangements further determine the affected nation’s ability to retain economic competitiveness after the disaster event.

Due to its isolated geographical location and major seismic faults and volcanoes across the country, New Zealand is vulnerable to various types of natural disasters. The need for a smooth delivery of the reconstruction process post-disaster is imperative to the success of the overall recovery effort following any national natural disaster in New Zealand. Among other aspects, the procurement and contractual arrangement for reconstruction is crucial as it determines the overall framework for reconstruction, embracing the structure of responsibilities, risks, and authorities of the stakeholders. The importance of, and the need for, relevant research in procurement and contractual arrangements for post-disaster reconstruction are also confirmed by the industry practitioners, government authorities, and other reconstruction agencies in New Zealand through a national workshop held at the beginning of this PhD study (Resilient Organisations, 2006). Procurement and contractual arrangements, together with three other themes on legislation and
regulation, resources availability, and coordination were the core issues in post-disaster reconstruction under the overall research project “Resilient Organisations1”.

During a national disaster reconstruction, it is unlikely that current normal procurement mechanisms used in the construction industry will deliver the best economic outcome. It is likely that without a comprehensive reconstruction procurement system, rapid reconstruction will be significantly hampered. Disaster reconstruction management requires a different response to ordinary construction. One of the key factors to consider is the development of a fast and efficient contractual framework, or procurement system, for rebuilding following a disaster event.

As a result, two aspects of the literature review need to be carried out - construction procurement and disaster reconstruction. The research on construction procurement has become a core theme and contributed to the body of knowledge of modern construction management over the last several decades. Studies conducted in this field so far have focused mainly on aspects such as categorization and analysis of associated characteristics of different procurement systems (Masterman, 2002a, Cartlidge, 2004) and contractual models (Walker and Hampson, 2003, Walker and Rowlinson, 2008); the drivers for change in procurement (Harty and Laing, 2009, Manston, 2006); the selection and negotiation process of different procurement systems (Dzeng, 2004, Ive and Chang, 2007, Kumaraswamy and Dissanayaka, 2001, Luu et al., 2006, Luu et al., 2003b); the legal framework and contractual procedures of construction procurement (Ashworth, 2001, Murdoch and Hughes, 2008). Besides these, it is noted that there has been a revolution in the forms of contract and other types of project relationship used in some sectors of construction in recent years (Henriod and Le Masurier, 2002) and these may be more suitable for reconstruction projects post-disaster than traditional contracts. A trend of shifting from the traditional confrontational procurement systems and contractual models to more relationship-based collaborative ones are initiated (Latham, 1994, Egan, 1998), observed (Masterman, 2002a), encouraged (Walker and Rowlinson, 2008, Hauck et al., 2004, Walker and Johannes, 2003, Walker and Keniger, 2002), and reflected back (Wilkinson and Scofield, 2003) in both academic researchers and industry practitioners.

Compared to the relatively easily-available literature on procurement and contractual models, most of the research on disaster recovery and reconstruction seems more generalized on the procedure models or system approach on disaster management (Haas et al., 1977, Ye, 2001, Chia,

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1 Resilient Organisations is a six year research project designed to assist New Zealand organisations to recover economic competitiveness after hazard events by improving their resilience. Full details of the programme is available on-line at www.resorgs.org.nz
2007, Fiedrich and Burghardt, 2007, Foster and Kodama, 2004, Li et al., 2009, Chandana and
Leung, 2010); temporary housing and shelter issues (Johnson et al., 2006, Schilderman, 2004);
urban planning aspect of reconstruction (Hewitt et al., 2009, Orabi et al., 2009, Sun and Zhu,
2009); government regulations on disaster reconstruction (MCDEM, 2008, Emergency
Management Australia (EMA), 2003, Higashihara, 2003); international disaster risk management
and sustainable development frameworks (Geis, 2003); or allocation of reconstruction financing
(Freeman, 2004, Wolfe, 2005, Cao, 2008) and resources (Chang et al., 2010, McCann, 2006, Peng
et al., 2009, Tian et al., 2009). However, there has been no focus on the reconstruction
procurement process other than the ones published earlier by the author or the “Resilient
Organisations” research team (Wilkinson et al., 2004, Zuo et al., 2009).

The mainstream research in construction procurement is set under the normal time project
management context, while the disaster reconstruction research focuses more on the general
issues of modelling, disaster management, and allocation of funding or resources. This gap in the
literature shows that not enough is known about the procurement and contractual arrangements for
post-disaster reconstruction. Project delivery mechanisms change in a reconstruction situation and
the associated procurement arrangements need to be reconsidered accordingly.

It is against this backdrop that this research project was undertaken. The major aim of this
research sets out to combine the literature on matters of procurement systems, including the
contractual models and standard contracts, and disaster reconstruction together to derive a
theoretical framework of procurement path for reconstruction, and then test its suitability and
applicability using reconstruction case studies following past disasters both in New Zealand and
internationally. The result of this research is expected to bridge the identified gaps in knowledge
between construction procurement and disaster reconstruction that have initiated this research.
The research looks into international and local past experiences on reconstruction procurement,
possible associated standard contracts for implementation, and relevant government regulations
and policies. These together will provide a significant contribution to the body of knowledge on
procurement and contractual arrangements for post-disaster reconstruction and some practical
solutions on best methods to use.
1.2 Objectives & research questions overview

New Zealand has long been considered as vulnerable to disruptions caused by natural disasters. The initiatives to understand, response, and recover effectively from disasters are made from the government funding authorities, local researchers and practitioners. This research is a part of the third objective, Legal and contractual frameworks, of a six year national research programme (2004 – 2010) “Resilient Organisation” funded by the Foundation of Research Science and Technology (FRST) in New Zealand. It is a collaborative research programme between the University of Auckland, Canterbury University, and Kestrel Group. It is believed that after a national natural disaster, without a comprehensive reconstruction procurement framework, rapid reconstruction will be significantly hampered.

The main objective of this PhD research is to review the existing procurement and contractual arrangements and analyze their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster in New Zealand. This objective is divided into three sub-objectives as:

- **Objective 1:** To review the literature on construction contracts and to examine their usefulness and applicability in a disaster reconstruction situation
- **Objective 2:** To examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstruction.
- **Objective 3:** To examine international experience of disaster reconstruction with a focus on the contractual and procurement systems used.

In order to make those objectives more accessible, the associated principal questions are set out as follows to cover the theory, practice, and analysis of each objective:

1. a) What are the common construction contracts used in New Zealand industry?
   b) Are they still useful in the aftermath of a natural disaster?
   c) If not, what are the main impediments and how could they be improved?

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2 Kestrel Group is a consulting practice specializing in risk and emergency management, operates from offices in Auckland, Wellington and Christchurch, and is involved in projects throughout New Zealand and in the Pacific.
2. a) What are the procurement systems and contractual models that are used in the construction industry?
   b) What are the existing government regulations on procurement?
   c) How are they relevant and useful in a disaster reconstruction situation?

3. a) What are the recent developments in forms of the major international construction contracts as they relate to post-disaster reconstruction?
   b) What are the procurement systems that have been used in reconstruction in other vulnerable zones in the world?
   c) Are these international experiences useful to New Zealand, if yes, how can they be/ have been modified to suit New Zealand conditions?

1.3 Research methods

A variety of research methods were used in this research. Initially a literature review was undertaken to analyse current national and international best practice in construction procurement, including the procurement systems, contractual models and standard contracts that have been used. The research further ascertained the procurement mechanisms and contract relationships used in reconstruction projects following natural disasters in New Zealand and other vulnerable zones in the world. Best approaches to project delivery in the event of a disaster were assessed. Separated, integrated, management-orientated, and collaborative procurement strategies were judged against, amongst other things, industry familiarity and responsiveness to these strategies. Reviews of previous local and international disaster reconstruction procurement strategies and their success, or failure, were also undertaken.

To be more specific, the methods adopted for this PhD research include:

1) A comprehensive literature review was undertaken to analyse current national and international best practice in construction procurement (including three layers of procurement systems, contractual models, and standard contracts) and disaster recovery theories and various relevant government guidelines, regulations and recovery plans. They provide a legitimate basis and management framework for the delivery of reconstruction work.
2) Case studies (i.e. 2004 Manawatu Floods Reconstruction and 2005 Matata Floods Reconstruction) about the reconstruction process after natural disaster were carried out in New Zealand to examine the procurement and contractual arrangements, government procurement guidelines and regulations, and their applicability to the industry. Similar case studies were used to ascertain the procurement mechanisms and contractual relationships used in reconstruction projects following natural disasters in other vulnerable zones in the world (i.e. Indonesia, China).

In these case studies, representatives of contractors, local authorities, consultants, and other industry practitioners were interviewed for their expectations of how they, and their contractual systems, operated in a disaster recovery situation. Discussion and comparison were made from different case studies, and between theoretical procurement frameworks from the literature review to the case studies. This was followed with conclusions and recommendations.

For detailed information on research methodology, please refer to Chapter 4. The overall research process is shown in Figure 1:
In Figure 1, the first column on the left is the collection of the principal research questions. The central column represents the topics that have been covered in sequence in each chapter. On the right hand side, relevant research methods that were utilized are associated with the chapters and also linked to the principal questions on the left.

1.4 Structure of this thesis

As demonstrated in the research procedure flowchart, the structure of this thesis could be divided into four major parts, these are:

Part I: Literature Review – which includes two major components: Chapter 2: General Literature Review – on procurement systems, contractual models, and standard contracts; and Chapter 3: Reconstruction Theories, Procurement Guidelines, Contractual Models and Procurement Systems.

Part II: Methodology – Chapter 4: Research Methodology; Part III: Case Studies – which comprises three chapters: Chapter 5: New Zealand Case Studies – includes two case studies of reconstruction following recent floods in Manawatu 2004 and Matata 2005; Chapter 6: Indonesian Aceh Tsunami Reconstruction Case Study; and Chapter 7: Chinese Case Studies – includes the case studies on 1998 Yangtze River Flood reconstruction and 2008 Wenchuan Earthquake reconstruction in China. This is followed by Part IV: Data Analysis, which includes Chapter 8: Analysis and Discussion.

These four parts together with this Chapter 1: Introduction and Chapter 9: Conclusions and Recommendations complete the overall structure of this thesis.

Chapter 1 briefly introduces the nature of the topics being researched, including backgrounds, objectives and research questions, methods used, and the structure of this thesis. The subsequent chapters specifically focus on the following:

Chapter 2 reviews the basis of literature needed for this research on three layers - procurement systems, contractual models and standard contracts under the normal time construction conditions. Each of those procurement systems is analysed with its advantages, disadvantages, and suitability
to certain engineering projects. Contractual models based on different risk allocation between the client and the contractor are introduced and compared. Standard Contracts used in New Zealand construction and internationally available standard forms are introduced and discussed. Different procurement systems, contractual models and standard contracts are summarised at the end of chapter 2 and relevant parts are associated together to demonstrate the possible combinations of procurement paths.

Chapter 3 introduces the theme of disaster reconstruction into the literature review. It comprises four sections: disaster reconstruction theories; guidelines on reconstruction procurement; disaster reconstruction contractual models; and disaster reconstruction procurement systems.

In the first section, the chapter reviews the recovery theory of segregation of activities according to different phases post-disaster and compares this model with New Zealand and Australian disaster recovery guidelines. The second section focuses on the government guidelines in both New Zealand and abroad on construction practice and their relevance and usefulness in post-disaster reconstruction. The third section examines the reconstruction contractual models in theory and in practice, followed by the last section on the suitability of procurement systems identified in the previous chapter to post-disaster reconstruction situations. A list of characteristics that are favoured in a contractual arrangement for post-disaster reconstruction is also summarised in the last section of this chapter.

Chapter 4 on research methodology systematically reviews and introduces the research strategy adopted and the manner in which the data were collected. It provides rationales to justify the methodology chosen and the use of case studies. It describes why certain cases were selected, how the data was collected and in which manner it was analysed. Interview methods are discussed, including the development of questionnaire, and the choice of participants. Chapter 4 goes on to review the conferences, workshops, disaster exercises, training, and other fieldtrips involved within this PhD research that are contributing to the formation of final research results. Other considerations including the reliability, validity, and ethical issues are also incorporated into the scope of this chapter.

Chapter 5, 6, and 7 concentrate on five case studies that were carried out in three countries - two in New Zealand, one in Indonesia and two in China. The major focus is the procurement and contractual arrangements in these disaster reconstruction cases. In order to fully understand the
subject matter, the case studies chapters also cover the regulations and guidelines on procurement and the cost/ time/ quality considerations of the reconstruction projects covered in the cases.

Chapter 8 presents the results of the research, analyses and discusses the data available from previous chapters, considers the implications of these data and uses them as a basis for further discussion and comparison on the themes of time/cost/quality, contractual relationships and procurement path, and procurement guidelines and regulations for post-disaster reconstruction.

Chapter 9 summarises the conclusions made in previous chapters and discusses the findings in chapter 8 and offers suggestions and recommendations to assist the selection of procurement and contractual arrangements for post-disaster reconstruction. Possible directions for future research are also discussed.
CHAPTER 2: LITERATURE REVIEW

2.1 Procurement Systems

2.1.1 Introduction

Whenever a construction project is conceptualized, a specific procurement method is selected to be associated with the project’s delivery. Though unconsciously implemented at an early stage before the Second World War, the conventional procurement system has dominated the construction market for over 150 years. Since then, numerous new forms of procurement have been developed and widely accepted by the construction industry over time, mainly as a result of willingness to change the poor performance within the industry and to catch up with the pace of development of new building technology.

Many attempts have been made to develop an appropriate definition for the term “procurement system”. A standard definition given by the International Council on Building (former French name: Conseil International du Bâtiment) (CIB W92) during its 1997 meeting was: “… a strategy to satisfy client’s development needs with respect to the provision of constructed facilities for a discrete life cycle”. McDermott (1999b) argued that this description should not only focus on the method used to design and construct the project, but should also include the cultural, managerial, economic, environmental and political issues raised by the implementation of the procurement process. In his work “A guide to best practice in construction procurement”, McDermott states that procurement system is the framework within which construction is brought about, acquired or obtained (McDermott, 1999b). While the importance of considering various aspects of procurement process should not be underrated, Masterman (2002a) is of the opinion that these should be treated as sub-elements of the project strategy rather than as integral part of the procurement system itself because the sub-elements by themselves do not have the ability to change the procurement systems but rather to affect the way in which they should be selected and used. Following the statement, a definition of a procurement system is given as the organisational structure adopted by the client for the implementation, and at times the eventual operation, of a project (Masterman, 2002a, p27). From “a strategy” to the “framework”, then the “organisational structure”; all these definitions seem too broad to some extent to be clearly comprehended. Therefore, in this section, a review of various types of procurement system is carried out to assist the understanding of what a procurement system is and how it is applied.
The choice of procurement systems available to the clients is now so wide that the need to carry out the selection of the most appropriate procurement method, and manage it, is becoming an objective discipline (Ive and Chang, 2007, Luu et al., 2003a). Because of its complexity, specialised knowledge of procurement systems is required and most engineering consultancy companies are currently including this as part of their practice. There are a number of ways for categorising the main procurement systems, such as by the risk taken by participating parties (Clamp and Cox, 1990), by the way in which the contractor is reimbursed, and by the relationship in which the interaction between the design and construction is managed (Masterman, 2002a). As the specific procurement system adopted is considered in the perspective of the overall project management process, it is natural to use the interaction level between the design and construction of an engineering project as a main indicator in order to differentiate between the chosen procurement systems and project delivery processes. Consequently, the building procurement systems can be categorised into four major types as shown in Table 1:

<table>
<thead>
<tr>
<th>Procurement systems</th>
<th>Characteristics</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated procurement systems</td>
<td>Design and construction are the responsibility of separate organisations; the Client fund, operate the facility and answer to all the project team members</td>
<td>Traditional system</td>
</tr>
<tr>
<td>Integrated procurement systems</td>
<td>One organisation, usually a contractor, taking responsibility for the design and construction; the client deals with one organisation</td>
<td>Design and build (D&amp;B);</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develop and construct; Turnkey; Package deals; BOT</td>
</tr>
<tr>
<td>Management-orientated procurement systems</td>
<td>The management of the project is carried out by an organisation working with all the parties involved; the client has a greater involvement than any other methods in previous two categories</td>
<td>Management Contracting; Construction Management; Design and manage</td>
</tr>
<tr>
<td>Discretionary (collaborative) procurement systems</td>
<td>The client lays down a framework for the overall administration of the project and uses the most appropriate of all procurement systems from the other three categories</td>
<td>Partnering; Alliancing; Joint venture</td>
</tr>
</tbody>
</table>

Table 1: Overview of different procurement systems (adapted from Masterman, 2002a)

The categorisation above emphasizes the importance of the interaction between the design and construction functions in the building procurement, which is a crucial factor to be considered when selecting the appropriate project delivery path. This categorisation method is widely
accepted and supported by other researchers in the field, such as Bower (2003) and Harris and McCaffer (2001).

2.1.2 Separated procurement systems

The act of building requires two basic phases firstly design and then construction. And as the name suggests, a unique feature of this type of procurement system is the separation between the design and construction functions within the project. Only one procurement system represents this category – ‘the traditional system’. Sometimes it can be used interchangeably with phrases such as “separated procurement system”, “traditional method” or “conventional procurement method”.

Given this separation, the process is essentially sequential. The architect or the client’s consultant is usually paid on a fee and expenses basis while the main contractor is reimbursed for the work completed in a milestone or lump-sum manner (Masterman, 2002c, Morledge et al., 2006, Walker and Hampson, 2003). Construction will only commence when most of the design information is available. In the majority of the cases, the design is completed before the construction begins so as to allow the time for the tendering process. Lack of communication between the client’s consultant and the contractor can be an issue in such a process. Insufficient engagement with each other’s activities will cause the variations and counter-claims between the client and the contractor at a later stage and may consequently cause a confrontational relationship between the contractual parties. The widespread use of the traditional procurement system has meant the acceptance of this hostile atmosphere almost as a business protocol. Contractors have to play the low-bid-wins game to secure their next job and use claims for additional reimbursement during the construction to increase the profit margin. This situation is not new and has been discussed by practitioners and researchers in the construction industry over decades (Egan, 1998, Latham, 1994, NBCC, 1989, Walker and Hampson, 2003, Chileshe and Watts, 2006, Pietroforte and Miller, 2002).

Despite this significant disadvantage, it remains as the most widely used approach. One reason for this is the certainty inherited from the usually fully-developed design before the tendering. It extends further to the certainty about the contract clauses, the lump-sum price, at least theoretically, and since it is “traditional”, this system is widely understood and accepted by the industry participants, and thus leads to the certainty of their respective responsibilities. Roles and responsibilities are known and well defined. The products from the traditional procurement system are usually of a higher degree of quality and satisfaction to the functional standards.
Provided the pre-tendering design is well-managed, proper competition can be ensured, and the selection of the bid would be the most advantageous to the client, being at a lower cost compared to the majority of other procurement methods.

The traditional procurement system involves discrete phases of project preparation, design development, preparing and obtaining tenders, evaluation and contract award, and construction delivery. A diagram adapted from the work of Masterman (2002a) showing the contractual and functional relationships between participants in a separated procurement system is presented in Figure 2:

As shown in Figure 2, the traditional procurement process begins with the client approaching the principal design consultant, usually an architect for building projects, or a design engineer for engineering projects. The client needs to discuss details with the design consultants and establish his/her requirements in principle, but not in detail, and they need to jointly select and appoint a design team (in some cases this appointment maybe left to a later stage), which will include at least an architect, and may also include a structural/civil engineer, a mechanical and an electrical engineer, and a quantity surveyor. The overall design is then developed to as close to completion as possible before tenders are invited. Open tendering allows anyone to participate while Closed or Pre-qualified tendering restricts main contractors to those invited firms that meet selected criteria such as financial soundness and relevant project experience. The selection of tenders in traditional procurement systems usually results in acceptance of the lowest “evaluated” fixed price being awarded the contract. However, as suggested earlier, the design is not usually completely
resolved at the tendering stage, which opens up opportunities for the contractor to claim for “extras” during the later construction delivery.

Thus the traditional procurement system is better suited to the following criteria. Given its consequential process, a project, from inception to the end of the construction, should not be time driven. The client should have a clear understanding of what he/she wants and successfully convey this information to its design consultant team. The consultant will need to have expertise in design and be aware of construction practice to prevent the “buildability” problems arisen in a later stage. The project will ideally be a standard process using mature technology without the client necessarily having any input in the construction phase since, in this case, “value for money” is achieved by competitive tender, rather than by working with the contractor in additional claims disputes. Nonetheless, the client should have a clear perception. This criterion is also necessary due to the susceptibility of the traditional system towards a high degree of change. The cost transparency under price-based contracts is relatively limited, thus leads to the difficulty in evaluating changes.

A table summarising the main features associated with the separated procurement system is included:

<table>
<thead>
<tr>
<th>1) Separated Procurement System</th>
<th>Description: Design and construction are the responsibility of separate organisations; the client fund, operates the facility and answers to all the project team members</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td><strong>Disadvantages</strong></td>
</tr>
<tr>
<td>• Certainty over design plans as they are usually fully-developed before tendering</td>
<td>• Construction will only commence when most of the design information is available → late commencement</td>
</tr>
<tr>
<td>• Certainty about the contract clauses, the lump-sum price, and responsibilities</td>
<td>• Lack of communication between the client’s consultant and the contractor</td>
</tr>
<tr>
<td>• Higher degree of quality and satisfaction to the functional standards</td>
<td>• Confrontational relationship between contractual parties</td>
</tr>
<tr>
<td>• Industry familiarity</td>
<td>• The cost transparency under price-based contracts is limited → vulnerable to a high degree of project changes</td>
</tr>
<tr>
<td></td>
<td>• Longer time required → higher costs</td>
</tr>
</tbody>
</table>

**Suitability:**
- The project should not be time-driven
- The client should have a clear understanding of the project design
- The client or its consultant has to have greater expertise in the field to prevent ‘buildability’ problems arising during the construction stage
- The project would ideally be a standard process using mature technology
- There is no requirement of client involvement in the construction stage

Table 2: Main features associated with Separated Procurement System
2.1.3 Integrated procurement systems

The feature of this category of procurement methods is the integration of the responsibility under one organisation in managing both design and construction phases in project delivery. The main member of the integrated systems is the Design and Build (D&B). Others are: Novated D&B, Package deal, Develop and Construct and Turnkey methods (Brusn, 2004, Chileshe and Watts, 2006).

To give a general idea about the integrated procurement systems for the purpose of this research, the definition developed by Masterman (2002a, p67) is given as “… an arrangement where one contracting organisation takes sole responsibility, normally on a lump-sum fixed price basis, for the bespoke design and construction of a client’s project”. Walker and Rowlinson (2008) state that this procurement approach provides for an organisation to be contracted by a client to manage the design and construction processes with a single point of contact.

General speaking, “Turnkey contracting” is more likely to be referred to in the power, process, and heavy engineering industries. The term “D&B” is used in the building industry, when being applied in a more general civil engineering context, “Design and Construct” are sometimes used interchangeably with “D&B”. Another variant of the method, “Package deal”, has been used in the building industry for many years as a one-for-all term covering D&B, develop and construct and turnkey contracting. However, there are nuances between these definitions: D&B tends to use more functional specifications in which the client designs an outline plan and states the functional requirements that the assets have to meet, while Turnkey contracting tends to use performance specifications in which the level of performance can be quantified; in addition, the Turnkey contractor usually supplies D&B services and also finances the project. When the duties of the contractor extend further to include the selection of the most suitable site for construction, the obtaining of planning permission from the appropriate authorities and sometimes even the financing of the project until handover, this method is usually called a “package deal” or “develop and build/construct”. The popular Build-Own-Operate-Transfer (BOOT) family of contractual models fall into this category and will be introduced in more detail in later sections.

As is evidenced from a series of surveys carried out by researchers and institutions through years, integrated procurement systems are currently eliciting greater attention from practitioners and acquiring an increasing share of the market. One example is the biennial survey (Davis et al., 2000) from the Royal Institution of Chartered Surveyors (RICS) which confirmed that the value of the contracts using the integrated systems in UK had increased from 5.1% in 1984 to 41.4% in
1998. Similar conclusions can be found in other works published under the international context (Moore, 1984, Bennett et al., 1996, Boudjabeur, 1997, Henderson, 2004). This popularity has been gained partially due to the system’s simplified structure and straightforward process. As can be seen from Figure 3, both contractual and functional relationships generated from design and construction are centralised into the sole responsibility of one organisation – the D&B contractor in the central of the diagram.

![Figure 3: Integrated procurement system’s contractual and functional relationship](image)

It is generally agreed that there are three major advantages associated with the integrated procurement system: speed, reduced cost and single-point responsibility, although individual cases may vary. The project duration is understandably shortened with the overlap between design and construction functions. The report (Bennett et al., 1996) carried out by Reading University found that projects using the D&B procurement method are 50% more likely to be completed within schedule than those with traditional systems. Single-point responsibility is self-evident as communication routes are minimised between the two major functions and the procedure is thus simplified. Single-point contact is believed to be the main benefit of D&B, outweighing the likely savings in time and cost (Turner, 1995). As for the aspect of cost, evidence is widely available from various researches to support the belief that the cost of D&B is lower than that of those using other procurement systems, basically as a result of diminished design costs, the integration of the design and construction elements and the in-built buildability of the detailed design (Masterman, 2002b, Migliaccio et al., 2009). The remaining factor that has not been mentioned so far within the classical triangle of time, cost and quality, is the quality, or functionality of D&B projects. There is less evidence or relevant literature on the quality aspect of D&B projects compared to projects following other procurement routes. Bennett et al. (1996) reported that the system performs better in terms of quality on complex and innovative buildings than on simpler
developments. So, the functional performance associated with D&B products does not seem directly relevant to their procurement choices. This is also confirmed by more recent researches (Ling and Chong, 2005).

Despite the benefits of shortened duration, reduced cost and single-point communication, there are several disadvantages pertaining to general integrated procurement systems that are also worth noting: as pointed out by Masterman (2002a), the brief given by client to the contractor tends to be ambiguous and not precisely specified, which may later result in difficulties when evaluating proposals and tender submissions. The other disadvantage for clients to this system is the restriction of variations to projects in the post contract period due to the absence of a bill of quantities. Constraints on client control in determining favoured methods of design and the aesthetical aspects of the project also present as another shortcoming of the system. So, after considering all the above characteristics, the conclusion could be safely drawn that integrated procurement systems would be suitable for those projects with 1) a tight schedule, 2) a high price certainty is required, and 3) the contractor is more experienced with design work and in managing similar kinds of projects. To avoid some of the disadvantages above-mentioned, it is suggested that the client should, from the outset of the project, know what he/she requires, express this requirement clearly to the contractor by giving an outline of design and/or specification of performance and function, work closely with the contractor and subcontractors to develop the design and project delivery plan before the contract is let, and adopt a more “hands-off” approach once the construction commences.

The main features associated with the integrated procurement system are summarised in Table 3:
2) Integrated Procurement System

**Description:** One organisation, usually a contractor, taking responsibility for the design and construction; the client deals with one organisation

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>- The project duration is shortened with the overlap between design and construction</td>
<td>- The client’s brief to the contractor needs to be clear and precisely specified</td>
</tr>
<tr>
<td>- Reduced cost</td>
<td>- Difficulties when evaluating proposals and tender submissions (designs are different)</td>
</tr>
<tr>
<td>- Single-point responsibility → communication routes are minimised between design and construction → procedure is simplified</td>
<td>- Restriction of variations to projects post-contract due to the absence of a BoQ (bill of quantities)</td>
</tr>
<tr>
<td>- Industry familiarity</td>
<td>- Constraints on the control by clients in determining favoured methods of design and aesthetical aspects of the project</td>
</tr>
<tr>
<td></td>
<td>- Lack of checks and balances may lead to lower quality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Suitability:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- A project with a tight schedule</td>
</tr>
<tr>
<td>- A project requiring a high price certainty</td>
</tr>
<tr>
<td>- The contractor is more experienced with design work and managing similar kind of projects</td>
</tr>
<tr>
<td>- Typical construction where standardised techniques and materials are to be used</td>
</tr>
<tr>
<td>- The scope of project is clearly defined</td>
</tr>
</tbody>
</table>

Table 3: Main features associated with Integrated Procurement System

### 2.1.4 Management-orientated procurement systems

The increasing use of management-orientated procurement systems in the last three decades can be seen as a new trend. The need for greater control of project cost and the client requirement of higher standards of quality, together with the demand of earlier commencement and completion times, are the major drivers contributing to the popularity of management contract routes (Donohoe and Brooks, 2007). A definition of “management contracts” given by Broome (2002, p79) is “the management contracts are those in which the client employs a contractor as a management professional, on a fee basis, to manage on its behalf the different work packages that make up a project”. This definition of management contracts also reflects some of the main features of the framework i.e. the management-orientated procurement systems, within which those contracts are delivered. A major characteristic of this category of procurement system is the elevation of status of the contractor to a role more like that of a consultant to the client, which distinguishes it from any other procurement systems mentioned previously (Walker and Rowlinson, 2008).
The contractor within this category does little of physical work and it is paid on a fee basis. The physical work is organised into packages and contracted out to subcontractors on a price-based, lump sum, or bill of quantities-based contract. Recently, cost-reimbursable, or target contracts have also been used for more innovative projects (Ward et al., 1991). The designer is subcontracted to the contractor or is in direct contract with the client but reports to the contractor. Three methods of procurement within this category consist of: 1) Management contracting approach, 2) Construction management approach, and 3) Design and management approach (Masterman, 2002c, Naoum and Langford, 1987).

As can be seen from the left half of the Figure 4, in the first and most popular type of management procurement system – management contracting, the centre of the relationship network is the role taken by the management contractor as it sits in between the role of the client and the physical work contractors (also referred to as “construction contractors” or “specialist contractors”). The management contractor is reimbursed by the client for the contractual prices of the specialist work packages and some of the associated administrative costs, plus a fee, usually a percentage of cost or in a fixed sum (Naoum and Langford, 1984). Also in the management contracting diagram, there are two dotted lines indicating the alternative relationships between client and designer or management contractor and designer. Although the choice is the client’s, understandably the contractor would prefer the latter relationship as, in this case, the designer is directly subcontracted to the contractor and thus the control and communication within the system can be centralized to that contractor. Alternatively, the designer will follow the traditional way and tend to communicate and report to the client, which may result in confusion of responsibility. To avoid...
this, sometimes the design work is carried out by the contractor’s internal team thus creating the third type of procurement system within this category, design and management.

In the construction management approach, shown on the right of the above diagram, the management contractor is contractually engaged by the client as a management consultant while all the other parties within the system, including the subcontractors, are in a direct contract with the client. The involvement level of the client or its consultants varies depending on the client’s experience in project management and the balance between client and the teams working for the contractor.

Management contracting became very popular in the mid-1980s but started to decline in popularity in the early 1990s and as a result of that, the market share of the other approach, construction management is gradually growing (Broome, 2002). It is supported by the results of some other surveys on this matter (Davis et al., 2000, Elton, 1985, Naoum, 1988). Broome (2002) attributes this popularity shift from management contracting to construction management to several reasons: Firstly, since the management contractor has a contractual position to defend if the subcontractor does not perform, it tends to pass on its own risks of asset performance and delivery time, etc. down the supply chain on to the work subcontractors; Also, from a contractual position the management contractor’s major concern is what his/her rights are if the client changes the plan or does not perform and how to allow for such events under the scope of the contract in order to escape damages rather than simply solving the problem with minimum impact. Since a traditional cultural or attitudinal reluctance exists among the staff of some contractors to act in the client’s best interests rather than working against it may also contributes to the downward trend of the management contracting. On the other hand, the client has more involvement in the project delivery in the construction management model. The subcontractors are directly contracted to the client, which means that payment is generally made more quickly and is more secure and the specialist contractor’s input can be easily incorporated into the project through the direct lines of communication. Having a clear distinction between the professional, contractual and commercial roles of the construction manager means that he/she is likely to act in a more professional way when representing the client (Walker and Hampson, 2003).

However, it should be noted that some advantages of the construction management procurement route come with the precondition that the client is willing, and has the expertise, to be actively involved in the project. There is another aspect needing to be mentioned concerning the management contracting method and that is the importance of the management contractor’s role
in contractual relationships. In addition this may give the management contracting method an advantage over construction management method (Olashore, 1986) because when the asset does not perform, the contractor can be held liable.

In conclusion, a construction management approach is more suitable for the client when the performance requirements are not yet well defined. When the certainty of the requirements is assured, the client may choose to change from the management contracting method to a D&B procurement route if he/she is willing to take a more “hands off” approach. Management-orientated procurement systems are generally more suitable for: 1) complex projects involving numerous different specialist subcontractors; 2) when the client does not have sufficient resources to manage the project itself; and 3) the project is on a tight schedule and clear functional or performance requirements are not easily available to the client at project commencement (Naoum and Langford, 1987).

Similarly, the features of the management-orientated procurement system are summarised in the following Table 4:

<table>
<thead>
<tr>
<th>3) Management-orientated Procurement System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: The management of the project is carried out by an organisation working with all the parties involved; the client has a greater involvement than in either of the other methods in previous two categories; the role of the contractor is elevated to a consultant to the client</td>
</tr>
<tr>
<td>Advantages</td>
</tr>
<tr>
<td>• More readily response to the client’s needs</td>
</tr>
<tr>
<td>• Accelerated commencement and completion</td>
</tr>
<tr>
<td>• Single-point interaction with the client</td>
</tr>
<tr>
<td>• Construction expertise of the contractor is encouraged in the design</td>
</tr>
<tr>
<td>• Clear distinction between the professional, contractual and commercial roles of the construction manager</td>
</tr>
<tr>
<td>• The payment is quicker and more secure when subcontractors are directly contracted with the client</td>
</tr>
<tr>
<td>Suitability:</td>
</tr>
<tr>
<td>• Complex projects involving numerous different specialist subcontractors</td>
</tr>
<tr>
<td>• Client does not have sufficient resources to manage the project itself</td>
</tr>
<tr>
<td>• The project is on a tight schedule</td>
</tr>
<tr>
<td>• Clear performance or functional requirements are not easily available to the client at project commencement</td>
</tr>
</tbody>
</table>

Table 4: Main features associated with Management-orientated Procurement System
2.1.5 Discretionary (collaborative) procurement systems

In previously introduced procurement systems, the categorisation is only achieved by analysing how the interactions between design and construction phases were managed. However, some newly emerging procurement methods, or to be accurate, project delivery environments, such as Partnering, do not fall into any category mentioned so far. As implied by the name, the discretionary procurement systems are the ones in which the client should have the discretion to use any system from the other categories, either singly or in combination for its project management purposes. It is rather an “administrative and cultural framework into which any procurement system(s) can be incorporated” and partnering methods within this category are “…not, in reality, a procurement system but rather a means of controlling the project environment (Masterman, 2002c, p131)”. Unlike previously introduced procurement systems, specific procurement processes and contractual models involved in the discretionary procurement systems category are uncertain. They are dependent on the individual needs and creativity of the particular client. However, there is a general trend that a more collaborative relationship between participating parties is involved in this procurement system. Sometimes this system may also be referred to as “a collaborative procurement system”, “relational procurement”, “relationship-based procurement” or, “relationship contracting”.

In this section, the major focus will be on the introduction of project partnering and strategic partnering methods as examples of discretionary procurement systems, the relevant literature, the individual characteristics and the processes involved in the systems, and some key points regarding their implementation.

It is generally accepted that the concept of partnering comes from the Japanese construction industry with technical features such as “total quality management”, “lean construction”, etc (Baden Hellard R., 1995). But its popularity in the western world has been gained from its introduction and industry practices in the USA (e.g. CII, 1991). In the UK, Sir Michael Latham’s 1994 report first drew attention to the benefits of partnering, he stated his committee’s confidence that partnering can bring significant benefits by improving the quality and timeliness of completion while reducing costs (Latham, 1994). The following year, the Reading University based Centre for Strategic Studies in Construction published its guide: Trust the team: the best practice guide to partnering in construction (Bennett and Jayes, 1995). It included a triangle illustration that quite neatly summed up the Centre’s thinking on partnering at the time, which was later referred to as the three fundamental elements of the partnering: Mutual Objectives,
Continuous Improvement and Problem Resolution. The idea was adopted and expanded by the Construction Industry Board (CIB) to form its brief and widely quoted definition of the partnering as “… a structured management approach to facilitate team-working across contractual boundaries. Its fundamental components are mutual objectives, agreed problem resolution methods and an active search for continuous measurable improvements (CIB, 1998)”. Bennett and Jayes (1998), with the Reading Construction Forum, published their second report on partnering – The seven pillars of partnering – a guide to second generation partnering, which focused primarily on strategic partnering arrangements stretching over multiple projects. Seven pillars, as stated in the report, the basic components to successful partnering are illustrated in Figure 5:

![Figure 5: Seven pillars of partnering (Bennett and Jayes, 1998)](image)

In the same year, another report (Egan, 1998) titled “Rethinking Construction”, published by the Construction Task Force headed by Sir John Egan has had a major impact on the modern literatures of partnering procurement. From his experiences as the chairman of Jaguar, his report emphasizes the need for many of the principles and production techniques used in the car industry to be taken up by the construction industry, among those are total quality management, lean production principles, integrated supply chains, greater standardization and prefabrication, increased use of information technology, etc. It headed a new trend in construction procurement, but it also caused controversial debate from other researchers in the industry. The main criticism of the report was that, “apart from ‘wait and see’, it provided little guidance on how these principles and processes might be applied to the one-off or occasional client (Broome, 2002, p13)” that dominates the construction market.

It is essential to understand that partnering is a framework within which the procurement systems operate in a more beneficial way to all the contracting parties. It is a voluntary arrangement and has no legal binding power upon any of the parties (Phua, 2006). There are two types of
partnering: *strategic partnering* and *project partnering*. Most of the advantages are expected to be maximized when utilizing the strategic partnering method through a continuous partnering improvement circle, but the majority of construction projects is likely to be in a one-off nature and would thus be more suitable for implementation in a project partnering approach. A diagram showing the process is included below. It could be divided into three stages as *Decision making* – incorporating mutual objectives, *Establishment of working practices* – through first workshop to formulate a partnering charter, and the, *Implementing phase*.

![Diagram of project partnering process](image)

**Figure 6: The project partnering process (Masterman, 2002c)**

The success of project partnering may bring in an opportunity for the parties involved to take a further step towards future cooperation and form a strategic partnering relationship. This usually involves long term partnering practices by two organisations on a series of construction projects (Chan et al., 2007). Several case studies (Chan et al., 2003, Jones and Kaluarachchi, 2007, Sohail and Baldwin, 2001) examining the procurement and contractual arrangements used in strategic partnering came out with a wide range of available choices: procurement methods included traditional, design and build and management contracting; awards made on a negotiated or competitive basis; and in some cases, contractor partners were appointed to carry out a share of the total long-term workload. There are many approaches that can be used in strategic partnering depending on the client’s culture, circumstances and needs. It could be seen as a series of project partnering processes combined together but is definitely more complicated than simply repeats as the situation varies from case to case.

As a new procurement implementation framework, the partnering method has drawn a great deal of attention and interest from researchers and practitioners. However, it should be noted that it is not a one-for-all solution for the construction market. To quote the CIB Working Group 12 (CIB,
1997), “Partnering … should not be confused with … long standing relationship, negotiated contracts, or preferred supplier relationships, all of which lack the structure and objective measures that must support a partnering relationship”. Broome concluded in his book, “Procurement routes for partnering”, that from a business point of view, “it is only worthwhile partnering or investing in cultural change and integrating processes and teams if there is sufficient interaction over a period of time to generate returns that allow a payback on investment for all parties (Broome, 2002, p28)”.

Many advantages have been observed with the implementation of partnering methods, and reported through researches and surveys worldwide. The emphasis was given to reductions in cost and time, improved quality, less conflict, effective communication, more efficient working and greater productivity. When strategic partnering methods are feasible, an increased amount of innovative development and reduced tendering costs from the partner contractor can be expected (Chan et al., 2007, Kadefors et al., 2007, Walker and Rowlinson, 2008).

Potential problems are also associated with partnering: There is always the possibility that the client will not be able, or not wish to comply with the arrangements made at the commencement stage of the partnering; additional costs will be required to hold workshops and train staff, etc; maintaining the commitment level of the staff within the partnering organisations before the profits are evident could be problematic; and in the strategic partnering practice where long term procurement and milestone contracts are needed, these elements could be complicated by the need to comply with competition law to satisfy public accountability (Jones and Kaluarachchi, 2007, Chan et al., 2003, Eriksson et al., 2008, Lu and Yan, 2007), especially in the case where a government body is the client in a disaster reconstruction situation.

Similar concepts and characteristics can be observed from the implementation of other types of collaborative procurement systems in this category, these may include the alliancing and joint venture methods used for high-value and complicated construction projects, such as infrastructure development ones. Eriksson and Westerberg (2011) examined how a broad range of procurement related factors affects project performance criteria. They put forward propositions suggesting that cooperative procurement procedures (joint specification, selected tendering, soft parameters in bid evaluation, joint subcontractor selection, incentive based payment, collaborative tools, and contractor self-control) generally have a positive influence on project performance when these relationships are moderated or mediated by the collaborative climate (i.e. the trust and commitment among partners) in the project and moderated by the overall project characteristics.
(i.e. how challenging the project is in terms of complexity, customization, uncertainty, value/size, and time pressure).

It should be noted that within the collaborative procurement system itself, significant differences between project partnering and project alliancing occur in the selection process, management structure of the organisations undertaking the project and nature of risk and reward incentives (Walker et al., 2002). A core issue that differentiates between the two approaches is that in partnering, partners may reap rewards at the expense of other partners. In alliancing each alliance member places their profit margin and reward structure “at risk”. Thus in alliancing, the entire alliance entity either benefits together or not at all. This changes the motivation and dynamics of relationship between alliance members. Partners in a partnering arrangement may and often do make varying profit levels and indeed some partners in such arrangements may well make a substantial financial loss. Gains and losses are severally but not jointly allocated. Project alliancing is different from partnering in that it is more all-embracing in its means for achieving unity of purpose between project teams. It could be seen as alliancing partners coalescing into a virtual company. Alliancing is at an even higher level than cooperation and collaboration. Alliancing may be seen as the highest level of mutual commitment where benefits and risks are treated as a whole-of-alliance concern (Walker and Keniger, 2002, Davis and Walker, 2008).

In summary, the discretionary procurement systems provide the client with an alternative platform on which to form a collaborative team-working environment with other participating parties towards the commonly agreed objectives of a project in order to result in a win-win situation for the stakeholders. In practice, the use of this type of procurement system has high requirements for all parties. These involve the organisational culture, overall circumstances, agreed dispute resolution methods and satisfactory measurable improvements along the project delivery.

The collaborative procurement system is summarised in Table 5:
4) Discretionary (Collaborative) Procurement System

Description: The client lays down a framework for the overall administration of the project and uses the most appropriate combination of the procurement systems from the other three categories; It is rather an administrative and cultural framework into which any procurement system(s) can be incorporated.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduced cost and time</td>
<td>• Industry familiarity is low</td>
</tr>
<tr>
<td>• Improved quality</td>
<td>• The client may not be able, or not wish to comply with the initially agreed arrangements during its implementation</td>
</tr>
<tr>
<td>• Effective communication → less conflicts</td>
<td>• Additional costs will be required to hold workshops and train staff</td>
</tr>
<tr>
<td>• Efficient working and greater productivity</td>
<td>• Before the profits are evident, it would be problematic to maintain the staff commitment level</td>
</tr>
</tbody>
</table>

When strategic relationship is formed:
| • Increased amount of innovative development | • Confidentiality could be compromised with shared information between organisations |
| • Reduced tendering costs from the partner contractors | When long-term strategic relationship is formed: |
| | • The need for long-term procurement and milestone contracts could be complicated by the need to comply with competition law to satisfy public accountability. |

Suitability: • Typically used on larger and more complex projects where there is a large amount of uncertainty as the size and duration of the project has to justify the investment in setting it up both commercially and culturally • The participating organisations need to develop and nurture a culture of collaboration throughout the system beforehand in order to manage such projects

Table 5: Main features associated with discretionary (collaborative) procurement system

2.1.6 Procurement systems used in NZ

New Zealand procurement systems have been well established and developed following the examples from generally recognised international models, such as the ones previously introduced in this chapter. As in many other countries, a variety of contractual relationships for the procurement of construction projects are widely applied within New Zealand construction industry. As defined in Best Practice Procurement (NZCIC, 2004), a discussion document issued by New Zealand Construction Industry Council, procurement is the phrase given to the process by which clients and users achieve their construction aims, but it is more than just construction procurement, covering the process from initial concept planning and design through to, development, construction, maintenance and ongoing monitoring of performance (NZCIC, 2004). Procurement is critical as it determines the overall framework for construction, embracing the
structure of responsibilities, risks, and sources of authority for construction practitioners. This structure is especially important for the smooth delivery of post-disaster reconstruction because, if due consideration has been given to the structure, adherence to it will assist with rapid recovery of damaged communities.

Procurement systems can be represented by Broome’s model of a procurement continuum, categorised by different contractual relationships among the parties involved, especially the relationship between the Principal and the Contractor.

<table>
<thead>
<tr>
<th>Incentives</th>
<th>Traditional contracting</th>
<th>Informal partnering</th>
<th>First generation</th>
<th>Target cost contracts</th>
<th>Project alliance</th>
<th>Strategic alliances</th>
<th>Joint ventures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• selection by lowest price</td>
<td>• selection on value</td>
<td>• selection on value</td>
<td>• negotiated</td>
<td>• supplier involvement</td>
<td>• integrated</td>
<td>• integrated processes</td>
<td></td>
</tr>
<tr>
<td>• confrontational</td>
<td>• confrontational</td>
<td>• confrontational</td>
<td>• price</td>
<td>• involvement prior to</td>
<td>processes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• claims oriented</td>
<td>• claims oriented</td>
<td>• claims oriented</td>
<td>• workshop</td>
<td>• sanction</td>
<td>benchmark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• legal challenge</td>
<td>• legal challenge</td>
<td>• legal challenge</td>
<td>• cultural change</td>
<td>• open book</td>
<td>-ing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• contract</td>
<td>• contract</td>
<td>• contract</td>
<td>• change</td>
<td>• accounting and</td>
<td>partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• negotiation</td>
<td>• negotiation</td>
<td>• negotiation</td>
<td>• sharing</td>
<td>• reimbursement</td>
<td>may</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• third party</td>
<td>• third party</td>
<td>• third party</td>
<td>• rewards</td>
<td></td>
<td>market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• product</td>
<td>• product</td>
<td>• product</td>
<td>• integrated</td>
<td></td>
<td>‘product’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• success</td>
<td>• success</td>
<td>• success</td>
<td>• teams</td>
<td></td>
<td>together</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6: Procurement relationship arrangements adapted from procurement continuum produced by Broome (2002, p14)

According to Broome’s model, contractual systems can be generally divided into transactional contracts and relationship contracts. A purely transactional contract is one where the client specifies all the requirements of a project, this will define not only the practicalities of the project such as what is required but also the individual requirements of each project participant will be outlined (Henderson, 2004). This form of contract is commonly termed as a “Traditional” or “Multi-point” contract, using, in New Zealand the common standard contract conditions of NZS3910:2003. Compared to this, at the other end of the procurement spectrum are relationship-focused contracts, such as “Project Alliance” and “Joint Ventures” with an emphasis on the way the contributing parties working together to procure the project, and it is not a contract form (Broome, 2002). According to NZCIC’s report (2004), many problems facing the construction sector in New Zealand, such as focusing on costs over value, constrained innovation, inappropriate risk allocation, unsustainable market, can be addressed with a procurement shift from the left side to the right side of Broome’s model.

A survey (Henderson, 2004) established the proportions of the major forms of contractual relationships being used in New Zealand construction as illustrated in Figure 7:
It can be seen that ‘traditional’ contractual relationship still dominates the New Zealand construction industry. However, the use of the pure partnering method and the combination methods with traditional tender occupy 7% and 19% of the total respectively, which suggests an increasing understanding and use of the newer forms of procurement. This is also supported by Shestakova (2005). As she states in her master’s thesis, with regard to the use of collaborative procurement systems in the New Zealand construction market, the majority of the New Zealand construction projects are procured in traditional form with fewer, but still a considerable number of projects, being delivered under the integrated procurement system, especially in the design-and-build format. A smaller number of projects are carried out in the management-orientated procurement form. Her research also reveals that there has been a trend in the New Zealand construction industry, especially among big construction companies and the public sector, towards adopting more relationship-based procurement strategies, such as partnering, alliancing and joint ventures (Shestakova, 2005).

2.1.7 Summary of Procurement Systems and other relevant issues

A procurement system is a strategy to satisfy client’s development needs with respect to the provision of constructed facilities for a discrete life cycle (CIB W92, 1997). The description of the procurement system should not only focus on the method used to design and construct the project, but should also include the cultural, managerial, economic, environmental and political issues raised by the implementation of the procurement process. It is the organisational structure adopted by the client for the implementation and operation of a project (McDermott, 1999c, Masterman, 2002a).

According to the different relationships in which the interaction of design and construction is managed, the building procurement systems are categorised into 4 groups. They are: 1) Separated procurement system; 2) Integrated procurement system; 3) Management-orientated procurement
system; and 4) Discretionary (collaborative) procurement system. The features of these procurement systems, including their advantages, disadvantages and suitability, are summarized at the end of previous relevant sections.

It is worth noting that the first three categories of procurement systems still dominate the construction market, while the last collaborative procurement system is rather more like an administrative framework/ environment within which any procurement system(s) can be incorporated to serve for the best interests of the project. It will allow the client to carry out the project by imposing a specific management style or company culture while make the full use of all the procurement methods available.

Besides the choice of a particular procurement path for a certain construction project, there are other issues that need to be considered by the client or the project manager in the broader project management context, which inevitably influence the procurement decision and the overall project delivery. These include the concepts of value proposition (Pil and Holweg, 2006, Anderson et al., 2006, Bradley, 2006), ethic and governance (e.g. Triple-bottom-line, 3BL in Elkington, 1997, Walker et al., 2008c), leadership, culture and stakeholder engagement (Walker et al., 2008b, House et al., 2002, Javidan et al., 2005, Steinfort and Walker, 2008), trust, and risk and uncertainty issues (Eriksson and Westerberg, 2011, Walker and Loosemore, 2003).

Customer value proposition theory argues for seeing value creation, such as those associated with the right choice of procurement path for a certain project, as multidirectional rather than linear. Given the constant tension between opportunity and threat, companies need to explore opportunities for managing risks, gaining additional influence over customer demand and generating new ways to create customer value (Pil and Holweg, 2006). Anderson et al (2006) indentify three different ways of custom value proposition – all benefits, favorable points of difference, and the best-practice ones which base their value proposition on the few elements that matter most to target customers, demonstrate the value of this superior performance, and communicate it in a way that conveys a sophisticated understanding of the customer’s business priorities. This is partially reflected in Table 20 - Indentifying the client’s priorities.

The ethic consideration, such as the 3BL concept came to the forefront of PM thinking with Elkington (1997) arguing that organisations should report performance in more than purely financial terms because this does not fully adequately address the value proposition of significant stakeholders. The second two “bottom lines” are social and environmental. Because the
businesses in general is to serve society by delivering goods and services, and the environment also sustains business activity, so any activity that harms the social and environmental bottom lines can potentially harm existing and future markets (Walker et al., 2008c). Increasingly, sustainability in 3BL is becoming a major part of project procurement criteria, which is a crucial factor to be considered among engaging stakeholders, especially in post-disaster reconstructions, such as in the case studies chapters.

The culture difference is another important factor to be considered in managing international procurement in large construction projects, or transferring knowledge gained from international case studies to the local reality. Javidan et al (2005) argue that cultural differences do not per se create problems; rather it is the way that cultural differences are managed that often results in poor knowledge transfer outcomes. If managed effectively, cultural differences can be a source of synergy and a stimulus for mutual learning. So the message to project managers is not to automatically shy away from cross-border situations in knowledge transfer. Instead, they need to take a proactive and systematic approach to dealing with cultural differences. The cooperating parties need to define their common goals in the transfer and their success criteria, need to understand and discuss their potential cultural challenges, need to ensure they have proper management of the relationship, and need to treat every case of cross-border knowledge transfer as a learning opportunity to improve their chances for the next time (Javidan et al., 2005). The GLOBE project measured the culture difference in 9 variables/factors (House et al., 2002) of power distance, in-group collectivism, institutional collectivism, uncertainty avoidance, future orientation, gender egalitarianism, assertiveness, humane orientation, and performance orientation.

Stakeholder identification, management and engagement are recognized as key project management skills that are relevant to the final procurement decision. It is also interconnected with the culture, leadership and value proposition theories. After considering the five dimensions in Stoney and Winstanley framework of the stakeholder’s ontological positions (Stoney and Winstanley, 2001), Walker et al (2008b) divided stakeholders into 4 groups: upstream stakeholders, comprising the paying customers and end users of the product/service; downstream stakeholders, including suppliers and subcontractors; external stakeholders, comprising the general community and independent concerned individuals or groups who feel that they will be affected by the project and its outcomes; and the project stakeholder group comprising the project sponsor or client as well as the project delivery team.
As introduced in the collaborative procurement systems, trust relationship between the contracting parties is the cornerstone to the success of the project. A special edition on trust in the 1998 ‘Special Edition Issue of the Academy of Management Review volume 23 number 3’ provides some useful literature to understand the concept. Mayer et al (1995) identify three factors that support trustworthiness: ability, benevolence and integrity. Ability means the capacity to do something, benevolence refers to intentions, and integrity refers to coherence between what is promised and what is delivered. These factors are in turn shaped by the trustor’s propensity to place trust in the entity to be trusted (Walker et al., 2008a). This is also reflected in a kind of trust bank process described by Walker and Hampson (2003, p199). The stability of the relationship makes sense in a project management context with changes in trust strength occurring during different project phases when parties have shifting ability to perform various trust tasks as their influence changes with the importance of their involvement (Inkpen and Beamish, 1997).

Risk and uncertainty factors are also crucial to consider when choosing a certain procurement path to suit a construction project. Relevant literature is easily available in most of the mainstream project management journals, books, and standards (e.g. Narasimhan, 2008, Regan and Pate-Cornell, 1997, Steed, 2000). However, it felt relevant here to briefly define the terms and the general risk management strategies in a project management context. In plain language, risk is a measure of something likely to happen in the future. Uncertainty is recognition that all is not known (Walker and Rowlinson, 2008). Standard/classic risk management approach/strategy includes detection, diagnosis, decision making, implementation, recovery, learning and monitoring (Loosemore, 2000). Similar set of principles is reflected in various risk management standards but in slightly different terms, such as communicate and consult, establish context, risk identification, analysis, evaluation, and treatment, and monitor and review in AS/NZS 4360:2004 or the 6-step approach in the PMI standard: Risk Management Planning, Risk Identification, Qualitative Risk Analysis, Quantitative Risk Analysis, Risk Response Planning, and Risk Monitoring and Control. These are also relevant to the hazard and disaster management literature in the next chapter.

2.2 Contractual models

In the previous section, all the major procurement systems have been reviewed and categorised into 4 different groups. When implemented, the procurement choice made by the client is embodied in a certain type of contractual model. Compared to the overall procurement system,
within which the organisational structure of participating parties are established, specific contractual models are needed for the practical implementation of the project and the administration of contractual relationships among stakeholders.

This section will delve more deeply into the literature of contractual models based on the outer layer of procurement systems. Some of these have already been touched on in previous sections as specific examples of general procurement systems. In this section, the most significant examples of contractual models will be reviewed from a horizontal perspective with a construction cost continuum for project delivery as developed by Walker and Hampson (2003). Any contractual model would fit into this continuum somewhere between its two ends of the traditional lump-sum and the full cost reimbursable according to different levels of cost risk distribution between the client and the contractor.

The risk that has been discussed here is mainly associated with the cost aspect of the contracting parties. When adopting a traditional lump-sum model at the left end of the continuum, all risk is absorbed by the contractor with the initial tender cost being fixed, thus any additional cost incurred during the project delivery will need to be met by the contractor. Alternatively, the client can share a certain level of cost risk and move to the right hand side of the continuum by allowing variable sum contracts or by adopting an ‘open book’ philosophy in which incurred cost is verified and reimbursed or a schedule of agreed rates is achieved. In the following sections of this sub-chapter, some important representatives of the contractual models will be introduced and discussed. Some of them have already been reviewed previously under the introduction of procurement systems, so in this section they will only be briefly discussed or compared while the others will be discussed in detail.

Figure 8: construction cost continuum (summarized from Walker and Hampson, 2003)
2.2.1 Traditional lump sum

As previously mentioned, in separated procurement systems, the traditional lump sum is the most commonly used contractual model within the industry. The whole process follows the classical separated route of design development, tender, contract award and construction delivery.

Design is supposed to be finished before tenders are invited, when it comes to the tender phase, three options are available to cater for the needs of different projects: open, pre-qualified or negotiated tendering. Theoretically, design is completed before tender, thus the construction cost is assumed “fixed”. However, in practice, the design is almost never complete before construction begins, except in very simple and straightforward small projects. Many opportunities are opened up for requests for variations from the client and claims for extras from the contractor. This situation is not new and has been the subject for discussion over decades by the practitioners and researchers within the construction industry. Much of the criticism of this model centres round the fact is that it invites a confrontational approach over disputes. “An entire claims industry has developed over past decades to advise contractors on how to claim for extra work, and from client representatives on how to counter such claims (Walker and Hampson, 2003, p14)”.

The level of familiarity with this model for most contractors and clients contributes largely to its popularity. None of the parties particularly like “the game” as played but each at least knows the rules. Latham’s report (1994) also attributed it to the apparent attractions of traditional model’s “cheapest price” or delivering the “market” price. Even recently, there are reports in favour of its certainty on cost. For example, Langford et al. (2003) conducted a research in UK and the results of the analysis indicated that in roadworks the construction cost per kilometre of road is some 11% less expensive when lump sum contracts are used. Of greater significance is the cost certainty that is afforded using the lump sum methods. The research showed that lump sum projects are much more likely to be completed within the budget.

The detailed analysis of its contractual and functional relationships is carried out in the previous section of separated procurement systems.

2.2.2 BOOT family of total package

In the integrated procurement systems category, besides D&B, Develop and Construct, Turnkey and Package deals, a major variant of total package options exists – BOOT family. This group of
models is becoming increasingly popular in PPP (Public Private Partnership) or PFI (Private Finance Initiative) types of projects. In the BOO, BOT, BOOT, the “B” represents the word “build”, the first “O” as “operate” and the second “O” as “own” and the “T” as “transfer”.

Contractors usually became involved as part of a consortium to guarantee involvement in the construction work. During the process of raising finance for the project, the consortium is granted a concession to operate the facility for an agreed period of time, after which, the facility is transferred back to the client, usually the local or government authorities. This reliance on a future stream of income as a reward to the investors has led the BOOT family being mainly advocated for schemes for which there is a clearly defined income source, for example a tolled road, bridge or tunnel (McDermott, 1999a). This contractual model provides an alternative way for a government seeking private sector finance for projects, especially for the successful provision of infrastructure projects in developing nations. The idea is supported by a wide range of researches and reports over last two decades (e.g. Mustapha et al., 1994, Ogunlana, 1997, Tam et al., 1994, Chen, 2009, Chen and Messner, 2005, Kumaraswamy and Morris, 2002, Thomas et al., 2006).

According to Smith (1999), if the entity proposing the design solution is responsible for maintaining and operating the facility then they will have the incentive to reduce long-term costs and thus develop a highly cost effective product over the product’s lifecycle. As is true of all contractual models, the key to a successful BOOT strategy is the identification and evaluation of the risks involved, followed by their allocation to the parties most able and willing to accept them (Dey and Ogunlana, 2004, Thomas et al., 2006). Considering the special feature of the BOOT method that the responsibilities of design, construction and operation have been integrated under the BOT consortium, the client is taking a relatively limited cost risk other than the possibility that the facility does not meet its needs or the concession agreement is unsatisfactory (Smith et al., 1994, Wang et al., 1999, Zhang and Kumaraswamy, 2001). McDermott reports (1999a) and that, in the UK it is now government policy to require all public sector projects to be market tested for private finance before the public purse is opened. Obviously, the BOOT family of contractual models is not likely to be viable for implementation in small scope projects with an uncertain future stream of payback. However, it is worth noting that governments are increasingly using this model for hospitals, prisons and other projects that previously widely undertaken through other contractual scenarios (Grimsey and Graham, 1997, Thomas et al., 2006) and these projects have succeeded.
Although the principle of this policy has been accepted enthusiastically by some in the industry, there has been almost unanimous criticism of the speed and effectiveness of its implementation (McDermott, 1999a). Walker and Hampson (2003) generally attributes some of the notable failures using this model to the lack of trust and communication, for example, in the Bangkok Second Stage Expressway project. McDermott (1999a) further concludes that host countries, particularly developing countries, may procure an inappropriate project as a result of inequalities in the commercial arrangements. Kumaraswamy (1994) explains that whereas some projects were formerly financed by clients or “promoters”, creative financing strategies are now used, for example, on large-scale infrastructure projects. In addition, the potential for conflict of interest occurs where the appointed contractor has a share in the concession company. It is suggested (Kumaraswamy and Morris, 2002) that a longer-term overview towards the use of BOOT group of contractual models should be encouraged to promote the use of a domestic contractor and general economic development, especially in developing countries.

2.2.3 D&B vs. PM/CM

These two contractual models have been introduced before as major variants in the subchapters relating to integrated procurement systems and management-orientated procurement systems. A Design and Build (D&B) procurement system enables a single point contact between the client and an organisation (usually a contractor) to be fully in charge of the design and construction processes. In a combined project management and construction management (PM/CM) contractual model, an organisation, previously referred to as “management contractor”, takes the responsibility of representing the client and leading the design team and in addition providing advice to specialist contractors during the construction.

However, the management contractor in PM/CM, sometimes referred to as “PM/CM entity”, only acts as consultant to the contracting parties rather than giving direct orders. The PM/CM entity may also undertake the work under a contractual arrangement in which it carries the financial risk. On the other hand, the D&B contractor subcontracts or forms a joint venture with design firms to manage the project. In that sense, the differences between a PM/CM and D&B are quite subtle and a PM/CM entity that carries financial risk is really a D&B contractor. Detailed contractual and functional relationships of both models are demonstrated in diagrams in the integrated and management-orientated procurement systems chapters.
2.2.4 On-call contracting

On-call contracting is a contractual model where the owner initially signs a master contract with one consultant for a project then divides the project work into task orders (TOs) that are released to the consultant in phases (Chang and Ibbs, 1998). It is understandable that in order to suit such a model, it is the client who should have a clearer and more complete perspective of what he/she requires and the nature of the work rather than the consultant, while the consultant is in a better place to manage and run the construction of the project. The on-call contracting concept is somewhat similar to the maintenance work projects where skilled workers are contracted during a certain period for on-call services. One advantage observed is the “capacity within an uncertain project environment to freeze design of work packages into discrete TOs” and this approach “enables the TO work to be sufficiently defined, planned for and budgeted to control the work packages as if they were mini-contracts (Walker and Hampson, 2003, p22)”. Some characteristics of the master contract and task orders are summarised in Table 7:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Master Contract</th>
<th>Task Order (TO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning mode</td>
<td>Pre-project planning</td>
<td>TO planning</td>
</tr>
<tr>
<td>Requirements</td>
<td>General requirements</td>
<td>Specific requirements</td>
</tr>
<tr>
<td>Contract analogy</td>
<td>Single prime contract</td>
<td>Multiple contracts</td>
</tr>
<tr>
<td>Payment method</td>
<td>Reimbursable</td>
<td>Fixed price (recommended)</td>
</tr>
<tr>
<td>Cost risk</td>
<td>Risk mainly with the owner</td>
<td>Mainly with the consultant</td>
</tr>
</tbody>
</table>

Table 7: Typical on-call contracting characteristics of design projects (Chang and Ibbs, 1998, p36)

This option has attractive features of client control over the cost and scope of the project, and contractor involvement in the design phase is assured. These features enable the cost to be fixed at an agreed sum during TO. Although one may recognise that this option has a lot of similarities with the management contracting approach, the number of TOs in on-call contracting would generally be greater than the number of subcontracts signed by a management contractor in a management contracting model. Fundamental difference between those two options is the division of the project into task order flow in the on-call contracting approach. Task orders also differ with work packages in their method of fast-tracking. A fast-tracking approach enables overlap between detailed design development and the more general design development to allow separated work packages to be tendered while construction proceeds. In both processes, overall work is pre-planned in general and complex work packages are planned in detail once the specific requirements are known. However, task orders in the on-call contracting approach are smaller in scope, more numerous, and planned more fully in detail. Fast-tracking requires much of the
detailed planning to be left for contractors to deal with after each contract package is awarded. On-call contracting also treats the detailed planning as a part of the negotiation process (Walker and Rowlinson, 2008).

According to Walker (1994), one drawback of on-call contracting is the additional administrative expense associated with the intensive nature of a highly planned project, but on the other hand, detailed planning has been shown to contribute effectively to construction time performance. Bonus incentive schemes can also be used to reward satisfactory performance on TOs (see for example: Abu-Hijleh and Ibbs, 1988). On-call contracting provides an alternative method to using the reimbursable contracts for complex projects since, in addition to having a master contract, it also adopts fixed price contracts for TOs.

### 2.2.5 Guaranteed maximum price (GMP)

In a GMP contract that a client and a consultant or a contractor enter into, both parties will agree to a negotiated maximum sum for which the client will reimburse the contractor. Any overspending of this GMP sum due to mismanagement of the project by the contractor or the consultant will be their responsibility, thus the cost risk to the client is limited and the interest of the client is protected. On a GMP project, “the contractor bases its bid on partially-completed documents and, extrapolating from them, warrants to the owner that the price will not exceed a certain sum. The work is then paid for at the contractor’s actual cost plus a fee, until the GMP is reached. After that, the contractor absorbs additional costs. If the actual cost is less than the GMP the owner keeps the savings or sometimes a portion of them with the contractor as an incentive (King, 1996, p402)”.

Walker (2003) reports that the GMP contractual model is gaining popularity in the USA market when used in conjunction with D&B approach. The GMP and the D&B share many similarities in functional relationships between parties: the major difference between them and also, the distinct feature of GMP, is that the design is fixed, and this is used as the negotiated price limit but with open-book reimbursement from the client.

### 2.2.6 Full cost reimbursable model

As the name suggests, this model takes the concept of GMP and develops it to another level – full cost reimbursable. If categorized into a procurement system as in the previous chapter, both GMP
and full cost reimbursable models would fit into the integrated procurement systems, with some similar features to those of the CM or management contracting methods. The cost risk borne by the client in the model is the highest among all. Ireland (1987) described this process as a contractor is to be chosen to undertake the work under a cost reimbursable basis with an agreed allowance for profit and overheads.

As the full cost reimbursable model comes with great risk borne by the client, it also entitles the client to have considerable power to influence the scope, cost, and other aspects of performance during the project design and construction phases (Walker and Hampson, 2003). One can imagine that such a model would be only suitable for exploring the type of project where design details are unknown or that could not be revealed at the time of tender and where the outer environment is subject to great change, or the client needs to maintain total control over the design result and construction of the facility. It could be seen in this way: that the client is paying the contractor a fee for his/her knowledge and expertise and using the contractor’s organisation as his/her own in-house D&B team by paying for whatever the work is being done through the open-book method. The drawback of the system is obvious as the open-book method also means open for exploitation. An appropriate auditing system is a necessary for the use of this approach and client confidence in both contractor and design team are also essential.

2.2.7 Summary of Contractual Models

Procurement systems are the overarching administrative environment of project delivery, however, they need to be embodied in the form of a certain contractual model for implementation. In the second section of the literature review, important representatives of the contractual model are introduced according to their different cost risk perspectives. From the highest contractor cost risk to the other end of the highest owner cost risk, the contractual models discussed are: Traditional Lump-sum; Total Package options – BOOT family; D&B, Develop and Construct, Novation and Turnkey; CM/PM; On-call multi-task contracting; GMP; and Full cost reimbursement. A summarising chart is provided as Table 8 comparing differences between those discussed contractual models.
After a certain type of procurement system has been chosen by the client, they will then need to further decide – which of the next level of contractual models will best suit their conditions. Aside from the extreme where the client or the contractor takes all the risk, there is much flexibility of contractual choice in between for the client. By realizing his/her capacity and willingness to participate in the procurement process, the client can decide which contractual model to use. The choice made will then reflect the client’s desire and confidence in establishing a framework where decision making and initiative are distributed amongst the three major participating parties of client, contractor, and engineer.

The major forms of contractual model associated with each procurement system are listed in Table 9:
Table 9: Major procurement systems and associated contractual models

<table>
<thead>
<tr>
<th>Procurement Systems</th>
<th>Contractual Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated Procurement System</td>
<td>Traditional Lump-sum</td>
</tr>
<tr>
<td>Integrated Procurement System</td>
<td>D&amp;B; Novation; Develop + Construct; Package deals; Turnkey (PFI, BOOT); GMP; Full cost reimbursable model</td>
</tr>
<tr>
<td>Management-orientated Procurement System</td>
<td>Management Contracting; Construction Management; Design and Manage (contractor-led or consultant-led); On-call contracting</td>
</tr>
<tr>
<td>Discretionary (collaborative) Procurement System</td>
<td>Partnering (project partnering, strategic partnering); Alliancing; Joint-venture</td>
</tr>
</tbody>
</table>

The characteristics and suitability of each contractual model fall into the description of their main procurement system summarized in the previous section. Procurement and contractual choice is a complex issue involving not only considerations in technical, legal and financial aspects, but also organisational culture, influence, risk distribution and design flexibility required. In this section, the discussion started from one extreme of the continuum of the traditional lump sum method and reviewed the major prevailing contractual models of the construction industry. Some have already been introduced in previous sections of procurement systems, the rest were analysed and compared to existing well-known models.

2.3 Standard Contracts

Following the first two layers of literature of procurement systems and contractual models within which the contract framework and structure has been defined, the last one is about the final decision for which a particular contract(s) is to be used. The objective of this section is to review major standard construction contracts that are used in New Zealand and internationally, introduce them within their own family of contracts and summarize them according to different procurement systems.

Generally speaking, a contract is a bargain, and should be clear and unambiguous as to who are the parties, what is to be done, when it is to be done and how much is to be paid. A simple definition and description of the contracting process given by Totterdill (2006) is that any construction contract is a legally binding agreement between two parties – the Owner, who is generally referred to as the Employer, and the Contractor. The Employer initiates the project, decides what he/she wants, gives instructions, supervises the construction, pays for the project and occupies the completed project. The Contractor builds the project and is paid for his work. This
set of documents is the key controlling the relation between the Employer and the Contractor. It specifies the details and procedure of exchange of work that the contractor has offered and payments from the employer. It is referred to in deciding who should bear the consequences when unexpected problems happen, which usually results in the project behind the schedule and/or over the budget.

A typical construction contract document will include the following parts, usually being arranged in an order of 1) The Contractor’s Tender, 2) The Contract Agreement, 3) The Employer’s Letter of Acceptance, 4) The Conditions of Contract, and 5) The Technical Documents (e.g. Drawings, Specifications, Bills of quantities, etc.).

### 2.3.1 Major Standard Contracts used in New Zealand


The series of NZS3910 “draw from the long tradition of British contracts, but has developed beyond the 1973 ICE (Institution of Civil Engineers) model, NZS3910 maintains the use of plain language, and is attuned to changes of law prior to 2002: the Building Act 1991, the Health and Safety in Employment Act of 1992, the Companies Act of 1993 and the Arbitration Act of 1996 (Henriod, 2003).” Some important changes in this new revision of NZS3910 compared to its previous 1998 version “make it compatible with the Construction Contract Act 2002 (NZS, 2003)”. The main aim of NZS3910:2003 as stated in its beginning foreword section has been “to produce a straightforward flexible document which includes all essential commercial provisions and which may be used for all types of engineering and building work with a variety of administrative arrangements.”

The NZS3910 conditions of contract are well established, tested, and widely used for most building and civil engineering construction works that are procured by a traditional method in New Zealand. At the same time, there are various other standard forms available in the diverse local construction market, some of them are variations developed based on NZS3910 for special
purpose, some are issued by different industry institutions for use by their own members. One example of variation of the standard forms is NZS3915:2000. This is a standard document for building and civil engineering construction “where an experienced engineer, architect, surveyor or other suitable person (either a direct employee or another person) is not readily available to the Principal to act as Engineer to the contract. (2000)”. The prompt for establishing such a variation of standard contract was originally raised by the Registered Master Builders’ Federation (MBF) of New Zealand to address the contractual situation on “comparatively straightforward” projects where the role of the Engineer is absent.

Besides NZS3910 and NZS3915, other commonly used standard forms for civil construction are those issued by MBF and the New Zealand Institute of Architects (NZIA). The MBF one was designed to cater to the needs of small building projects of any nature, which overlapped with the drafting purpose of NZS3915, so “in the future there may be a shift towards NZS3915, away from the MBF standard conditions (Wilkinson, 2003)”. The three main standard contracts developed by NZIA for its members are: 1) The Standard Conditions of Contract, 2009 (SCC); 2) The National Building Contract – General, 1998 (NBC-G1); and 3) The National Building Contract – Minor Works, 2000 (NBC-MW2). Familiarity with these forms of contract in the construction industry is high, and the use of these with the traditional forms of procurement is common. The relationships and some of the features of these standard contracts are illustrated in the following organisational chart (Figure 9):

![Figure 9: Major Standard Contracts used in New Zealand and their relationships](image-url)
A brief introduction of the principal standard forms of building contracts used in New Zealand is provided in Table 10:

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZS3910:2003</td>
<td>Major standard contract used in New Zealand construction industry, compatible with the Construction Contract Act 2002</td>
</tr>
<tr>
<td>NZS3915:2000</td>
<td>Standard document for building and civil engineering construction where an experienced engineer, architect, surveyor or other suitable person (either a direct employee or another person) is not readily available to the Principal to act as Engineer to the contract. (2000).</td>
</tr>
<tr>
<td>MBF Standard Contracts</td>
<td>Registered Master Builders’ Federation of New Zealand prepared this set of standard contracts to address the contractual situation on “comparatively straightforward” projects where the role of the engineer is absent.</td>
</tr>
<tr>
<td>NZIA SCC</td>
<td>New Zealand Institute of Architects Standard Condition of Contract 2009</td>
</tr>
<tr>
<td>NZIA NBC G1</td>
<td>NZIA The National Building Contract – General, 1998</td>
</tr>
<tr>
<td>NZIA NBC MW1</td>
<td>NZIA The National Building Contract – Minor Works, 2000</td>
</tr>
<tr>
<td>NZIA NBC MW2</td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Major Standard Contracts used in New Zealand Construction Industry

2.3.2 International Standard Contracts

Although other choices such as organisation-specific non-standard contracts exist, it is common practice in the industry to appoint the contractor on a standard-form building contract during construction procurement, and most of those organisational non-standard contracts have been drafted using one or two standard forms as a basis but cater for the needs within users’ own organisations. Different groups of standard contracts have been developed from various parts of construction industry and for a variety of reasons. It is essential to understand these standard forms in terms of their specific purposes, risk distributions among contracting parties and suitability for and categorisation into different procurement systems and contractual models. Three major sets of standard contracts that are used in construction projects internationally, FIDIC, NEC and JCT families, will be reviewed in the following sections.

2.3.2.1 FIDIC

Introduction

The most commonly used Conditions of Contract for international construction projects are published by the Federation Internationale des Ingenieurs-Conseils (FIDIC), the International Federation of Consulting Engineers. The Traditional FIDIC Contract for civil engineering
construction is the FIDIC “Conditions of Contract for Works of Civil Engineering Construction”, commonly known as “The Red Book”. In 1999 this was superseded by the FIDIC “Conditions of Contract for Construction”, together with the “Conditions of Contract for Plant and Design-Build”.

There are two major components within the FIDIC Conditions of Contract: General Conditions and the Particular Conditions. The General Conditions are those clauses intended to be used unchanged for every project while the Particular Conditions are prepared for the particular project with their specific requirements. Any changes or additional clauses are included within the Particular Conditions section. One obvious advantage of dividing the contract clauses into general and particular conditions is that it enables parties to reduce the emphasis on specific contractual terms during project bargaining phase but remain the individuality of the project by providing a custom-defined particular conditions section for further negotiation.

Specific FIDIC contracts and their purposes

FIDIC publishes a family of different Conditions of Contract catering for the requirements of different types of construction projects. Since 1999 there have been 2 separate and distinct sets of FIDIC Conditions of Contract available for use – the Traditional FIDIC Conditions of Contract and the new 1999 FIDIC Conditions of Contract (FIDIC, 2010a).

Some major representatives of the family of Traditional FIDIC Conditions of Contract are as follows:


It is natural for standard contracts to be revised every few years to cater for the developments in practice. In 1997, FIDIC decided that the time had come for a major review of all its conditions of contracts to create a new suite of conditions of contracts that “would change the basic purpose of each of the contract and completely rearrange the layout” (Totterdill, 2006). The intention was
first embodied in the publication of the Conditions of Contract for Design-Build and Turnkey in 1995 written in a different style and layout compared to earlier contracts, within which detailed provisions for design by the contractor is included. This style and layout was developed further in 1999 when FIDIC published the first edition of a new set of Conditions of Contract. These are:

1. The Conditions of Contract for Construction, developed for building and engineering works which have been designed by the Employer and replaces the traditional FIDIC Red Book.

2. The Conditions of Contract for Plant and Design-Build, for electrical and mechanical plant and for building and engineering works, designed by the Contractor and replaces the traditional FIDIC Yellow and Orange Books. The publication is yellow in colour.

3. The Conditions of Contract for EPC/Turnkey Projects. This Contract is for Engineering, Procurement and Construction or Turnkey Projects where the Contractor takes total responsibility for the design and execution of the project, providing a completed project ready for occupation. This new FIDIC Contract is silver in colour.

4. The Short Form of Contract. It is for building and engineering works of relatively small capital value or time period or for relatively simple works where a much shorter form of contract is suitable. This is also a new FIDIC Contract and is green in colour.

5. The Form of Contract for Dredging and Reclamation Works. The publication is blue in colour.

During 2005 FIDIC published the Multilateral Development Banks Harmonised Edition of the Conditions of Contract for Construction (the MDB Edition). This contract was prepared and agreed to with a group of Development Banks which had been licensed to include it in their procurement procedures. A comparison of these two different set of FIDIC standard contracts is illustrated in Table 11:
Table 11: Two different sets of FIDIC standard Conditions of Contract

Selecting appropriate FIDIC contracts

With growing number of choices within the FIDIC family of standard contracts, a simplified flowchart (Wade, 2009) has been developed by the FIDIC committee as a practical guide for the client to select from different post-1999 FIDIC Conditions of Contract.
As can be seen from Figure 10, the process begins with choices of complexity of the project as the green book, Short Form of Contract, would be appropriate for small-scale straightforward projects. Then there comes the choice of designing party, either designed by the employer or by the contractor, using respectively the red book or the yellow book. The silver book in the next step is designed for the projects using EPC and Turnkey methods where the contractor takes total responsibility for the design and execution of the project, providing a completed project ready for occupation under secure circumstances which have no major unforeseen risks. The choice of route is completed after the silver book and specifies that other employer’s requirements should be discussed in detail and a modified FIDIC contract would be more appropriate after negotiation between contracting parties. Two major procurement systems, the separated and integrated, and relevant contractual models are identified associating with the choice of FIDIC standard contracts in the following Figure 11:
2.3.2.2 NEC

Introduction

As a response to the growing discontent with contractual procedures and prevailing adversarial attitudes in the construction industry (Murdoch and Hughes, 2008), the New Engineering Contract (NEC), the first version within this family, was produced and published in 1993 by the Institution of Civil Engineers (ICE). It was followed by the first edition of the subcontract form within the same year. The wording of the two forms was found to be identical except in places where the differences in nature of the two contracts demand different wording and slightly different provisions (Weddell, 2006). This is different to the ICE Conditions of Contract where a subcontract form was produced by the contractors’ organisation, the Federation of Civil Engineering Contractors (FCEC), later the Civil Engineering Contractors’ Association (CECA).
Four objectives were established from the drafting of NEC contract and were maintained in all subsequent forms of contract comprising the NEC family, namely flexibility, clarity, simplicity, and stimulus to good management. They are described in detail in the published guidance notes (Institution of Civil Engineers, 1993). Flexibility, as the first objective, was embodied in the general applicability of NEC contract to both construction and other engineering projects. It is also achieved by providing various optional clauses associated with different procurement systems, accommodating all varieties of design responsibilities from solely contractor design, partially involved to no design responsibility. As for clarity and simplicity, the NEC contract drove it to another degree. It has been achieved with the aim of producing user-friendly documents. Bearing that in mind, the drafting committee used short sentences and bullet points, flowcharts and avoided subjective and legal terms and the clauses were written in a preset tense. It is interesting to note that an Accreditation Certificate was awarded to the first edition of the Engineering and Construction Short Contract in 1999 by the Plain Language Commission. The idea of last objective is that contracting procedures within NEC should contribute to better management practice and reflect advances in developing project management principles and practice.

**Specific NEC Contracts**

The publication of Sir Michael Latham’s report (Latham, 1994) on the construction industry in July 1994 was a significant event in the formation of NEC suite of contracts. Latham identified some 13 matters within his recommendations that should be included in any effective form of construction contract under modern conditions and found that the New Engineering Contract as being “extremely attractive” and embodied these principles. Therefore, he recommended that it be slightly revised and adopted for use throughout the industry (Murdoch and Hughes, 2008). Recommendations from the Latham report were considered by the NEC Working Group and incorporated with other users’ feedback into the second edition in 1995 named NEC 2 Engineering and Construction Contract (ECC). However, the acronym NEC has been retained to describe the family of standard contracts that have been developed under the same NEC principles. In 2005 the third suite of contracts was published and the main contract is called NEC 3 Engineering and Construction Contract. Details of the NEC standard conditions of contract are listed in the following Table 12:
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering and Construction Short Subcontract</td>
<td>ECSS</td>
<td>n/a</td>
<td>July 2001</td>
<td>June 2005</td>
<td>June 2005 (NEC 3)</td>
</tr>
<tr>
<td>Term Service Contract</td>
<td>TSC</td>
<td>May 2002</td>
<td>June 2005 (NEC 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Framework Contract</td>
<td></td>
<td></td>
<td>June 2005 (NEC 3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12: Published NEC Contracts (source: Weddell, 2006)

The NEC family of contracts has become increasingly popular during the last few years. For example, the Channel Tunnel Rail Link was procured on an amended version of NEC 2 and the English National Health Service also bases its contract on an NEC form (Bridgewater and Hemsley, 2006).

The latest version of NEC standard contracts family was published in 2005 in the name of “NEC 3 Engineering and Construction Contract”. It was drafted under the four objectives established since the publication of first generation of NEC contracts in 1993 by the Institution of Civil Engineers (ICE). These are flexibility, clarity, simplicity, and stimulus to good management. The major set of standard contract in the NEC family is the New Engineering Contract/ Engineering and Construction Contract (NEC/ECC) aiming at utilization in almost every engineering and construction project. The current list of published NEC3 contracts is summarized in Table 13:
<table>
<thead>
<tr>
<th>NEC Title (all published in June 2005)</th>
<th>Abbr.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEC3 Engineering and Construction Contract</td>
<td>ECC</td>
<td>used for the appointment of a contractor for engineering and construction work, including any level of design responsibility</td>
</tr>
<tr>
<td>NEC3 Engineering and Consultant Subcontract</td>
<td>ECS</td>
<td>used for the appointment of a subcontractor for engineering and construction work where the contractor has been appointed under the ECC</td>
</tr>
<tr>
<td>NEC3 Engineering and Construction Short Contract</td>
<td>ECSC</td>
<td>alternative to ECC and is for use with contracts which do not require sophisticated management techniques, comprise straightforward work and impose only low risks on both client and a contractor</td>
</tr>
<tr>
<td>NEC3 Engineering and Construction Short Subcontract</td>
<td>ECSS</td>
<td>used as a subcontract to ECC or ECSC, like above, it should be used with contracts comprise straightforward work and impose only low risks</td>
</tr>
<tr>
<td>NEC3 Term Service Contract</td>
<td>TSC</td>
<td>used for the appointment of a supplier for a period of time to manage and provide a service</td>
</tr>
<tr>
<td>NEC3 Professional Services Contract</td>
<td>PSC</td>
<td>used for the appointment of a supplier to provide professional services</td>
</tr>
<tr>
<td>NEC3 Framework Contract</td>
<td>FC</td>
<td>used for the appointment of one or more suppliers to carry out construction work or to provide design or advisory services on an ‘as instructed’ basis over a set term</td>
</tr>
<tr>
<td>NEC3 Adjudicator’s Contract</td>
<td>AC</td>
<td>used for the appointment of an Adjudicator to decide disputes under the NEC family of contracts, or for appointment of an Adjudicator under other forms of contract</td>
</tr>
</tbody>
</table>

Table 13: NEC3 Contracts (NEC, 2005)

Selecting appropriate NEC contracts

The optimum allocation of risk between contracting parties is a major decision to be made when preparing a particular contract. A main feature of all the standard NEC contracts, except the short forms and the Adjudicator’s Contract, is that they contain main options and secondary options within their clauses for the client to choose from. Taking NEC/ECC as an example, the financial risk is shifted from the contractor to the client with the choice from option A to cost reimbursable option E and also the management contract option F. A set of pre-configured versions of NEC Main Option clauses is listed below:

- The lump sum option A: Priced contract with activity schedule
- The re-measurement option B: Priced contract with bill of quantities
- The target option with the target established as a lump sum, option C: Target contract with activity schedule
• The target option with the target established as a re-measurable sum, option D: Target contract with bill of quantities
• The option where the contractor is paid by his costs, option E: Cost reimbursable contract
• Option F: Management contract

With this flexibility of choices among different contractual models with one single contract, it is clear that the ECC can be used for all kinds of construction projects required by a client to be built and perhaps designed by a contractor. No separate form of contract is required when the degree of design involvement of the contractor changes. In some straightforward cases, the short contract (ECSC) may be more appropriate. However, this choice is not based on estimated financial value of the contract but depends on such matters of complexity, risks allocation, nature of the work, and convenience of management. The NEC Professional Services Contract (PSC) is designated for the purpose of provision of professional services. The Engineering and Construction Subcontract (ECS) is for the project with subcontracting arrangements. For maintenance-type contracts over a fixed period of time, the NEC Term Service Contract (TSC) would be more appropriate.

The flexibility in reaching the optimum allocation of risks between contracting parties is an important feature of all the NEC standard contracts except the Adjudicator’s Contract and the Short Forms. Take ECC for example, the financial risk is shifted from the contractor to the client with the contractual choice from option A (lump-sum) to option E (cost-reimbursable) and the management contracting option F. Comparing these options to the contractual models introduced previously according to their cost risk perspectives, one can categorise the selected option to the certain contractual model in order to determine the relevant procurement system and overall procurement route chosen.

The choice of procurement and contractual strategy of a certain engineering or construction project is embodied by a combination use of appropriate NEC3 contracts to form the overall project delivery framework. This is demonstrated in the appendix B, which covers the procurement and contractual framework under the family of NEC3 standard contracts of 1) Separated procurement system; 2) Integrated procurement system; 3) Management-orientated System; and 4) Collaborative procurement system.
2.3.2.3 JCT

Introduction

The Joint Contracts Tribunal (JCT) Contracts share a long history, which dates back to their origins in 1870, when the Builder’s Society (now the CIOB: Chartered Institute of Building) and RIBA, Royal Institute of British Architects, jointly produced the first “standard form” of contract for use only in London. It was seen as an attempt to overcome some of ad hoc building contracts problems of the day (Spiers, 1983). Despite its name, the Joint Contracts Tribunal does not sit in judgement of others, but rather an affiliation of interest groups within the construction industry, which operates as a forum for discussing and determining the content of the clauses of the standard form building contracts (Murdoch and Hughes, 2008). Its current membership consists of 8 professional bodies. The first national standard form for UK was made available in 1909 drafted by then RIBA and NFBTE (National Federation of Building Trades Employers, now the Construction Confederation, a member of JCT) and later developed into the 1980 range of JCT standard forms. After taking on recommendations and criticisms from the 1994 Latham report, JCT has been completely reorganized to adopt more appropriate approaches to the negotiation and drafting of standard form contracts.

From May 2005, JCT started to launch its series of new suite of contracts. Most of them were published between May and December of 2005, some in 2006, and several revisions were made in 2007 and 2008. The JCT 2005 suite consists of contract families made up of main contracts and sub-contracts, together with other documents that can be used across certain contract families (JCT, 2007). An important new form worth noting is the Framework Agreement, which is designed for the use in collaborative working relationships such as in partnering. Lupton (2006) summarizes major changes in the 2005 suite of JCT contract (updated in 2009 as JCT 09 suite of contracts) as having brought a vast increase in user-friendliness, improvement in layout and drafting, resulted in a more manageable document, which it is likely to be more popular than its predecessor. Judging from its appearance and detailed categorisation, choosing the appropriate JCT standard contract for a construction project is obviously more complex than in any other standard systems such as in FIDIC and NEC families. However, one may argue that this complexity of choice would later be compensated by the ease of management in a custom-fit contracting environment. A list summarizing published JCT 09 suite of contracts is shown in Table 14:
### Specific JCT Contracts

It should be noted that each contract title in the above table is a sub-family of contracts. Take JCT SBC 09 for an example, the Standard Building Contract 09 is the name given to this small group of contracts intended for use in general contracting and is published in three versions:

- SBC/AQ: Standard Building Contract with Approximate Quantities
- SBC/Q: Standard Building Contract with Quantities
- SBC/XQ: Standard Building Contract without Quantities

There is an official guide “SBC/G: Standard Building Contract Guide” to associate with these three versions. If the version number is not specified, JCT SBC 09 usually refers to SBC/Q. There are certain sub-contract standard forms designed for use in this SBC sub-family as well:

- SBCSub/A: Standard Building Sub-Contract Agreement
- SBCSub/C Standard Building Sub-Contract Conditions
- SBCSub/D/A Standard Building Sub-Contract with sub-contractor's design Agreement
- SBCSub/D/C Standard Building Sub-Contract with sub-contractor's design Conditions

Also published with SBCSub forms of contract is the “SBCSub/G Standard Building Sub-Contract Guide”. So all together in this JCT SBC 09 family, there are three versions of main contracts and four different documents of sub-contracts, plus two guides. Similarly, in other sub-
families, standard forms could usually be divided into main contracts, sub-contracts and guides on when and how to use them. Since the details are not directly relevant to this research and could be easily available through JCT website, following review and discussion will remain on sub-family level and treat them (i.e. SBC 09, IC 09, MW 09, etc.) as individual standard contract.

The latest version of JCT family of standard contract was released in 2009. It has the most detailed categories of standard forms of contracts available to be used in different engineering and construction projects. For example, it comprises suites of contracts in Minor Work Building Contract (MW), Intermediate Building Contract (IC), Standard Building Contract (SBC), Design and Build Contract (DB), Management Building Contract (MC), etc. Judging from its complexity and detailed categorisation, choosing the appropriate JCT standard contract for a construction project is obviously more complex than in any other standard systems such as in FIDIC and NEC families. However, one may argue that this complexity of choice would later be compensated by the ease of management in a custom-fit contracting environment.

JCT standard main contracts are divided into various groups in according to their different ways of procurement. These are summarized in the following Table 15:

<table>
<thead>
<tr>
<th>Procurement Systems</th>
<th>JCT Main Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated</td>
<td>Standard Building Contract (SBC)</td>
</tr>
<tr>
<td></td>
<td>Intermediate Building Contract (IC)</td>
</tr>
<tr>
<td></td>
<td>Minor Works Building Contract (MW)</td>
</tr>
<tr>
<td></td>
<td>Repair and Maintenance Contract (RM)</td>
</tr>
<tr>
<td></td>
<td>Building Contract for a home owner/ occupier (HO)</td>
</tr>
<tr>
<td></td>
<td>Home Repair and Maintenance Contract (HO/RM)</td>
</tr>
<tr>
<td>Measurement</td>
<td>Standard Building Contract With Approximate Quantities (SBC/AQ)</td>
</tr>
<tr>
<td></td>
<td>Measured Term Contract (MTC)</td>
</tr>
<tr>
<td>cost-reimbursement or</td>
<td>Prime Cost Building Contract (PCC)</td>
</tr>
<tr>
<td>cost-plus</td>
<td></td>
</tr>
<tr>
<td>Integrated</td>
<td>Major Project Construction Contract (MP)</td>
</tr>
<tr>
<td></td>
<td>Design and Build Contract (DB)</td>
</tr>
<tr>
<td>Management-orientated</td>
<td>Management Building Contract (MC)</td>
</tr>
<tr>
<td></td>
<td>Construction Management Appointment (CM/A)</td>
</tr>
<tr>
<td></td>
<td>Construction Management Trade Contract (CM/TC)</td>
</tr>
<tr>
<td>Collaborative (partnering)</td>
<td>JCT – Constructing Excellence Contract (CE)</td>
</tr>
<tr>
<td></td>
<td>JCT – Constructing Excellence Contract Project Team Agreement (CE/P)</td>
</tr>
<tr>
<td></td>
<td>Framework Agreement (FA)</td>
</tr>
</tbody>
</table>

Table 15: JCT Main Contracts categorised according to different procurement systems
It should be noted in the above table all versions of the JCT Standard Building Contract (SBC) in the separated procurement system contain an optional Contractor’s Designed Portion in respect of design by the contractor for a defined portion of the work, this is of limited application and does not result in a design and build contract. So under the integrated procurement system, specific MP and DB contracts are used for this purpose. This is also reflected in the appendix A of official guide to selecting the appropriate JCT main contract. In this diagram (Appendix A), it should be noted that different names have been given to the procurement systems: traditional is the separated in this research, its design and build is the integrated procurement system in the above list, and its integrated procurement is actually referred to as the collaborative (discretionary) procurement system used in this research.

**Selecting appropriate JCT contracts**

After reviewing all the main contracts of JCT family, the next step would be to select the appropriate one for a given project. In assisting this process, JCT has published a practice note of Deciding on appropriate JCT contract and is available to be downloaded from their website (JCT, 2008). A diagram showing selecting routes extracted from the publication is included as appendix A. As can be seen from this diagram (appendix A), various JCT contracts could be generally categorised into four different procurement systems and the most appropriate one would be chosen by selecting a certain type of procurement model and following the path. Take the choice of selecting the Standard Building Contract without Quantities in the central of the diagram for example: it comes firstly the choice of using traditional procurement method, then the responsibility for design, followed by the choice of price basis for the contract then the complexity of the works involved. It is argued (Murdoch and Hughes, 2008) that there are six factors need to be considered before selecting a specific and complete procurement path, which will result in choosing a certain type of standard contract. A table of these six categories is included as Table 16:
<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of funding</td>
<td>Owner-financed, public sector-financed, developer-financed, PFI, PPP</td>
</tr>
<tr>
<td>Selection method</td>
<td>Negotiation, partnering, frameworks, selective competition, open competition</td>
</tr>
<tr>
<td>Price basis</td>
<td>Work and materials as defined by bills of quantities, cost reimbursable, whole building, a fully-maintained facility, performance</td>
</tr>
<tr>
<td>Responsibility for design</td>
<td>Architect, engineer, contractor, in-house design teams, supplier</td>
</tr>
<tr>
<td>Responsibility for management</td>
<td>Client, lead designer, principal contractor, joint venture, construction manager</td>
</tr>
<tr>
<td>Amount of sub-contracting</td>
<td>0-100%</td>
</tr>
</tbody>
</table>

Table 16: Conceptual definitions in procurement choice (Murdoch and Hughes, 2008, p98)

It is understandable that describing a project as owner-financed does not specify which party is responsible for design. Similarly, describing a project as contractor design and build does not indicate how much sub-contracting there is or how the contractor was selected. So in order to adequately describe how the project is procured in plan to select a certain JCT contract, all these six categories of information are needed. It is true not only in selecting a JCT standard contract but also applicable in a more general sense of selecting a certain procurement path.

2.3.3 Summary on the use of international standard contracts

Although European based, The FIDIC sets of standard contracts for civil engineering construction are used throughout the world and often referred to as the international standard (IBA, 2009). It has member associations in Africa, Asia Pacific, Europe, Americas, and Mid-East (FIDIC, 2010b). The research on the use of FIDIC under international context has increased in the past two decades focusing on aspects such as international procurement, the role of engineers in contractual relationship, dispute resolution and risk allocation, etc (Abdelkhalek, 2006, Mortimer-Hawkins, 1995, Ndekugri et al., 2007, Seifert, 2005, Likhitruangsilp and Ioannou, 2009). Compared to FIDIC, NEC and JCT suite of standard contracts are more UK based.

NEC is now in its Third Edition and will be projected as the preferred form of contract for works relating to the 2012 Olympics in London (IBA, 2009). The NEC is a legal framework of project management procedures designed to handle all aspects of the management of engineering and construction projects. The NEC is now (2010) used in over 16 countries, including New Zealand, with ongoing interest in many more. The NEC is being increasingly used throughout the
Australasian region - particularly in New Zealand, as it is believed to provide an alternative to the NZS3910. A number of New Zealand clients have recently or are currently undertaking projects using one or more of the NEC suite of contracts. Clients include local authorities, utility companies and private sector companies (NEC, 2010a). In particular the NEC is being used to facilitate early contractor involvement and some of the more innovative forms of procurement, including pain / gain share arrangements between the parties using NEC3 Engineering and Construction Contract Options C and D. The Term Service Contract (TSC) is also being used in New Zealand for facilities management contracts. For example, Meridian Energy in New Zealand is one of the first users of the NEC3 Supply Contract. This popularity of NEC 3 in New Zealand may be explained by its compatibility to the New Zealand legislation. There are only a few minor additional clauses required to the NEC Engineering and Construction Contract (ECC) to address the requirements of the Construction Contracts Act (2002) (CCA). NEC is currently drafting clauses to address the CCA and other NZ legislation, which will shortly be made available publicly to assist clients and NEC users in New Zealand (NEC, 2010b).

NEC3 suite is expected to be used as a management tool allowing parties to adopt a best practice for project management. For example, the NEC3 facilitate the immediate problems resolution at the time and as the work progresses, rather than towards the end of the project. NEC is also well-known for a process-driven contract which rely upon good project management thus lead to the requirement of an experienced project manager. It is designed to give the project manager a more proactive role rather than acting as an agent to the client. One of the key features of the NEC is the obligation on the parties to act in a spirit of mutual trust and cooperation under clause 10.1 (Button, 2009). There is also a partnering option at clause X12 which deals with partnering between contractors (see Appendix B: NEC3 Procurement and Contract Strategies). Risk Register is a key part of NEC 3, together with early warning clause (Clause 16.1) for delay, promotes good management through effective communication.

The JCT range of contracts are fundamentally building, rather than civil engineering, contracts but are used for projects where both building and civil engineering works are involved. They cover orthodox contracting and design and build and management contracts. Some forms deal with less complicated or expensive forms of contract (Twort and Rees, 2003, IBA, 2009). It is mainly used in UK construction market. In contrast to NEC 3, the JCT 2005 suite is a stand-alone contract that is designed to be taken off the shelf, have contract specifics inserted and then become operational (Button, 2009). JCT is not commonly used in complex engineering projects. There are those who regard the JCT 2005 as an adversarial contract (such as K.M.A., 2003), especially its “Extensions
of Time” clauses, which are believed leading to “delays and disruptions” (Atkinson, 2003). The approach to delay under the JCT 2005 is retrospective which sharply contrasts with the proactive NEC 3 approach of addressing delays as soon as they arise (Clause 2.24) (Button, 2009). However, JCT is a historic and well-known standard set of contracts, which means it is very prescriptive and an established body of case law means that it can easily be interpreted.

2.4 Conclusion on procurement systems, contractual models and standard contracts

After examining the literature review sections on procurement systems, contractual models and standard contracts, it is worth summarizing their relationship and relevance in an overview table as demonstrated below. When approaching the question of which appropriate standard construction contract should be chosen, the first decisions to be made are those concerning the choice of procurement and the type of contractual arrangement. Only when these two decisions have been made can the choice of a form of contract be decided. A summarising Table 17 is included.

The above literature review has focused on the procurement practices and contractual paths under the normal time construction. However, it is unlikely that the popular contractual path under normal time construction conditions, such as design-bid-build in a separated procurement system, will deliver the best economic outcome in a post-disaster reconstruction situation. This is because that the special features which are favoured in post-disaster reconstruction are different to the requirements of ordinary construction. The next chapter will introduce the disaster reconstruction theme and review the major reconstruction theories and discuss the associated contractual considerations.
<table>
<thead>
<tr>
<th>Procurement Systems</th>
<th>Contractual Models</th>
<th>NZ</th>
<th>Standard Contracts FIDIC</th>
<th>NEC</th>
<th>JCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated Procurement System</td>
<td>Traditional Lump-sum</td>
<td>NZS3910:2003 NZS3915:2000 MBF SC NZIA SCC1 NZIA NBC G1 NZIA SW1,2</td>
<td>Short Form of Contract (Green); Construction Contract (Red);</td>
<td>a combination of PSC, TSC, ECC, ECSC, ECS, ECSS (see appendix B)</td>
<td>SBC; IC; MW; RM; HO; HO/RM; SBC/AQ; MTC; PCC</td>
</tr>
<tr>
<td>Integrated Procurement System</td>
<td>D&amp;B; Novation; Develop + Construct; Package deals; Turnkey (PFI, BOOT); GMP; Full cost reimbursable model</td>
<td>Plant and Design-Build (Yellow); EPC Turnkey Projects (Silver)</td>
<td>a combination of PSC, ECC, ECSC, ECS, ECSS (see appendix B)</td>
<td>MP; DB</td>
<td></td>
</tr>
<tr>
<td>Management-orientated Procurement System</td>
<td>Management Contracting; Construction Management; Design and Manage (contractor-led or consultant-led); On-call contracting</td>
<td></td>
<td>a combination of PSC, ECC Option F, ECS or ECSS (see appendix B)</td>
<td>MC; CM/A; CM/TC</td>
<td></td>
</tr>
<tr>
<td>Discretionary (collaborative) Procurement System</td>
<td>Partnering (project partnering, strategic partnering); Alliancing; Joint-venture</td>
<td></td>
<td>NEC Option X12 Partnering (see appendix B)</td>
<td>CE; CE/P; FA</td>
<td></td>
</tr>
</tbody>
</table>

Table 17: Procurement systems, contractual models, and standard contracts
CHAPTER 3: RECONSTRUCTION THEORIES, PROCUREMENT GUIDELINES, CONTRACTUAL MODELS AND PROCUREMENT SYSTEMS

3.1 Disaster reconstruction theories

3.1.1 General introduction on disaster reconstruction theories

Natural hazards and natural disasters are two very distinct terms which are frequently confused and used interchangeably in our everyday conversation. From the dictionary definitions, one can sense that “disaster” focuses more on the consequence and “hazard” is an often unavoidable danger that may lead to potential disasters (Kelman and Pooley, 2004). Although natural hazards like earthquakes can be highly destructive, they do not necessarily cause a disaster. An earthquake in an uninhabited desert would not be considered a disaster, no matter how strong the intensities produced. An earthquake is only disastrous when it directly or indirectly affects people, their activities and their properties. Natural disasters are generally considered as a coincidence between natural hazards and conditions of vulnerability (White, 1974, Geol, 2005, Plate and Kron, 1994, Weichselgartner and Bertens, 2000). It is safe to conclude that there is a high risk of disaster when one or more natural hazards occur in a vulnerable situation.

3.1.1.1 Disaster reconstruction in the whole picture of disaster recovery

The purpose of providing disaster recovery services generally is to assist the disaster-affected community towards management of its own recovery according to the Emergency Management Australia (EMA) Manual on Recovery Management (2003). It emphasises the community-driven or community-based recovery management process and recognises that where a community experiences a significant disaster, there is a need to supplement/ reconstruct the personal, family and community structures which have been disrupted by the disaster. The term “disaster recovery” is usually referred to a sequence of events and processes by which an affected community (which can be a small village, a city, a region or a whole nation) recovers from disaster. In order to examine the disaster reconstruction process, it is necessary to put it into the whole picture of disaster recovery and consider reconstruction as a component of the overall recovery process.
Several models of disaster recovery activity exist (Fiedrich and Burghardt, 2007, Hewitt et al., 2009). The recovery process can be divided into an initial response phase and a long-term recovery phase. The latter can be further divided into the reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical well-being. In this study, a sequential model of disaster recovery activity developed by Haas et al will be adopted (Haas et al., 1977). This model was developed using disaster recovery case studies in America and it seems to reflect the reality in the recovery process. It was accepted and widely quoted internationally in its exact format or similar ways by other researchers in this field (such as Ye, 2001, Chia, 2007, Foster and Kodama, 2004, Li et al., 2009, Rubin, 1996).

This sequential disaster recovery model argues that the sequence of events and processes involved in recovery is ordered by activity, is regular in time and space requirements, and is explainable in terms of a few significant factors:

1. emergency responses;
2. restoration of the restorable;
3. reconstruction of the destroyed for functional replacement; and
4. reconstruction for commemoration, betterment and development.

The time required for each activity period (except for the last) is about ten times that of the previous one. This specific temporal sequence is a function of pre-disaster trends, the damages suffered, the resources available for recovery, and to a lesser degree, leadership, planning and organisation. So, based on those above-mentioned factors, a four-stage model is developed as shown in Figure 12.
A simple but central need for research on reconstruction following disasters is to measure the progress of reconstruction (Chandana and Leung, 2010, Chia, 2007, Johnson et al., 2006). Distinguishing the recovery processes by dividing them into three stages after the initial response as shown above is useful in trying to access the comparative rate of the overall recovery and to determine the effectiveness of different policies or procurement methods used for reconstruction in each stage.

As stated above, it is believed that each of the first three periods lasts approximately ten times longer than the previous one, so on a logarithmic scale of time, they are shown as equal intervals. One must realise that although such period divisions provide a clear focus on certain indicators and performances on each phase for comparative study, recovery activities do not cease suddenly, to be replaced by another set of activities. Those recovery phases are overlapping (Chia, 2007, Haas et al., 1977, Ye, 2001). The strategy for the research purpose is to emphasise the dominant activities in any period, realising that other related activities are also going on simultaneously.
Some sample indicators are given in the above figure, showing the changing, overlapping parts of adjacent processes. The emergency period usually lasts only days or a few weeks - depending on the capacity of affected societies to cope with a disaster. It gradually proceeds to the restoration phase with typical indicators such as the completion of the search and rescue missions, reduction in emergency housing, water and food programmes, and clearance of debris from principal arteries. The restoration period ends with the resumption of the functioning of the major urban services, utilities, and transport, the return of those refugees intending to return, further clearance of the rubble and an initial sense of normalcy. Again, the time 10 ~ 20 weeks given in the above model is an approximation only. In the next step, the replacement reconstruction period, major reconstruction work is carried out. The capital stock is rebuilt to pre-disaster level and social and economic activities return to pre-disaster level or greater. The replacement of population and their needs in homes, jobs and urban activities will be accomplished by the end of this period.

Based on reconstruction of the first Rebuilt phase, the next phase of major construction will be carried out to serve three interrelated functions: to commemorate the disaster; to mark the community’s post-disaster improvement; and to serve its future growth or development. The projects involved in the last phase are usually large and are financed by the government. It is estimated to be twice the period required for the previous replacement reconstruction. The third period of replacement reconstruction will be the main focus of this study.

**3.1.1.2 Principles of disaster recovery management**

Reconstruction as an important component of the disaster recovery process should be managed consistently within the overall framework and general principles for recovery. In Australia, the principles for disaster recovery management are set out as follows (Emergency Management Australia (EMA), 2003):

Disaster recovery is most effective:

- When management arrangements recognise that recovery from disaster is a complex, dynamic and protracted process;
- When agreed plans and management arrangements are well understood by the community and all disaster management agencies;
- When recovery agencies are properly integrated into disaster management arrangements;
- When community service and reconstruction agencies have input to key decision making;
- When conducted with the active participation of the affected community;
- When recovery managers are involved from initial briefings onwards;
Similar principles could be found in New Zealand from the National Civil Defence and Emergency Management Strategy 2008 (MCDEM, 2008):

- Principle One: Individual and community responsibility and self-reliance
  Individuals and communities are ultimately responsible for their own safety and the security of their livelihoods.

- Principle Two: A transparent and systematic approach to managing the risks from hazards
  Communities must be given a say in what levels of risk they consider acceptable and what measures are put in place to manage those risks. A systematic approach is necessary to ensure that a logical and consistent process is followed when identifying and assessing risks, consulting and communicating with communities and, where appropriate, implementing cost-effective measures to reduce risk.

- Principle Three: Comprehensive and integrated hazard risk management
  Comprehensive risk management means dealing with the risks associated with all our hazards, through the 4Rs: reduction, readiness, response and recovery. Integrated activity promotes the coordinated involvement of all agencies that have a role in managing these risks.

- Principle Four: Addressing the consequences of hazards
  The consequences of hazards can be physical, social, technical, environmental, cultural, or economic, and may affect one or more communities. Focusing on consequences provides a basis for planning, informs decision-making, and enables more effective action through improved prioritisation and resource allocation.

- Principle Five: Making best use of information, expertise and structures
  It is necessary to develop the appropriate range of skills, knowledge and decision support tools and systems within our society as well as share best practice approaches to hazard risk management and operational activity.

Comparing these two sets of national principles in disaster recovery management suggests several common values: First of all, community involvement is crucial. In the New Zealand National CDEM strategy, individual and community responsibility and self-reliance are set out as the first principle. Similarly, in the Australian principles, community participation and community input to key decision making are emphasised. It further requires that agreed plans are well understood by the community. Secondly, a transparent and systematic approach is important. This is Principle Two in the New Zealand strategy and it is reflected in the Australian EMA Manual as recovery agencies should be integrated into disaster management arrangements and disaster recovery is a complex, dynamic and protracted process. Focusing on addressing consequences of the disaster provides a basis for planning, informs decision making, and enables more effective action through improved prioritisation and resource allocation. It is partially reflected in Australian principles as
timely, fair, equitable and flexible recovery services. Finally, the importance of related supportive 
training programmes and exercises is well recognised in Australian recovery management 
principles and is supported in New Zealand strategy as it calls on the best use of information, 
expertise and structures as well as sharing best practice approaches.

Similarly, FEMA (Federal Emergency Management Agency) in US produced its set of “principles 
of emergency management” in March 2007. The group agreed upon eight principles that will be 
used to guide the development of a doctrine of emergency management (FEMA, 2007). These are: 
Comprehensive, Progressive, Risk-driven, Integrated, Collaborative, Coordinated, Flexible, and 
Professional. Compared to those of Australia and New Zealand, FEMA’s principles focus more on 
the conduct of emergency managers and emphasise an all-angle approach to the disaster 
management. For example, in “Comprehensive”, it anticipates that the emergency managers will 
consider and take into account all hazards, all phases, all stakeholders and all impacts relevant to 
disasters. In “Integrated”, emergency managers should ensure unity of effort among all levels of 
government and all elements of a community. Although taken from a perspective of management 
authorities and emergency managers, FEMA’s principles still share the same values as defined in the 
Australian and New Zealand strategies, such as “community involvement, systematic approach” 
and “integrated”; “addressing consequences” and “risk-driven”; “training program and exercises” 
as compared to “professional”.

In an effort to integrate the disaster risk management principles into construction process in UK, 
Bosher et al. (2007b) conducted a survey, which indicated that knowledge and awareness of 
integrated disaster risk management approaches are poor, and the construction sector as a key 
stakeholder and potential resource is not being used sufficiently in UK. As a result, they 
recommended the following: construction-related stakeholders need to become more involved in 
local disaster planning groups and forums; risk and hazard awareness training needs to be 
integrated systematically into the professional training of architects, planners, engineers, 
developers, etc.; and the construction sector should embrace and pre-empt regulatory changes 
regarding resilient construction requirements (Bosher et al., 2007b). These recommendations could 
be seen as a UK version of construction-sector-focused disaster preparation principles. The same 
authors also urge a trend of establishing built-in resilience to disasters in UK construction market 
by identifying the key construction stakeholders that should be responsible for ensuring that 
resilience issues become integrated and ensuring the key stages of the design-construction-operate 
process where their inputs are required (Bosher et al., 2007a). Again, the key words such as
integrated, professional training, collaborative, and coordinated appear in those other sets of recovery management principles are also mentioned.

Compared to the somewhat general terms of disaster recovery principles introduced above, the Chinese principles developed after the 2008 Wenchuan Earthquake seem to be more specific and reconstruction-orientated. It first summarised the international experiences on disaster reconstruction in 7 points, which are listed below (Wang and Yan, 2008). 1) The reconstruction process is not universal. However, a crucial factor to the success of a reconstruction process is for effective government leadership, its communication with other government agencies and community organisations, which leads to the swift decision making; 2) community participation; 3) The importance of economic and social function resilience; 4) Although the external help is important, over-relying on external resources, technical supports, and labours would slow down the reconstruction speed and reduce long-term sustainability of reconstruction works; 5) addressing the needs of vulnerable groups; 6) Priority of the reconstruction needs to be planned and determined pre-disaster to speed up the process. Relevant policies should be in place to guide and coordinate the spontaneous reconstruction initiatives from the affected community; 7) effective information sharing system.

As a result, Wang and Yan (2008) proposed 11 aspects to be considered in establishing an effective and successful all-around policy framework for disaster reconstruction in China, covering the issues such as the establishment of legal framework, administrative structure, damage evaluation system, reconstruction plan, funding mechanism, innovative insurance policies, job opportunities, psychological counselling services, and social welfare system to ensure the successful recovery of physical, cultural, and ecological environments. There are more and more specific researches into disaster reconstruction management published each year in China since the Wenchuan Earthquake, covering similar issues but in greater detail (Xu et al., 2008, Zhao et al., 2009, Cao, 2008, Yang et al., 2009, Wang and Dong, 2009, Beijing International Urban Development Research Institute, 2008, Gao et al., 2008, Luo et al., 2008, Xu and Ma, 2009, Yang and Yang, 2008).

Although not reconstruction-oriented, the “Shanghai Principles” (Geis, 2003) for creating safer cities and societies through sustainable urban development agreed by the 5th International Conference of Local Authorities for Confronting Disasters and Emergencies (LACDE) is worth mentioning here. The principles produced at the conference were aiming at reducing risks and vulnerabilities through sustainable urban planning, which set the context for future disaster mitigation/recovery management. It addressed the issues such as the research, education, and
Project Management Institute (PMI) also developed its own updated “Methodology for Disaster Reconstruction” (PMI, 2005), aimed at those in the disaster recovery field who are providing the kind of leadership and clarity of thought needed to help in the reconstruction effort. It was developed for global application by relief agencies, non-governmental organizations (NGOs) and/or governments following a major disaster. It is meant to enhance collaboration and consistency, as well as quality and accountability, of projects undertaken in a crisis/disaster rebuild environment (PMI Educational Foundation, 2010). It has a practical sense in helping the project manager in three primary areas of schedule, cost and information distribution. However, it should be noted that the PMI Methodology was not designed for large-scale projects but to assist in the completion of individual, rudimentary projects, such as the reconstruction of one story homes and schools, simple irrigation systems, basic roads, etc. following a disaster event (Project Aid, 2010).

Based on the disaster recovery management principles discussed above, the next section will focus on the detailed theories of disaster management used in New Zealand as it is where this research is based and also whose reconstruction practices the recommendations of this research aim for. Before that, the Australian disaster management theory will also be introduced as Australia and New Zealand are closely-related countries with similar disaster recovery processes. They also are likely to response and help each other in a disaster recovery situation.

### 3.1.2 Different disaster recovery theories

#### 3.1.2.1 Australian PPRR disaster management theories

The Australian Emergency Manual of Disaster Recovery states that “The Australian concept of disaster management calls for a comprehensive approach, embracing prevention, preparedness, response and recovery (PPRR) (Emergency Management Australia (EMA), 2003)”.

It emphasises that these elements are not necessarily sequential or mutually exclusive, and recovery managers and agencies must be involved in the broader processes of disaster management and planning. Recovery and response operations must be simultaneously conducted and managed.

In the introduction phase, a definition of disaster recovery is given: “Disaster recovery is the coordinated process of supporting disaster-affected communities in the reconstruction of the
physical infrastructure and restoration of emotional, social, economic and physical well-being”. It is worth noting that in this definition, the objects of disaster recovery management are “affected communities” and it focuses on two aspects of the recovery: “physical infrastructure” and “emotional, social, economic and physical well-being”. This research will focus on the first aspect of disaster recovery in this definition, i.e. to reconstruct the physical infrastructure.

The physical and social aspects are both critical to effective recovery. Disaster recovery in the whole picture is more than the replacement of what was destroyed and rehabilitation of individuals. It is a complex social process and is best achieved when the affected community exercises a high degree of self-determination and initiative in recovery. It points out in the manual (Emergency Management Australia (EMA), 2003) that recovery is a developmental rather than a remedial process, so the manner in which the physical and social aspects of the process are undertaken will have a critical impact. Activities which are conducted without consultation and recognition of needs and priorities will disrupt and hinder the process.

3.1.2.2 New Zealand “4R” – A Holistic Framework for Disaster Management

New Zealand’s relatively isolated geographic location and its diverse landscape means the country is subject to a wide range of hazards. New Zealand’s vulnerability to hazards is influenced by the structure of its economy and society. The economy depends heavily on agriculture, tourism and international trade, all of which could be severely affected by New Zealand’s hazardscape. In addition, the nature of the lifestyles, settlement patterns and resource use affect New Zealand’s vulnerability to hazards (e.g. growing number of people choose to live in the coastal area of relatively high risk.) The Civil Defence and Emergency Management (CDEM) Act in New Zealand takes a broad interpretation of the term “hazard”. An “all hazards” approach is adopted in the new CDEM environment (MCDEM, 2004b). According to MCDEM’s records, among those natural hazards, flooding is the most common cause for a community-wide emergency in New Zealand, the most under-estimated is volcanic eruption and potentially the most dangerous is an earthquake (MCDEM, 2004b).

In pursuit of a new, more holistic approach to CDEM in New Zealand, a series of reviews which started in the 1990s was being carried out. The reforms identified that the new approach to CDEM can be broken down into four areas of activity, known as the “4Rs”: Reduction – Readiness – Response – Recovery (MCDEM, 2008):
Reduction
Identifying and analysing long-term risks to human life and property from natural or man-made hazards; taking steps to eliminate these risk where practicable, and where not, reducing the likelihood and magnitude of their impact.

Readiness
Developing operational systems and capabilities before an emergency happens. These include self-help and response programmes for the general public, as well as specific programmes for emergency services, utilities and other agencies.

Response
Action taken immediately before, during or directly after an emergency, to save lives and property, as well as to help communities to recover

Recovery
Activities beginning after initial impact has been stabilised and extending until the community’s capacity for self-help has been restored.

Based on these 4 areas of CDEM activities, the national strategy identifies 4 goals and associated objectives that are also reflected in the provisions of CDEM Act 2002. These are:

Reduction – Goal 1: Increasing community awareness, understanding, preparedness and participation in civil defence emergency management

Readiness – Goal 2: Reducing the risks from hazards to New Zealand

Response – Goal 3: Enhancing New Zealand’s capability to manage civil defence emergencies

Recovery – Goal 4: Enhancing New Zealand’s capability to recover from civil defence emergencies

Under each goal, detailed objectives were given for practical implementation. This research will focus on Goal 4, which is related to the last R in 4Rs – Recovery. Under Goal 4, two objectives were set out in the 2008 updated version of National Civil Defence Emergency Management Strategy as (MCDEM, 2008):

4A: Implementing effective recovery planning and activities in communities and across the social, economic, natural and built environments

4B: Enhancing the ability of agencies to manage the recovery process

As a holistic approach of civil defence and emergency management, MCDEM published a series of other documents, alongside the CDEM Act 2002, forming the CDEM policy framework. The Strategy is one part of the CDEM framework in New Zealand. The CDEM Act 2002 (the Act), the
Strategy, the National CDEM Plan (the Plan), the Guide to the National CDEM Plan (the Guide) and CDEM Group plans all form part of the framework, with the support and participation of central and local government, emergency services, lifeline utilities, other general infrastructure providers, businesses and volunteer agencies who are implementing the CDEM arrangements. The Strategy provides the vision and strategic direction. The Plan, the Guide and CDEM Group plans support the strategy.

3.1.3 Disaster reconstruction theories summary

At the beginning of this chapter, general definitions of disasters and hazards were reviewed. It is believed that natural disasters are generally considered as a coincidence between natural hazards and conditions of vulnerability. Emphasis has been given to the community-driven or community-based disaster reconstruction in the modern literature of disaster recovery. The concept has been accepted by various countries and embodied in their national disaster recovery strategies. The purpose of providing disaster recovery services generally is to assist the disaster affected community towards management of its own recovery.

A sequential model of disaster recovery activity developed by Haas et al. was adopted for this research (Haas et al., 1977). The post-disaster activities were grouped into 4 phases of 1) emergency response, 2) restoration, 3) reconstruction phase I (rebuilt, replacement), and 4) reconstruction phase II (commemoration, improvement, development). This model seems to well reflect the reality in the recovery process and since then has been accepted and quoted by the researchers in disaster recovery fields around the world (e.g. Prof. Ye from Chinese Architectural Research Group introduced the model in his work of Chinese experiences on disaster reconstruction (Ye, 2001) and believed it is an effective tool to evaluate the results of reconstruction activity and the effect of policy decisions). Distinguishing the recovery process into three stages after initial response as in Haas’ model is useful in trying to access the comparative rate of the overall recovery and determine the effectiveness of different policies or procurement methods used for reconstruction in each stage.

By comparing the disaster recovery principles of both Australian (Emergency Management Australia (EMA), 2003) and New Zealand (MCDEM, 2008) guidelines, several common values are observed. They are: 1) Community Involvement; 2) Systematic Approach; 3) Addressing the consequences; and 4) Training programmes and exercises. These principles are also shared
internationally in US, UK, and China. The Chinese reconstruction principles are more specific and reconstruction-orientated. It could be seen as a result of the increased researches into the area after The 2008 Wenchuan Earthquake.

In the last section of the disaster reconstruction theories, the Australian disaster management approach of *PPRR* (Prevention, Preparedness, Response and Recovery) and New Zealand Ministry of Civil Defence and Emergency Management’s approach of *4Rs* (Reduction, Readiness, Response and Recovery) are introduced. A diagram (Figure 13) showing the focus of those activities in comparing with the Haas model is included:

![Figure 13: Haas Model and Australian and New Zealand Disaster Management Approaches](image)

### 3.2 Guidelines on reconstruction procurement

#### 3.2.1 NZ regulations and government guidelines
There have been changes in the forms of contract and other types of project relationships used in some sectors of construction in recent years, and some of these may be more suitable for post-disaster reconstruction projects than traditional systems (Wilkinson et al., 2004). The procurement planning should form part of any reconstruction planning for major disasters. However, this appears to be lacking in New Zealand. A series of Recovery Plans prepared by New Zealand Ministry of Civil Defence & Emergency Management (MCDEM) in order to achieve greater standardisation and equity in central government policies for dealing with the aftermath of disasters (MCDEM, 2005b) provide some assistance in the reconstruction procurement process expected to be followed after a disaster event.

The Civil Defence and Emergency Management (CDEM) Act 2002 established a framework for MCDEM to build resilient communities (2005a). As a part of this framework, a national CDEM strategy (2004) was also established, focusing on reducing the impact of emergencies through a sustainable approach to hazard risk management and pre-event recovery planning to cope with the long-term impact of disasters. Four goals have been identified in this strategy and the main interest of this research is to focus on the reconstruction procurement aspect within Goal 4 – to enhance New Zealand’s capability to recover from disasters (Recovery within the ‘4Rs’).

There are various published related documents about the post-disaster recovery issued by MCDEM available, such as “Focus on Recovery”, “Preparation a Recovery Plan (2002)”, or the above mentioned “National CDEM Strategy”. The CDEM Act is the foundation for the CDEM environment upon which the National CDEM Strategy has been developed. “The Director’s Guideline and Information Series” in combination with the “National CDEM Strategy” and “CDEM Act” assist in driving the planning processes involved in the development of “CDEM Group Plans” and the “National CDEM Plan” (2005a). Aiming at detailing the framework and responsibilities for disaster and emergency recovery operations and the principles and existing policies for post-disaster activity (2005b), the Nation Recovery Plan does not directly concern itself with the reconstruction procurement process or related contractual arrangements. The Plan focuses more on the general aspects of recovery activities and the resilience of the whole community. But there are some points, such as financial matters and insurance arrangements, addressed within the Plan relevant to the cost aspect of reconstruction procurement. However, there is a lack of understanding of how construction works will be procured, how the industry will facilitate reconstruction, and who in the construction industry will be involved in procuring and constructing such reconstructed facilities. This is confirmed by the involvement of central government in assistance of recovery which seems hands-off in both financial and physical aspects with the
intention of encouraging local authorities, businesses and individuals to initiate the reconstruction process. Central government would become involved only when recovery is beyond the ability of the community to manage.

There are several guidelines that currently exist in New Zealand for government (central or local) for procurement in normal situations. These are listed in Table 18.

<table>
<thead>
<tr>
<th>Government Bodies</th>
<th>Guidelines for procurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Association of Consulting Engineers of New Zealand and the Institution of Professional Engineers of New Zealand (ACENZ &amp; IPENZ)</td>
<td>Guideline on the Briefing and Engagement for Consulting Engineering Services (January 2004)</td>
</tr>
<tr>
<td>The Office of Controller and Auditor-General</td>
<td>Procurement – A Statement of Good Practice (June 2001) replaced by Procurement Guidance for Public Entities (June 2008)</td>
</tr>
<tr>
<td>New Zealand Transport Agency (NZTA)</td>
<td>Transfund New Zealand’s Competitive Pricing Procedures (CPPs)</td>
</tr>
</tbody>
</table>

Table 18: Guidelines on procurement in New Zealand

The Ministry of Economic Development (MED)’s guide to procurement is the major guideline available in New Zealand for government procurement activities, it is intended “to help government departments and other taxpayer funded agencies to support the government’s procurement policy (Ministry of Economic Development's Regulatory and Competition Policy branch, 2002) but it does not provide significant guidance on processes for securing suppliers of large construction and/or building contracts.

The ACENZ & IPENZ guideline on briefing and engagement is used for selecting consulting engineers’ processes and has a focus on quality-based selection. According to the CIC (2004), the Audit Office’s Guideline assists with understanding the importance of a well-structured procurement process, and importance of the ‘basics’ – careful definition of the specification, cost estimating, robustness and transparency of process, attention to detail in planning and project management etc (2004). However, compared to ACENZ & IPENZ’s guideline, it does not provide guidance on how to embody the quality and value consideration in the actual selection step. The last one, NZTA (formerly Transfund NZ)’s Competitive Pricing Procedures, provides guidance in
the transport sector, with a range from Lowest-Price Conforming procedures to Brooks Law procedures with an emphasis shifting from price to quality.

It is worth noting that stated in the over-riding considerations of the updated Auditor Office’s “Procurement Guidance for public entities” (Office of Controller and Auditor-General New Zealand, 2008) are some basic principles that govern all public spending, which are: accountability, openness, value for money, lawfulness, fairness and integrity. By applying these principles sensibly, public entities can demonstrate that they are spending public money wisely, and properly managing the process for spending it. These principles are the basic considerations for any good practice procurement and should be shared by all other procurement guidelines issued by the government authorities or their agencies.

In the “Direct procurement” chapter of the Auditor-General’s guideline, there is a section titled “Emergency procurement”, which gives general considerations and expectations for the public entity to conduct procurement process in an emergency that are related to the post-disaster reconstruction theme of this research. It states that it may not be possible to satisfy the principle of open and effective competition throughout the procurement process in an emergency. Thus a public entity may dispense with parts of the procurement process if it needs to react quickly to genuinely unforeseen events (Office of Controller and Auditor-General New Zealand, 2008). However, it then states that poor planning or organisation of a procurement does not justify using an emergency process. It consequently sets out the guidance on emergency procurement: firstly, there should be relevant policies and procedures on what constitutes an emergency. Possible criteria could be life, property at risk or standards of public health, welfare, etc. Then it calls on the procedures which should be set out in relevant procurement guidance on lines and levels of authority and control – who is authorised to do what, and quality control and self-review needs for the public entities to conduct procurement in an emergency.

3.2.2 International experiences

3.2.2.1 OGC Procurement Guidelines, UK

Similar guidelines on procurement are available internationally, aiming to standardise the procurement practices in various specific disciplines in both public and private sectors. One example in UK is the series guidelines published by the Office of Government Commerce (2007). The Office of Government Commerce (OGC) is an independent office of HM Treasury (the United Kingdom's Economics and Finance Ministry) established to help Government deliver best value
from its spending. A specific collection of webpages and documents is dedicated to the Policy and Standard Framework on OGC’s website (OGC, 2010) including various links in 4 categories: Introduction to the New Developments in the Policy and Standards Framework; the Legal Framework; Key Policy Principles and Supporting Guidance; and a How to Buy Guide and Practical Guidance. Within the How to Buy Guide category, a further link to Construction Procurement is specifically provided. A suite of Achieving Excellence in Construction Guides (12 of them) is available for public access, tackling various aspects of public-procured construction projects: project organisation; project procurement lifecycle; risk and value management; the integrated project team; procurement and contract strategies; whole-life costing, etc.

The interest of this research on construction procurement guidelines will focus on the Guide 3: Project procurement lifecycle – the integrated process. Within the guide, it outlines the decision points and processes involved in the delivery of construction projects. It sets the project procurement process in the context of ‘Gateway’ reviews, the design and construction stages and key supporting processes such as risk management, value management and quality, cost, time and change control and describes the key outputs that are required at each stage.

The whole process of construction procurement is expressed in Figure 14. It sets out an example of government procurement in a generic integrated process. The framework should be regarded as a general guide and needs to be tailored to the individual requirements of different government departments or procurement systems and contractual models chosen. It is underpinned by the business case, which is maintained throughout the life of the project, to check that there continues to be a business need for the facility and that it is being met. Another special feature of this construction procurement framework developed by Office of Government Commerce (OGC) is that the gateway review points along the project planning route (see the figure below): Strategic Assessment; Business Justification; Procurement Strategy; Investment Decision; Readiness for Service; and repeatable last gateway point, Benefits Evaluation. Beyond those gateway checkpoints the project should not proceed unless specific management and funding activities have been completed. This system is similar to the concept of Stage-Gate Idea-to-launch framework (Cooper, 2005) in the mainstream project management literature, in which the project review and decision meetings are called “Gates”. At gates, projects are evaluated by management; projects are approved and prioritized; and resources are allocated to projects; poor projects are killed before additional resources are wasted.
The OGC Procurement Guidelines is included in the literature review as it is believed to be a robust and complete representation of most of the government guidelines and required procedures on public-sector procurement in the Commonwealth. It generally follows a traditional separated procurement route with various checkpoints along the process to make the accountability and integrity is maintained. However, it would be hard to imagine this procedure would cater for the needs of reconstruction procurement as only a limited timeframe is available post-disaster and the requirement of Business Justification and Strategic Assessment etc. would be troublesome to follow. A similar situation is observed in 2005 Matata Flood reconstruction case where a business case of regeneration package was required to be justified before the funding would be allocated, which eventually delayed the reconstruction commencement.
Figure 14: Framework for construction procurement (UK Office of Government Commerce, 2007)
3.2.2.2 Procurement Methodology Guidelines for Construction, NSW, Australia

This set of procurement guidelines was developed by the Construction Agency Coordination Committee (CACC), New South Wales (NSW) Government in June 2005. It is a part of the quality management guidelines for construction issued by the NSW Department of Commerce. The specific aim for developing this procurement guideline was to establish common terminology used to describe various options and provides guidance for the selection of the most appropriate procurement methodology, allowing for a range of management, delivery and contract system options and project types, as part of the procurement strategy for construction works (Construction Agency Coordination Committee (CACC) NSW Australia, 2005).

The major part of this guideline is devoted to the introduction and explanation of different features of three systems in the procurement framework: Delivery, Contract and Management Systems. It is designed to assist NSW Government agencies seeking to procure construction works to select a suitable procurement methodology for management and tenders/contracting, as part of the procurement strategy in accordance with the procurement policy.

A procurement methodology outlines the key means by which the objectives of a project are to be achieved. The above mentioned three systems (delivery, contract, management) are broken down into specific procurement systems that are commonly available and in use in the construction market, and analysed in accordance with their risks, benefits, advantages and disadvantages, and suggestions as to the systems that suit particular types of projects and project risks. Similar to the OGC procurement guidelines used in UK for public sector procurements, the NSW procurement guidelines summarise the procurement process for government projects into ten stages as shown in Figure 15:
So for a government construction project in NSW, a methodology description of the delivery/contract/management systems selected, with the project brief and a risk management plan, would be documented in the procurement strategy for approval in an initial methodology report. The rest of the strategy would be documented progressively in a strategy report with a project procurement plan dealing with the strategy implementation processes, supplemented by more detailed programmes and budgets, development and other approvals required, the management team authorities proposed, project governance and proposed tender processes.

Similar to the three-layer procurement path discussed previously in the literature review part (Procurement Systems – Contractual Models – Standard Contracts), the NSW procurement guidelines adopted a three-layer procurement methodology involves establishing:
• **Delivery system** – most appropriate overall arrangements for the procurement
• **Contract system** – for each of the contract or work packages involved as the components of the chosen delivery system; and
• **Management system** – how the procurement will be managed by the agency to suit the delivery system and contract system(s) selected

The components of each system forming the overall procurement framework are summarised in the following Table 19:

<table>
<thead>
<tr>
<th><strong>Delivery System</strong></th>
<th><strong>Contract System</strong></th>
<th><strong>Management System</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Contract</td>
<td>Construct Only (CO)</td>
<td>Project Management</td>
</tr>
<tr>
<td>Multiple Contract</td>
<td>Design Development and Construct (DD&amp;C)</td>
<td>Project Management</td>
</tr>
<tr>
<td>Managing Contractor</td>
<td>Design and Construct (D&amp;C)</td>
<td>Project/Construct management</td>
</tr>
<tr>
<td>Alliance Contract</td>
<td>Design, Novate and Construct (DN&amp;C)</td>
<td></td>
</tr>
<tr>
<td>Privately Financed Project</td>
<td>Design Development Construct and Maintain (DDC&amp;M)</td>
<td>Project/Contract Management</td>
</tr>
<tr>
<td>Direct Labour</td>
<td>Design Construct and Maintain (DC&amp;M)</td>
<td></td>
</tr>
<tr>
<td>Period Contract</td>
<td>Design Development Construct and Operate (DDCO)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design Construct and Operate (DCO)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Guaranteed Maximum Price (GMP)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 19: Components of a procurement methodology (summarized from CACC’s procurement guidelines 2005)**

So, as an example, if a single contract delivery system is selected, then one of the available contract systems could be chosen, such as DD&C. A project manager would also be involved. An alliance contract or managing contractor system could also be chosen for the single contract delivery system. They would then require a project/contract management system and sufficient management and agency support to prepare a brief and award and manage a contract. If a multiple contract system was adopted for the project, then various combinations of the listed contract systems would be available for the procurement. A project manager and probably a design consultant would also be involved.
3.2.2.3 Other international guidelines on reconstruction procurement

Generally speaking, there is no universal guideline available internationally for the sole purpose of procurement of disaster reconstruction works. However, as mentioned earlier, government guidelines, usually within the public procurement practice, are common. These guidelines are designed for the normal time construction would also be applicable under the reconstruction situation, but usually will be accompanied by other regulations issued by the authority after the event to suit specific local conditions for recovery. For example, in China the government procurement activities are regulated by The Government Procurement Law of the People's Republic of China 2002. The Law specifies parties, methods, proceedings, and contracts associated with government procurement. The procedures of query and complaint, supervision and inspection, and legal liabilities are also covered. The Tendering Act 1999 covers the legal requirements of conducting tendering activities in China. These pieces of legislation provide guidance over the general procurement practices. In Article 2 of The Government Procurement Law, “Procurement” refers to activities conducted by means of contract for the acquisition of goods, construction or services for consideration, including but not limited to purchase, lease, entrustment and employment; and “Construction” refers to all construction projects, including construction, reconstruction, expansion, fitting up, demolition and repair and renovation of a building or structure (PRC, 2002). It is worth noting that “reconstruction” is also included into the scope of this law. However, during the reconstruction process, in addition to these main pieces of legislation over procurement activities, specific regulations would normally be passed to give more practical guidance to the actual implementation of the reconstruction procurement. This specific legislation for reconstruction procurement will be covered in detail in relevant case study chapters (e.g. section 7.2.2.3 and 7.3.2.3).

Besides these guidelines or regulations issued by government, there are also procurement guidelines issued by large international banks. These banks usually provide funding to significant natural disaster reconstructions around the world and would be considered as a major client in the reconstruction contracting relationship. For example, the Asian Development Bank issued its updated version of Procurement Guidelines in April 2010. It comprises three parts: introduction; international competitive bidding; and other methods of procurement. It is notable that in Part III - Other methods of procurement, special provisions are made which are relevant to the reconstruction considerations (ADB, 2010), such as section 3.13 Procurement under BOO/BOT/BOOT Concessions and Similar Private Sector Arrangements; 3.14 Performance-Based
Procurement; 3.17 Community Participation in Procurement; and especially section 3.18 Procurement under Disaster and Emergency Assistance. In section 3.18, “greater flexibility” is given to the procurement of goods and works under disaster and emergency assistance circumstances. For example, international competitive bidding (ICB) will be relaxed in favour of national competitive bidding (NCB) with an abbreviated bidding period, and limited international bidding (LIB) will be the norm for procurement of goods with minimum bidding periods ranging from one to two weeks (ADB, 2010).

Similarly, The World Bank revised its relevant policies in May 2010 and issued its Guidelines Procurement under IBRD\(^3\) Loans and IDA\(^4\) Credits (The World Bank, 2010). It was formatted in the same structure of ADB’s Procurement Guidelines. The international competitive bidding (ICB) is the major component of this guideline and it was regulated in detail, covering its type and size of the contracts, pre-qualification of the bidders, bidding documents, and the procedure of bid opening, evaluation, and award of contract. It also incorporates the provisions of procurement under BOOT arrangements, performance-based procurement, and community-participation in procurement.

### 3.2.3 Guidelines on reconstruction procurement summary

#### 3.2.3.1 NZ regulations and government guidelines

A series of recovery plans prepared by the New Zealand Ministry of Civil Defence & Emergency Management (MCDEM) provide some assistance in the reconstruction procurement process expected to be followed after a disaster event. There are various published related documents about the post-disaster recovery issued by MCDEM. The cornerstone document of MCDEM policy framework, the National Recovery Plan, does not directly concern itself with the reconstruction procurement process or related contractual arrangements. The National Plan focuses more on the general aspects of recovery activities and the resilience of the whole community. But there are some points, such as financial matters and insurance arrangements addressed within the plan, which are relevant to the cost aspect of reconstruction procurement. But generally speaking, there is a lack of understanding in the specific terms of the official policy regarding how construction works will be procured, how the industry will facilitate reconstruction, and who, in the construction industry, will be involved in procuring and constructing such reconstructed facilities.

\(^3\) International Bank for Reconstruction and Development (World Bank)
\(^4\) International Development Agency
Other regulating authorities issued various guidelines on government procurement for the use under normal conditions. Those reviewed in the literature review part are the guidelines issued by MED, ACENZ&IPENZ, Office of Controller and Auditor-General, and NZIA. It is argued that the basic principles that govern all public spending brought up by the Auditor-General’s office procurement guidance for public entities (Office of Controller and Auditor-General New Zealand, 2008) should be shared by all government agencies, which are accountability, openness, value for money, lawfulness, fairness and integrity.

Consider a post-disaster reconstruction situation, the relevant government departments and agencies would most likely become ‘the client’ leading the reconstruction process. The policies established to regulate the government procurement in normal times would become the basis of procurement practice protocol to be followed in a reconstruction situation. The New Zealand Government expects its departments to conduct all their procurements within the framework of the policy principles set out in Government Procurement in New Zealand: Policy Guide for Purchasers – August 2007, issued by the Ministry of Economic Development (Government Procurement Development Group (NZ), 2007). The complete framework of government policy principles comprises:

- best value for money over whole of life;
- open and effective competition;
- full and fair opportunity for domestic suppliers;
- improving business capabilities, including e-commerce capability;
- recognition of New Zealand's international trade obligations and interests; and
- requiring sustainably produced goods and services wherever possible, having regard to economic, environmental and social impacts over their life cycle.

At the time of drafting this thesis, a reform of New Zealand State Sector procurement policy and practice was announced in June 2009 (Ministry of Economic Development (MED), 2010). The reform programme has four work streams: achieving cost savings; building procurement capability and capacity; enhancing business participation; and improving governance, oversight and accountability. Broadly speaking, all government agencies except local authorities are included within the scope of this $20 million, 4-year procurement reform. Public Service Departments are expected to participate in reform activities and use all-of-government contracts, as are State Services agencies (including NZ Police, NZ Defence Force, District Health Boards, and Crown Research Institutes). The MED’s Government Procurement Development Group holds up-to-date
details of current government policies concerning procurement in the public sector, and the effects on international agreements on procurement. Detailed relevant information could be found in the procurement section of the MED’s website (MED, 2010).

### 3.2.3.2 International Experiences

Similar guidelines on procurement are available internationally, aiming to standardise the procurement practices in various specific disciplines in both public and private sectors. In the relevant literature review sections, the OGC’s (Office of Government Commerce) procurement framework in UK, Procurement Guidelines for Construction in NSW, Australia, The Government Procurement Law in China, and Procurement Guidelines issued by Asian Development Bank and The World Bank have been introduced and reviewed.

There must be some regulations or guidelines for construction procurement available in almost every government around the world aiming to standardise the construction procurement practices in the public sector. These guidelines would also be applicable in a disaster reconstruction situation. A general structure of such guidelines would start with the introduction and explanation of the overall procurement process, then stipulate the certain mechanism for authoritative approvals (e.g. gateway review points in OGC procurement guideline), or generally the way to justify the chosen option and its related evaluation, financial appraisal and forming the strategy report for documentation. Some guidelines, such as the NSW one, go further and review the detailed components of the procurement and contractual framework, providing specific guidance on how to deliver the whole process, what contractual models should be used for each work package, and how to manage the procurement from the perspective of the overseeing government agency. The Chinese legislation on government procurement includes ‘reconstruction’ in its scope and is usually accompanied by other regulations issued post-disaster to suit specific local needs. The Asian Development Bank (ADB) and World Bank’s Procurement Guidelines incorporate the provisions on utilising BOOT arrangements, performance-based procurement, and community participation in procurement. A disaster and emergency assistance procurement provision is included in the ADB’s guidelines, under which greater flexibility is given to the reconstruction procurement process.

Some other policies and guidelines regulating the post-disaster reconstruction procurement are further introduced in the case studies chapters where the context of the overall recovery activities is much more specific.
3.3 Disaster reconstruction contractual models

As reviewed earlier in the literature review section, there are many contractual models and associated standard contracts available in the construction industry tailored to suit the specific needs of every particular engineering project. They were then summarised according to different procurement systems under the normal time construction. How these are used in a disaster is the focus of the remaining parts of this thesis.

3.3.1 Contractual models for reconstruction – theory

The spectrum of contractual models needs to be fully understood in the scope of the overall procurement environment. As stated in the earlier subchapter on contractual models described in previous literature review, different contractual models may be summarised in the following Figure 16 according to their payment methods. Several factors have been compared along with those models, such as the information required for tender, information required for control, owner’s risk and control effort.

Figure 16: Range of contract payment types (Burgess, 1980, p149, Ashworth, 2001, p123)
This figure compares factors such as information requirements with control and risk considerations. In a typical conventional contractual arrangement, if the main priority of a client is, for example, to obtain a lump sum contract price from a contractor, then almost all the information of the project design will be required at the tender stage to facilitate the price estimation. After the contract is awarded, the associated risk and control effort are relatively minimal to the client. However, in a disaster reconstruction situation, the ability to provide such detailed information at the initial stage is usually problematic. The more imprecise the design information is, the greater will be the risks to the client. All other things being equal, it is more likely for the disaster reconstruction contracts to be within the right half of the triangle in the above figure: limited information available at the tender stage, cost reimbursement contracts, relatively high owner risk thus more control effort is required during the project.

The three broad areas of concern to the client and the expectations that are required in any building project are, generally speaking, performance, cost and time. The appropriate mix/ tradeoffs of these factors need to be considered in selecting the most suitable contractual model for the project. A table of the client’s different priorities, including associated questions, has been developed by Ashworth (2001) based on an EDC (Engineering Design Consultants) report in helping selecting among the contract models. The name of contractual models in Ashworth’s table has been changed to reflect the categorisation adopted in this research. And some other relationship-based contractual models that were not included originally have now been added to the following Table 20 and been compared and analysed collectively.
<table>
<thead>
<tr>
<th>Contractual models:</th>
<th>Procurement systems:</th>
<th>Separated</th>
<th>Integrated</th>
<th>Management-orientated</th>
<th>Discretionary</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional Lump-sum</td>
<td>Early selection (2 stages)</td>
<td>D&amp;B/ Package deal/ Turnkey</td>
<td>Management contracting</td>
<td>Construction management</td>
</tr>
<tr>
<td>Timing</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Variations</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Complexity</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Quality</td>
<td>High</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>Basic</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Price certainty</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Professional</td>
<td>Yes</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<td></td>
<td>No</td>
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<td>*</td>
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<tr>
<td>Risk avoidance</td>
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<td>*</td>
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<tr>
<td></td>
<td>Shared</td>
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<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

Table 20: Identifying the client's priorities (adapted from Ashworth, 2001 to suit the scope of this research)
If this table of criteria is considered in the reconstruction situation in a serious disaster event, the most likely client for major projects will be the government. For the timing issue, it is clear that the early completion is crucial for any type of reconstruction post-disaster, which is not likely to be achieved by using the traditional selective tendering. The second criterion in the list - flexibility for variations - will depend on specific project requirements. For the large and complex infrastructure projects to be constructed post-disaster, the scope of the design and planning may not be thoroughly comprehended initially given the pressure of limited time, so variations may be important. Providing transitional or temporary housing for the immediate shelter needs post-disaster, the design would be relatively straightforward in scope so variations would not be an important consideration. This also touches on the choice of the complexity involved in certain construction projects post-disaster. Arguably, most of the reconstruction in the private sector would be of basic or average level of complexity.

Quality expectation is the next factor on the list. Certainly, quality of the reconstruction works should be completed to a high standard as they will have to ensure a safety protection to the affected people against the possibility of future disaster strikes, such as in the case of transitional houses reconstruction after a major earthquake with potential threats of aftershocks. However, one may argue that as long as the safety requirements of the structure can be met, the quality of the reconstruction works can be reduced to some degree to speed up the overall construction process to cater for the massive needs: for example, simplify and standardise the design, fast-track the tendering process for temporary shelters construction etc. The next item in the table, price certainty, may have practical implications for a post-disaster reconstruction project. In both public and private sector procurements for reconstruction works, funding approval is a crucial part of the standard procedure to secure the project, either for infrastructure investment from certain government departments or for housing programme’s donor approval from certain NGOs. The price certainty is a basic requirement for the client’s overall budget planning. Admittedly, in some specific cases, the reconstruction works have been carried out without any certainty of the overall contract price as either they are explorative or difficult projects by their nature or they may be sensitive and the details of the construction should remain confidential (e.g. reconstruction of military structures). By now, the Design and Build and Construction Management types of contracts stand out from the above list as they meet most criteria favoured for post-disaster reconstruction projects. Furthermore, considering the remaining factors, the Design and Build has a sole responsibility and a single point of contact for contract management and the risk would be minimal to the client, whereas construction-management type contracts allow the direct involvement of the professional consultant employed by the client in project delivery.
3.3.2 Contractual models for reconstruction - practice

3.3.2.1 New Zealand reconstruction contractual models

As discussed previously in the literature review of standard contracts, the current basic contract document used in New Zealand construction industry is NZS3910:2003, *Conditions of Contract for Building and Civil Engineering Construction*. The NZS3910 conditions of contract is well established, tested and widely used for most building and civil engineering construction works that are procured in a traditional method in New Zealand. Generally speaking, the contract documents under any building project should include the following information as a minimum: the work to be performed; the quality of work required; the contractual conditions; the cost of the finished work; and the construction programme (thus to determine the time required for the construction work). Respectively, they answer the fundamental questions of what is to be constructed and how, as well as the quality, time, cost considerations associated with it. Therefore the contract documents on a building contract will normally comprise the following. 1) Form of contract, including articles of agreement and appendix; 2) Contract drawings; and 3) Bills of quantities, specifications or measured schedules.

In the standard set of contract documents NZS3910:2003, major components are General conditions of contract, Schedules to general conditions of contract, Conditions of tendering, and Guidelines. It is designed to suit the different types of contractual models. In clause 2.1 of its general conditions of contract, it specifies that “The contract shall be a lump sum contract, or a measure and value contract, or a cost reimbursement contract as stated in the Special Conditions”, and this choice needs to be made clear in its later section of Schedules.

The reconstructions after two recent New Zealand flooding disasters are selected as the case studies in this research, namely, the 2004 Manawatu and 2005 Matata Floods reconstruction (refer to the case studies sections for detailed information). During the study, it was found that most of the reconstruction works involved following these two floods was carried out in the traditional way of tendering and contractual arrangements: NZS3910 was the major type of contract that was applied for the reconstructions. No major differences were observed during the procurement and subsequent contractual arrangements in reconstruction projects compared to normal time construction works. This may be due to the limited size and impact of New Zealand disaster cases and/or limited size of the
construction markets in affected areas and industry familiarity towards the conventional procurement system. During the reconstruction phase, the involved parties were almost the same as in the normal situation. Working with existing consultants meant that the contract approaches do not differ from the normal situation but the circumstances of the reconstruction did differ from normal construction. In particular, emergency services, civil defence and council maintenance crews were involved. Various utility providers, consultants and contractors worked 24-hour days to repair damaged roads and bridges, and restore disrupted services. The focus was on rebuilding quickly, hence the need to try and use existing contractual relationships, ones with a proven track record and relationships often based on mutual trust that had already been established pre-disaster.

3.3.2.2 International reconstruction contractual models

Similarly, the contracts used for reconstruction post-disaster around the world are those standard contracts that have been used previously under the normal time construction. These include standard contracts families FIDIC, JCT, etc. However, during the international case studies, it is found that certain procurement systems and contractual models were favoured over others to be used for post-disaster reconstruction due to their various features. This lead to the selection of appropriate associated standard contract documents. As mentioned in the introduction section, the relevant literature on reconstruction contractual models is limited. This section will briefly discuss the available post-disaster contractual arrangements both in theory and in practices. Examples of practical use will be presented. Detailed analyses of specific reconstruction contractual arrangements under different settings will be covered in relevant case study chapters later in this thesis.

As discussed in the literature review section, the client in most post-disaster reconstruction situations is the corresponding government departments or relevant agencies. In the literature review section, different contractual models were analysed according to their suitability to the reconstruction, and Design and Build (as in the Integrated Procurement Systems) and Management-orientated Procurement Systems stand out as most desirable ones for reconstruction after disaster. So during a post-disaster reconstruction scenario, it would most probably be government agencies or a committee comprised of government agencies and other stakeholders acting as the client, procuring construction works under the D&B or Management-orientated contractual models within the commercial industry market. Theoretically, in this way it will deliver the most favourable outcome to both the client
The 1994 Alaska flood recovery demonstrates an excellent regional management. In spite of several environmental and social constraints, the region successfully recovered in minimum time and within the forecasted budget. Key to the recovery was that a general contractor was employed by government agencies to manage the reconstruction effort (Westhaver and Boyce, 1996), which shows the features associated with integrated procurement systems. Government agencies worldwide are increasingly turning to design/build for new building construction due to its desirable features, such as single point of responsibility, price certainty and risk avoidance etc (Dietsch, 1995). A similar idea is expressed by Greenstein (2003) towards the reconstruction contracting: “Urgent or emergency job order contracting procedures are useful to combine many urgent works into one project administered by one project team. These projects may cover all types of works, reconstruction, repair and rehabilitation of different facilities (roads, bridges, slopes, seawalls, docks, water supply) under a single contract. The projects are competitively bid with fixed costs and with performance indicators.”

As an industry initiative, the American Institute of Architects (AIA) and Associated General Contractors of America (AGC), representing the two ends in construction contractual relationship in US, produced a set of recommended guidelines for D&B procurement in public building projects (Dietsch, 1995). Some principles embodied in this guideline would also be practical for post-disaster reconstruction projects: Firstly, the AIA/AGC guideline urges the owners to rethink their decision to use the D&B contractual model over other, more conventional methods of project-delivery, providing a series of factors similar to what is covered earlier in this subchapter as the specific project’s time constraints, budget, programme, and quality expectations. Then the government agencies are encouraged to think through and define their space needs, design goals, site conditions, regulatory requirements, as well as selection criteria, timetables, and budget parameters in its initial plan. Only the most promising contractors should be shortlisted through a selection jury, comprised of agency officials, users (i.e. beneficiaries in a disaster reconstruction project), technical advisors and other relevant parties’ representatives. The guidelines also counsel owners on what priority project costs should receive in selecting the D&B contractors - should price be the absolute, competitive factor, or should selection be based on more relative calculations of value? A "modest yet fair" stipend is suggested for all tenderers and the ones that did not win the commission should receive candid
feedback from the agency on the competition's results. The major focus of this guideline is to ensure that fair competition is facilitated and a win-win scenario is achieved for all parties involved.

No matter what specific form the reconstruction contractual arrangements takes, either a general contractor (Westhaver and Boyce, 1996), or a single contract by one project team (Greenstein, 2003), it emphasises the similar features associated with integrated and management type of procurement systems, such as Design and Build (Dietsch, 1995), or Management Contracting. In the next section, a specific example of reconstruction contractual model used in practice will be examined.

### 3.3.2.3 A successful example of integrated procurement system for disaster reconstruction - Community Contracts

Utilising the same principles as in integrated procurement systems, a special contractual arrangement, “Community Contract” was initiated first by UN-HABITAT at 1986 in Sri Lanka for community development programmes. It was then upgraded and expanded to include other small-scale construction projects both post-disaster and under the normal time in other developing countries in south-east Asia and Africa. A Community Contract is a contract awarded to a community organisation by a government agency, NGO or project to carry out physical works that have been identified in the Community Action Plan (UN-HABITAT, 2008). Within the same report, an overview of community contracts awarded by UN-Habitat projects in Asia is provided in Table 21.

<table>
<thead>
<tr>
<th>Country</th>
<th>Period</th>
<th>Contracts</th>
<th>Value in USD (million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>2002-06</td>
<td>3,245</td>
<td>93.72</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2002-06</td>
<td>1,066</td>
<td>9.67</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2005-06</td>
<td>362</td>
<td>14.39</td>
</tr>
<tr>
<td>Maldives</td>
<td>2005-06</td>
<td>97</td>
<td>12.26</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>2005-06</td>
<td>677</td>
<td>6.98</td>
</tr>
<tr>
<td></td>
<td>1986-99</td>
<td>400</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Table 21: Overview of Community Contracts in Asia (UN-HABITAT, 2008)

It can be seen that after Indian Ocean Tsunami, there is a significant increase of number and value of the Community Contracts that have been let in disaster-hit countries, such as Indonesia, Sri Lanka and Maldives in 2005-06, contributing to the reconstruction efforts there.
One can imagine that the introduction of such a new contractual arrangement into the existing commercial market would be difficult. The first obstacle was to solve the legitimate status of the affected community to be engaged into a contract. This was done by registering Community Development Councils (CDC) with local authorities, and local government by-laws had to be adjusted to allow for sole-source bidding in case of community contracts (Pathirana and Yap Kioe, 1992, Sohail and Baldwin, 2004). Advantages of this arrangement are obvious as this facilitates an integrated process of communities identifying and prioritising their problems and agreeing on the plans to be realised through the guidance and technical assistance of the implementing agencies.

Under the conventional procurement systems with commercial contractors, the affected community and beneficiaries post-disaster would only benefit from the output of the contract and not from the process of the construction. Criticisms about the lack of community consultation and engagement in the post-disaster reconstruction (Steinfort and Walker, 2008) argue that the suffering communities are often railroaded by NGO or government agencies using stock standard approaches without considering the communities and the stakeholders they serve through these projects. Awarding the contract to the community would facilitate the community-driven disaster reconstruction and allow the community to be involved in every significant decision made for their own recovery. It is a tool for community empowerment and a process that ensures both social and economic accountability. Different to the conventional practises of employing affected beneficiaries to provide labour, which is then paid for by the implementing agency, the community and beneficiaries in Community Contracts are at the centre of the decision-making process. They acquire a feeling of ownership and attachment to the facility, which automatically ensures long-term maintenance and sustainability. The involvement of affected communities through this arrangement post-disaster also has therapeutic effect for individuals suffering from trauma of losses from the event. The experience of implementing community contracts with UN-Habitat proved to be successful; communities embraced the efficiency of the system and donors like it because of its transparency.

Having discussed the advantages of using community contracts for post-disaster reconstruction, one should also understand the limitations during its implementation. The typical type of community contract would be for works that can be classified as physical improvements within the settlement, mostly labour-intensive rather than mechanised, technically straightforward, not capital intensive, not requiring highly specialised skills and relatively easy to manage (UN-HABITAT, 2007, UN-HABITAT, 2008). Some examples of the infrastructure and facilities constructed through community
contracts are access roads and paved footpaths to and within the settlement; drains, culverts and small bridges; water tanks, wells and hand-pumps; public toilets; community halls, schools, clinics; and housing in massive post-disaster reconstruction.

Another report of UN-Habitat illustrated a typical six-step process of community contracting.

<table>
<thead>
<tr>
<th>Step 1: Socialization/ information dissemination</th>
</tr>
</thead>
<tbody>
<tr>
<td>• town level consultation</td>
</tr>
<tr>
<td>• community identification</td>
</tr>
<tr>
<td>• training of village facilitators</td>
</tr>
<tr>
<td>• identification of location of stakeholders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 2: Community mobilisation and organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• meeting with stakeholders (village)</td>
</tr>
<tr>
<td>• baseline data collection</td>
</tr>
<tr>
<td>• formation of CDC and other committees</td>
</tr>
<tr>
<td>• survey of material price</td>
</tr>
<tr>
<td>• village meeting to discuss proposal</td>
</tr>
<tr>
<td>• inter-village meeting to prioritize proposal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 3: Community contracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Community Action Planning (CAP)</td>
</tr>
<tr>
<td>• Preparation of proposal with design and budget</td>
</tr>
<tr>
<td>• certification of technical feasibility</td>
</tr>
<tr>
<td>• community contracts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 4: Owner built houses and financial management</th>
</tr>
</thead>
<tbody>
<tr>
<td>• establishment of bank accounts</td>
</tr>
<tr>
<td>• disbursement of funds in instalments</td>
</tr>
<tr>
<td>• procurement of material and labour</td>
</tr>
<tr>
<td>• implementation of shelter component</td>
</tr>
<tr>
<td>• implementation of community asset component</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 5: Oversight/ monitoring and training</th>
</tr>
</thead>
<tbody>
<tr>
<td>• social audit (village level)</td>
</tr>
<tr>
<td>• inter-village meeting for accountability and reporting</td>
</tr>
<tr>
<td>• training of labours, CDC members</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 6: Linkage with governance planning</th>
</tr>
</thead>
</table>

Table 22: Community Contracting Process of The Aceh-Nias Settlements Support Programme (ANSSP) (UN-HABITAT, 2007)

It is a mixed method of integrated and management-orientated procurement systems where the community has been incorporated as an essential component to both client and contractor, a community Do-It-Yourself version of design/build. It goes from community identification in step 1 to community organisation in step 2, and then followed with centre part of the process: community contracting in step 3, owner building the house and obtaining financial assistances through instalments in the next step 4, then the constant monitoring and training in step 5. It is worth noting that step 6
stresses the need to link this process with the formal governance structure throughout the implementation process. It has proved to be a very practical model to be implemented post-disaster for community-driven reconstruction.

3.3.3 Reconstruction contractual models summary

This section deals with the reconstruction contractual models and contracts that have been used previously post-disaster under different arrangements of procurement systems. It starts with summarising different contractual models according to their payment types. It is believed more likely that reconstruction projects would be on the right hand side of the triangle diagram, with limited information available at the tender stage, possible use of cost reimbursement contracts, relatively high owner risk and more control effort required during the project duration.

Then it compares the contractual models against different priorities of clients, including the factors such as time requirements, flexibility for variations, quality expectation, price certainty, complexity, single or multiple points of responsibility, professional consultant involvement and risk avoidance strategy. By considering these criteria under the perspective of a disaster reconstruction project, it is found that the D&B and Construction Management models were more desirable over other arrangements in a post-disaster reconstruction situation.

It goes on to the specific contractual arrangements and contracts that been used previously in disaster reconstruction situations. Within a New Zealand context, no major differences were observed between the contracts that have been used before for disaster reconstruction and the normal time construction contracts. This may be due to the limited size and impact of the disasters that have been considered as well as the size of the local construction industry and relatively high level of industry familiarity and dependence over the more conventional contractual arrangements. However, it is found that the trust-based or relationship-based contracts would be more suitable in New Zealand disaster reconstruction cases. The need to try to use existing contractual relationships is emphasised.

In the international reconstruction contracts section, it is realised that in most reconstruction cases, since the standard contracts have already been formally established and widely applied in the construction industry pre-disaster, the standard contract documents and delivery methods remain the same as in the normal time construction. However, it is believed that by adopting the integrated or
management-orientated procurement systems and associated contractual models post-disaster, the relevant parties and various stakeholders involved in reconstruction would benefit as well as the whole industry. The American Institute of Architects (AIA) and Associated General Contractors of America (AGC) produced a set of recommended guidelines for D&B procurement in public building projects. Some principles embodied in this guideline would also be practical for post-disaster reconstruction projects and these were introduced in the relevant section to achieve a win-win scenario for all the parties involved.

A special contractual arrangement of community contracts initiated by UN-Habitat for the use of disaster reconstruction projects to facilitate the community-driven recovery has been reviewed. It is rather a community Do-It-Yourself version of D&B contractual model, and has the features of both integrated and management-orientated procurement systems. It incorporates the beneficiaries, who in the conventional contractual arrangements would only be the receiver of the reconstruction output, into the centre of decision-making process of their own rebuilding. It fits perfectly with the concept of community-based or community-driven reconstruction. Some obvious advantages by implementing the community contracts model are: community empowerment, social and economic accountability, ownership and attachment of the community towards the reconstruction works, thus ensuring the long-term sustainability and maintenance. There was a spike in the usage of community contracts among UN agencies after the Indian Ocean Tsunami in 2004. The experience so far with UN-Habitat has proved to be successful. Although the implementation of the model is limited to relatively straightforward projects at the moment, it is favoured by both beneficiaries and donors for its efficiency and transparency.

Due to the limited literature on reconstruction procurement and contractual arrangements, which initiate the need for this research, the discussion in this section is concentrated on the available examples in a more theoretical sense. However, detailed analyses of specific reconstruction contractual arrangements in practice will be made in relevant case studies in later chapters of this thesis.

### 3.4 Post-disaster reconstruction procurement systems

From previous discussion, it is summarized that a list of characteristics that are favoured in a contractual arrangement for post-disaster reconstruction, combining these with the characteristics
identified by Wilkinson et al. (2004), it is concluded that following a disaster event the procurement framework needs to have the following:

1. allows the *overlap between the design and construction* thus a early completion of the reconstruction project would be possible
2. prefer the *single point responsibility* as most of the implementing agencies (e.g. NGOs) involved in disaster reconstruction would not have relevant disaster reconstruction management experiences, the D&B or Construction Management models are favoured
3. allows for *effective communication links* between the parties
4. allows for the use of the *existing relationships* between the parties involved
5. allows the involvement of the affected community into the decision making process to facilitate a *community-driven* reconstruction effort
6. ensures both *social and economic accountability*, not only to the implementing agency who award the contract and provide the funding, but also to the affected community or beneficiaries
7. provides effective mechanism for *quality assurance and monitoring* during the project duration and after for sustainable maintenance with future hazard mitigation options considered
8. ensures the contract arrangement is “*win-win*”, i.e. that is the best possible deal both for the client and the contractor
9. ensures local *industry familiarity* with the framework
10. encourages the use of *local material, labour and plant*
11. facilitates the reconstruction works to be carried under *limited timeframe* and relatively *low cost*

Not all procurement systems will be suitable post-disaster, so the governing organisations need to be advised of the best system to meet their needs.

### 3.4.1 Separated procurement systems for disaster reconstruction

In a disaster, the ability of a separated procurement system to quickly respond to rebuild could be a disadvantage. If a short time for rebuilding is required then using the separated system may be a disadvantage. As Wilkinson and Scofield (2003) suggest, the traditional separated procurement system usually results in a longer time period for the whole construction project mainly because the design is
often fully completed before tendering and construction. They further point out that usually the longer
the time period, the higher the cost, hence the traditional system is often associated with higher costs.
A higher cost product would be a disadvantage in a disaster rebuild situation, as financial resources
will already be stretched. However, with full design documentation at tender stage, the total cost of the
project should be known which might introduce some clearer measure of reconstruction costs.

The separated procurement system is associated with design by a design professional and a quality
product. Administration of the project by a design professional usually means high quality as the
design professional is often focused on quality. Care should be taken that following a disaster, quality
is not taken to mean importing expensive material at the expense of getting local infrastructure and
material supply businesses functioning.

The traditional separated system is a well understood, tried and tested procurement system making it
attractive from a familiarity viewpoint. If the parties have worked together with the framework on
previous projects then there is likely to be well-developed relationships between the parties. However,
the fragmented and sequential nature of the systems tends to mean that communication becomes
complex. This is a disadvantage when working in a crisis situation where clear and easily understood
communication systems are required. On balance, the main impediments to separated procurement
system for reconstruction following a disaster are the time, cost and communication factors. The main
advantages for reconstruction following a disaster are familiarity with the system and receiving a
quality product.

3.4.2 Integrated procurement systems for disaster reconstruction

Concern is expressed in the use of design and build because of the lack of checks and balances leading
to a lower quality (Beard et al., 2001). Quality may not be such a priority in a crisis situation, as
recovery needs are more likely to focus on time and cost, although arguably this approach could lead
to the increased vulnerability of a poorly planned and designed built environment to future disasters.
Too often there are stresses on national and local administrations to rebuild key lifelines that have been
lost. Menoni (2001, p105) notes that, ‘Market forces put pressures to reconstruct as quickly as possible
transportation networks to long distances and commercial and office buildings, hampering efforts to
implement lessons learnt from the disaster in the attempt to reduce pre-earthquake vulnerability’. Extra
quality and embedded forethought can help the reconstructed built assets and community to be more resilient, but there is inevitably a trade-off between time, cost and quality which communities need to make.

Mulvey (1997) summarises that the design and build approach is especially successful in the case where the scope of project is clearly defined, the design is a standard, repetitive design, and the schedule is tight. In a disaster, design and build procurement could be suitable because of this short time and low cost focus. This coupled with a local contractor’s likely knowledge of the local construction industry such as fast access to local material, labour and plant make it an attractive option. The integrated system is uncomplicated and therefore it is easy to establish well-developed communication links between the main parties, contractor and client. In many countries internationally, integrated procurement system such as design and build also scores on local industry familiarity with the framework. The only caution to be noted is in the reputation of the design and build framework to be focused on repetitive, simple constructions and some concerns about the reliance on one company to be able to undertake all the work effectively – hence trust becomes a major factor.

3.4.3 Management-orientated procurement systems for disaster reconstruction

Having a management tier in a project could be advantageous during disaster reconstruction as the sole focus of the project management or construction management organisation is management of the project. The skill of the managing organization is critical to its success, more so in a disaster scenario where quick and efficient decision making is required. Wilkinson and Scofield (2003) discuss the advantages and disadvantages of the project management system. They suggest that when a project manager is employed, the programme may be shortened due to the project manager using increased knowledge of project planning. By concentrating on management, the project manager can focus on reducing the overall time. This could be good for disaster reconstruction management. In New Zealand the Earth Quake Commission trialled a coordinated response to the Te Anau earthquake of 2003, using a large single contractor to coordinate and manage the recovery works on its behalf. Coordination was clearly an improvement on the situation where individual property owners competed for the services of a limited number of building contractors.
Where skilled local project managers can be used for managing reconstruction, the expectations of project success are high. As with integrated procurement system, the project manager or construction manager, using existing communication links between the parties would be able to facilitate rapid rebuild – especially if the project manager has a well developed sense of the local material, plant and labour situation. However, there is a need to check for local industry familiarity with the system and in particular the value of having another management tier in the project, increasing the lines of communication between the parties.

3.4.4 Discretionary (collaborative) procurement systems for disaster reconstruction

One of the major representatives of the collaborative procurement systems is Partnering. It is a voluntary arrangement made between all of the project participants and has no legal standing and imposes no contractual obligations upon any of the parties (Broome, 2002). But, as Egan (1998) and Latham (1994) discuss, the partnering approach can prove useful in the construction process and in improving construction practices. For disaster reconstruction, partnering may be a suitable option to overlay other frameworks. As a focus on relationships and trust are likely to be crucial in such a situation, partnering might provide a vehicle for reconstruction procurement. If local companies in a reconstruction zone have an established long-term relationship, as a system based on trust requires, then the use of partnering might be viable. Internationally, familiarity with partnering concepts may still not be high, but could be quickly learnt, especially given the needs of the parties to face the common objective of rebuilding communities.

Project alliancing is typically used on larger and more complex projects, where there is a large amount of uncertainty, so would be useful in an emergency situation. The size and duration of the project has to justify the investment in setting it up, both commercially and culturally (Broome, 2002).

If reconstruction projects following a disaster are treated piecemeal then the use of alliancing would not be justified on the many smaller individual projects. If however a coordinated programme of work is envisaged to facilitate post-disaster reconstruction, this situation presents an opportunity to use an alliancing approach. Hence alliancing would be appropriate in this situation due to the following factors:
• Large scale of work programme;
• Large degree of uncertainty and complexity;
• Need for a target-cost type of payment mechanism to allow for variation in the scope of work and promotion of innovation in the execution;
• Generation of a cooperative culture due to the wider social incentives to work together for the benefit of the whole community;
• The use of alliancing does necessitate pre-planning and detailed preparation.

Parties need to be confident that they understand how the relationship will work and the benefits for each party will need to be transparent, which is key to increasing trust between parties. Preparation for an alliance relationship can be done in anticipation of a future event and the role parties will be able to play in such an event.

Since alliancing requires significant input in the early stages to establish an appropriate commercial and cultural framework, this would work against the use of alliancing if there is no prior planning and attempts are made to establish such a relationship in a reactive way following a disaster. However, some preparation can be done in advance which would facilitate adoption of an alliance for post-disaster reconstruction. Preparations should be carried out by agencies that would be responsible for delivering reconstruction projects (such as major public utility and highway infrastructure owners). Such preparations need to include: Identifying construction supply chain companies with similar values and commercial culture to that of the owner; Identifying facilitators who could be called upon to accelerate and maintain the culture; Developing alliancing agreements that are provisionally agreed to in advance by potential alliance parties, including commercial and legal frameworks and dispute resolution procedures; Developing procedures for establishing target costs and pain/gain share. By having reconstruction plans in place in the form of procurement strategies, collaborative arrangements between key organisations involved in a disaster event will be able to facilitate quick and effective reconstruction.

3.4.5 Reconstruction procurement systems summary

Four categories of procurement systems analysed in this research have been examined for their applicability to the post-disaster reconstruction situation according to a list of desirable features
identified in this research. It is found theoretically that the procurement systems that demonstrate the characteristics of integration of design and construction functions and collaboration between contracting parties are more likely to succeed in a post-disaster reconstruction setting. The integrated procurement system and management-orientated procurement system are believed to be in the best position to deliver construction works post-disaster. It should be noted that the traditional separated procurement system and more collaborative procurement system may also be favoured post-disaster under certain conditions. For the traditional ones, if the scale of the disaster is not significant and the scope of the reconstruction project is straightforward, then the separated systems could be used for its certainty over cost pre-construction, industry familiarity and high-quality outputs. The collaborative procurement system, such as partnering or alliancing, may also be used post-disaster if well-developed communication links and established long-term relationships exist between collaboration parties and the reconstruction projects are of large scale and have a high degree of complexity and uncertainty.

The integrated and management procurement systems bring in the benefits of single-point responsibility, overlap of design and construction thus shortened duration, minimised communication links, and simplified procedure to the post-disaster procurement process. They are generally more suitable for the construction projects with a tight schedule, and where client does not have the resources to manage the project itself. The integrated system is more suitable to projects with typical construction where standardised techniques and materials are to be used and the scope of project is clearly defined and the management one is more suitable to complex projects involving numerous different specialist subcontractors where clear performance or functional requirements are not easily available to the client at project commencement. These fit in well to the typical circumstance one can expect to experience in a post-disaster reconstruction environment.
CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

This chapter describes the research methodology used to achieve the objectives of this research. This research primarily utilizes qualitative approaches to derive the research findings. The choice of qualitative strategy is based on two considerations: the research problems and the nature of qualitative methodology.

A number of researchers (Yin, 2003, Bailey, 2007, Blaikie, 2000) pointed out that the selection of research methods, to large extent, depends on the purpose of research and research questions posed. This research aims to review the existing procurement and contractual arrangements and analyse their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster. In order to achieve the overall objective, the existing procurement systems, contractual models and government regulations on procurement are subject to review with the purpose of investigating their relevance and usefulness in a disaster reconstruction situation. Moreover, the overarching theme of this research requires further analysis on what procurement systems have been used in reconstruction in disaster zones, coming up with possible recommendations which can be applied in future post-disaster reconstruction. The past literature on procurement systems in construction industry and reconstruction theories offer the researcher general knowledge of the research background, but they are not sufficient or detailed enough to address all the research questions. Thus, the study also relies on practical case studies to seek in-depth insights and perspectives so that proposed questions can be answered and a post-disaster procurement path can be identified correspondingly.

Smyth and Morris (2007) argued that the pursuit of explanations that rely upon identifying general patterns based upon cause and effect marginalises the particular, while a focus upon the particular frustrates the emergence of common patterns, shared meanings and normative recommendations. The absence of a received theoretical framework for project management, and the importance of context, puts a special burden on ensuring that the researchers pay attention to epistemology and hence methodological issues. Just as the various Body-of-Knowledge (BOKs) can create self-fulfilling perceptions and self-serving reinforcement amongst practitioners as to what constitutes appropriate
knowledge, so too an uncritical use of methodology can create self-fulfilling perceptions and self-serving reinforcement amongst academics (Maruyama and Ghoshal, 2005). Smyth and Morris (2007) summarised the dominant methodologies used in the project management research according to their key epistemological aspects into positivism, empiricism, hermeneutics, and critical realism. Both positivist and empiricist traditions have been dominant historically in research on projects. They explain events based on the causality of linear thinking. This creates a preference for closed cause–effect models, yet social systems and many natural systems are open. Hermeneutics or interpretative methodologies are excellent for understanding perceptions, which are part of the particular, but poor at addressing the general. Critical realism philosophically places research endeavour in context in theory and practice, hence encouraging critical evaluation and reflection on research endeavours (Smyth and Morris, 2007). This in turn leads to the consideration of using a combination of literature review and case studies as research methods.

A systematic qualitative methodology provides in-depth ways to seek the experts’ insights and perspectives on a particular subject matter and emphasizes in-depth knowledge on the refinement and elaboration of images and concepts (Ragin, 1994, Mcneill and Chapman, 2005). Hancock (2002) suggested one of distinguishing features is that data are used to develop concepts and theories, which are helped to understand the social world.

Qualitative methods are particularly suited for studying a substantive area about which little is known previously to describe the phenomena in detail, and to explore topics that are difficult to be studied by other means (Kalof et al., 2008). Both the construction procurement practices and reconstruction theories have been studied by the previous researchers, whereas few of them (discussed in details in literature review part of this thesis) have made attempts to investigate the application of general procurement practices and contractual arrangements in post-disaster reconstruction circumstances. Given the scarcity of previous research and investigations, it is difficult to establish causal relationships among the relevant variables as quantitative studies (Sapsford and Jupp, 2006) and it appears unrealistic to collect numerical data to draw the conclusions on which procurement systems are suitable, or how the contractual arrangements should be set up, under post-disaster reconstruction situations. Thus the qualitative research method is adopted in this research.
4.2 Research Design

A research design is the logical sequence that connects the empirical data to a study’s initial research questions and, ultimately, to its conclusions (Yin, 2003). Frankfort-Nachmias and Nachmias (1992) described research plan as a plan that guides the investigator in the process of collecting, analysing, and interpreting observations. It is a logical model of proof that allows the researcher to draw inferences concerning causal relations among the variables under investigation.

This research follows the inductive process where data is collected and theoretical insights are derived from the data, which is typical logic of a qualitative research (Kalof et al., 2008). An overview of qualitative research process is presented in Figure 17:

![Figure 17: overview of qualitative research process (Kalof et al., 2008)](image)

The aim of this section is to ascertain and discuss the logic flow of the strategy used in designing the procedure of this research and to match rational research questions with the right evidence that will allow the researcher to draw analytical generalisations. Similar to the Kalof model showed before, Yin (2003) argued that a “blueprint” of the research should deal with generally four questions: 1) what questions to study, 2) what data are relevant, 3) what data to collect, and 4) how to analyze the results. The discussions within the rest of this section are arranged according to the sequence of these four questions.
This research is a part of the third objective, Legal and contractual frameworks, of a six year national research programme (2004 – 2010) “Resilient Organisation” funded by the Foundation of Research Science and Technology (FRST) in New Zealand. It is a collaborative research programme between University of Auckland, Canterbury University, and Kestrel Group. It is believed that after a national natural disaster, without a comprehensive reconstruction procurement framework, rapid reconstruction will be significantly hampered.

The main objective of this PhD research is to review the existing procurement and contractual arrangements and analyze their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster in New Zealand. The main objective is divided into 3 sub-objectives with associated principal research questions.

Objective 1 is set out as “to review the literature on construction contracts and to examine their usefulness and applicability in a disaster reconstruction situation”. Research question 1 is designed for the purpose of this objective on construction contracts. It comprises three sub-questions, which require different research methods in addressing them.

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Relevant methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. What are the common construction contracts used in New Zealand industry?</td>
<td>Literature review</td>
</tr>
<tr>
<td>b. Are they still useful in the aftermath of a natural disaster?</td>
<td>Case study</td>
</tr>
<tr>
<td>c. If not, what are the main impediments and how could they be improved</td>
<td>Data analysis; Comparison study; Discussion and Recommendation</td>
</tr>
</tbody>
</table>

Table 23: Objective 1 research questions and relevant research methods

Similarly, the research questions and relevant methods could be summarised for both objective 2 and objective 3:

---

5 Resilient Organisations is a six year research project designed to assist New Zealand organisations to recover economic competitiveness after hazard events by improving their resilience. Full details of the programme is available on-line at www.resorgs.org.nz

6 Kestrel Group is a consulting practice specializing in risk and emergency management, operates from offices in Auckland, Wellington and Christchurch, and is involved in projects throughout New Zealand and in the Pacific.
Objective 2: To examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstruction

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Relevant methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. What are the procurement systems and contractual models that are used in the construction industry?</td>
<td>Literature review</td>
</tr>
<tr>
<td>b. What are the existing government regulations on procurement?</td>
<td>Literature review</td>
</tr>
<tr>
<td>c. how are they relevant and useful in a disaster reconstruction situation</td>
<td>Case study</td>
</tr>
</tbody>
</table>

Table 24: Objective 2 research questions and relevant research methods

Objective 3: To examine international experience of disaster reconstruction with a focus on the procurement and contractual systems used

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Relevant methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. What are the recent developments in forms of the major international construction contracts?</td>
<td>Literature review</td>
</tr>
<tr>
<td>b. What are the procurement systems that have been used in reconstruction in other vulnerable zones in the world?</td>
<td>Case study</td>
</tr>
<tr>
<td>c. Are these international experiences useful to New Zealand, if yes, how can they be/ have been modified to suit New Zealand conditions?</td>
<td>Data analysis; Comparison study; Discussion and Recommendation</td>
</tr>
</tbody>
</table>

Table 25: Objective 3 research questions and relevant research methods

The overall research design is illustrated in the following Figure 18:
As can be seen from the flow chart above, the research procedure is divided into 3 steps of firstly literature review, then case studies, followed by data analysis and conclusion. The first column on the left hand side is the collection of research questions reviewed earlier in this section. Within each of the three steps, questions are arranged in the sequence of objective 1 (construction contracts), objective 2 (procurement systems, contractual models, government regulations), and objective 3 (international experiences). The relevant chapter topics are listed in the central column, which demonstrates the logic flow of the whole thesis. The column on the right hand side is a summary of relevant research methods used in each of those steps.

In the next section, the major research methods used for this PhD study will be reviewed and discussed, the rationale for choosing the specific research method, case or interviewee will be discussed and justified.

**4.3 Research Methods**

**4.3.1 Literature Review**

A literature review is a customary component of research with the main purposes to provide a background to and context for the research, and to establish a bridge between the research project and the current state of knowledge on the topic (Blaikie, 2000). More specifically, the aim of the literature review is to indicate what the state of knowledge is with respect to each research question, or group of questions.

Within this research, the literature review is divided into two parts. The first part is on the procurement framework, which includes three layers of literature on procurement systems, contractual models, and standard contracts. Disaster reconstruction literature, comprise relevant topics on disaster reconstruction theories and models, government guidelines and regulations, reconstruction contractual models, and reconstruction procurement systems.

Firstly, the theoretical framework of procurement systems is established according to the level of interaction between design and construction functions into separated, integrated, management-
orientated, and discretionary (collaborative) procurement systems. Relevant literature is reviewed and summarised to determine the contractual relationships, characteristics, advantages, disadvantages, and suitability of each system. Within each of these procurement systems, a number of contractual models are identified according to their different cost risk perspectives from traditional lump-sum to the other end of spectrum of full cost-reimbursement. Similarly, each of these contractual models is introduced with its characteristics and suitability and similar ones are compared in details. The first decisions to be made in a procurement process are those concerning the choice of procurement systems and the type of contractual arrangement. Only when these two decisions have been made can the choice of a form of contract be decided. The next section after the procurement systems and contractual models are the standard contracts, which embodies the implementation phase of certain procurement and contractual choices into the real contracts management in the project delivery process. Standard contracts used in both New Zealand and internationally are introduced, three sets of popular international standard contracts, FIDIC, NEC, and JCT are reviewed in terms of their applicability with different procurement and contractual models’ combinations. The results of this general literature review on the theoretical framework of procurement systems are summarized in chapter 2, showing possible combinations of contractual paths (procurement systems – contractual models – standard contracts). The focus of the research is then concentrated on the selection of (an) appropriate contractual path(s) for the use under the post-disaster reconstruction situation.

The second part of the literature review is devoted to the theme of post-disaster reconstruction. Firstly, the disaster recovery model developed by Haas et al. (1977) demonstrating different activities involved within each of the recovery phases is introduced with comparison to both Australian and New Zealand emergency management models (Australian PPRR model and New Zealand 4Rs model). Their theoretical basis, principles, similarities and differences are discussed. Then relevant literature on government procurement guidelines is analyzed and summarized in both New Zealand and international context. Generally speaking, most of the government guidelines available are issued for the purpose of utilizing them in public sector procurement by relevant government agencies under the normal time construction, nor specifically drafted for the use of post-disaster reconstruction. However, those guidelines share several principles in regulating the procurement practice which are also applicable to the disaster reconstruction situation. The third section of the disaster reconstruction literature review focus on the forms of contracts that have been previously used in disaster reconstruction situations. A special contractual arrangement, “community contracts”, developed by UN Habitat for the use in post-disaster reconstruction is introduced and praised for its efficiency and
transparency. In the last section of the disaster reconstruction literature review, different procurement systems for post-disaster reconstruction are discussed.

The literature review of this study is essential and provides a knowledge basis to further pursue the ‘applicability’ research questions in achieving the overall research objectives.

4.3.2 Case Studies

4.3.2.1 Rationale

The qualitative approach is chosen as the overall research strategy. Within the qualitative approach, there is a variety of sub-strategies. Following its own logic, each of those sub-strategies is a different way in collection and analysis of empirical evidence. 5 main traditional methods within the qualitative research approach are identified and compared in Table 26 (Yin, 2003):

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Research paradigm (Form of research question)</th>
<th>Requires control of behavioural events?</th>
<th>Focuses on contemporary events?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment</td>
<td>how, why?</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Survey</td>
<td>who, what, where, how many, how much?</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Archival analysis</td>
<td>who, what, where, how many, how much?</td>
<td>No</td>
<td>Yes/No</td>
</tr>
<tr>
<td>History</td>
<td>how, why?</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Case study</td>
<td>how, why?</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 26: Characteristics of different qualitative research strategies (Yin, 2003)

After answering “what” questions in the literature review part, obviously the rest of principal research questions focus on “how” and “why”. These could be addressed by Experiment, History or Case study strategies according to the table above. The further choice of case study as the research method takes three conditions into account: (a) the type of research questions posed, (b) the extent of control an investigator has over actual behavioural events, and (c) the degree of focus on contemporary as opposed to historical events. After considering these criteria, the method of case study is confirmed for the purpose of this study.
This research utilizes case study as the primary research method to investigate the various research questions. An in-depth study of a single person, event, community or group is called a case study (Kalof et al., 2008). According to Yin (2003), a case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. The case study inquiry copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result benefits from the prior development of theoretical propositions to guide data collection and analysis.

Case study method, as a strategy, makes relatively comprehensive and open-ended search for relevant information in the real world realities. Accordingly, the information can be used to identify the major themes and patterns associated with the phenomenon of interest, articulate tentative hypotheses about the meanings and their relations, and refine questions and/or suggest conceptual perspectives that might serve as fruitful guides for subsequent investigations (Ogawa and Malen, 1991). The case study method is adopted in this research after the initial literature review on procurement systems and reconstruction theories to identify the major themes and patterns associated with the phenomenon of interest, which are the reconstruction procurement systems. The case study is required at this point to examine the theoretical conclusions generated from the literature review in the real world examples. Further observations on the actual disaster reconstruction process in the case study are also valuable inputs to the overall research.

4.3.2.2 Single Case Study vs. Multiple Case Studies (Design of Case studies)

Case studies can be either instrumental or intrinsic in type. An instrumental case study is examined mainly to provide insight into an issue and to draw out generalisations about the issue, whereas intrinsic case study focuses on the case because of its uniqueness or to have a better understanding of that particular case (Stake, 2006). This research uses the instrumental type of case studies to address the usefulness and relevance questions raised and fill the gap between the theoretical models and real world engineering practices (see Figure 18, step 2).
It then comes to the choice of whether using single case study or multiple case studies methods. A single case study is usually (Yin, 2003)

1) employed to test a well-formulated theory, in which it should meet all the conditions of confirming, challenging or extending the theory. The interpretation can thus be used to determine the correctness of a theory’s propositions or the relevance of explanations to some alternatives;
2) A single case study sometimes has to stand for an extreme or unique circumstance, which commonly occurs in clinical psychology;
3) A single case study should be a representative or typical case, which in the best position to capture the circumstances and conditions of an average situation;
4) The fourth rationale for a single case study is the revelatory case, which exists in the situation when a researcher has an opportunity to observe and analyse a previously inaccessible phenomenon;
5) A single case study should be a longitudinal case, which means the same single case is studied at two or more different points of time.

While for the utilization of multiple case studies, the underlying logic is “replication”, which means that each case should be selected so that either a literal replication or a theoretical replication can occur. Literal replication is referred to when case studies may predict similar results, while theoretical replication means the contrasting results are foreseen for predictable reasons. As one can imagine, there is a certain level of risks of misrepresentation associated with using only single case study. According to Herriot and Firestone (1983), compare to single case design, multi case designs have recognizable advantages and disadvantages and is regarded as being more robust, since the evidence from the cases is considered more compelling.

As Yin (2003) stated, if the researcher has the choices and resources, multiple-case study may be preferred over single-case design. Analytic conclusions independently derived from multiple cases will be more powerful than those coming from a single case alone. Furthermore, the contexts of multiple cases are likely to differ to some extent and under these varied circumstances, if common conclusions can be drawn, they will help to increase the generalizability of research findings (Esterberg, 2002). Yin also stressed (2003) that a sampling logic should not be used in deciding the number of multiple case studies and the typical criteria regarding sample size are irrelevant. An important reason for
conducting the multiple case studies is to examine how the programme or phenomenon performs in different environment when cases are chosen carefully (Stake, 2006). He also stated that for multiple case study method applying in qualitative research, the individual cases should be studied to learn about their self-centring, complexity, and situational uniqueness.

Following the above logic, this research initially identified five general aspects associated with the disaster reconstruction process that are of interest to the research: general contractual arrangement; government regulations; funding and cost; time; and quality of the reconstruction outputs. A general questions list is developed and used in the first two pilot case studies in New Zealand. Although revised several times during further case studies to reflect the unique situations, the basic format and general topics of the questionnaire are maintained and used in the other international case studies to provide basis for comparison study. As a total, this research employs five case studies to extract the best practice procurement which can be applied in post-disaster reconstruction situations. The researcher conducted several fieldtrips to the sites where the post-disaster reconstruction was carried out, which enable the deep analysis of these cases. It is worth noting that the aim of conducting these multiple case studies is to draw an “analytic generalization” rather than “statistical generalization”, which focuses more to expanding and generalizing theories instead of enumerating frequencies.

4.3.2.3 Case Selection

The primary criterion for case selection should be the relevance to the research objective of the study, whether it includes theory development, theory testing, or heuristic purposes (George and Bennett, 2005). Cases should also be selected to provide the kind of control and variation required by the research problem. There are two things need to be decided when selecting the case for study according to Eisenhardt (1989): First, the population of interest is specified; Second, the sample of cases must be determined based on their theoretical usefulness.

There are 5 cases studies that are incorporated into the scope of this research. These are the disaster reconstruction after two recent New Zealand floods, 2004 Manawatu Flood and 2005 Matata Flood; the reconstruction of housing units in Banda Aceh, Indonesia after the 2004 Indian Ocean Tsunami; and two Chinese cases that span a 10 years’ interval, reconstruction after the 1998 Yangtze River
Floods and the 2008 Wenchuan Earthquakes. The research objectives and principal questions derived from those objectives in relating to the use of case study methods are summarized in Figure 19:

Figure 19: Research questions that lead to the use of case study

The population of interest in these case studies are the reconstruction projects that are carried out under a post-disaster situation, more specifically, the procurement and contractual arrangements of these reconstruction projects. It is theoretically useful to test the initial results from the literature review in these reconstruction cases to determine the applicability of those procurement systems, contractual models, and standard contracts in the real disaster recovery in both New Zealand and other vulnerable zones around the world.

Stake (2006) proposed three main criteria for selecting cases as a general rule. First, similar to the requirement raised by George and Bennett (2005), that the case should be relevant to the research objectives and principal research questions; Second, the cases should also provide diversity across contexts; The last criterion is that the case selected should provide opportunity to study about the complexity of the contexts. The 5 case studies are summarised in Table 27:
<table>
<thead>
<tr>
<th>Disaster Reconstruction Case studies</th>
<th>accompanied with fieldtrips</th>
<th>Disaster Date</th>
<th>Fieldtrip Date</th>
<th>Relevant research objectives and principal research questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NZ</td>
<td></td>
<td></td>
<td></td>
<td>Objective 1: To review the literature on construction contracts and to examine their usefulness and applicability in a disaster reconstruction situation.</td>
</tr>
<tr>
<td>Manawatu</td>
<td>No</td>
<td>15~23 Feb, 2004</td>
<td>n/a</td>
<td>Research question: Are common used NZ construction contracts still useful in the aftermath of a natural disaster?</td>
</tr>
<tr>
<td>Matata</td>
<td></td>
<td>18~30 May, 2005</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indonesia</td>
<td></td>
<td></td>
<td></td>
<td>Objective 2: To examine current procurement systems and contractual models, existing regulations on procurement and their relevance to disaster reconstructions.</td>
</tr>
<tr>
<td>Banda Aceh</td>
<td>Yes</td>
<td>26 Dec, 2004</td>
<td>July 2006</td>
<td>Research question: What are the relevance and usefulness of procurement systems, contractual models, and procurement regulations in a disaster reconstruction situation?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>March ~ May 2008</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td></td>
<td></td>
<td></td>
<td>Objective 3: To examine international experience of disaster reconstruction with a focus on the contractual and procurement systems used.</td>
</tr>
<tr>
<td>Yangtze</td>
<td>No</td>
<td>July ~ August, 1998</td>
<td>n/a</td>
<td>Research question: What are the procurement systems have been used in reconstruction in other vulnerable zones in the world.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wenchuan</td>
<td>Yes</td>
<td>12 May, 2008</td>
<td>Dec, 2008</td>
<td></td>
</tr>
</tbody>
</table>

Table 27: Disaster reconstruction case studies

Two New Zealand floods of 2004 Manawatu and 2005 Matata were chosen as the pilot case studies at an early stage of this research. The flooding disaster is the most common cause of a national emergency declaration in New Zealand. Both these events caused major damage to infrastructure, and as a result required general recovery procedure and reconstruction strategies to be implemented. The case studies on these two events were carried out when the actual reconstruction was still underway.

7 Detailed interview questions, meeting schedules, and dates are included in the appendix.
They are obviously highly relevant to the research objectives and by studying them, the researcher had an opportunity to understand the basics of disaster reconstruction process and to finalize the main questionnaire that would be used in all the case studies. The February 2004 Manawatu Flood was the largest emergency management event in the past 20 years and was the first major event since the passage of the Civil Defence Emergency Management (CDEM) Act in December 2002. Both Manawatu and Matata floods are believed to be the typical disaster that will be encountered in New Zealand. The Transit NZ Regional Manager and Manager from MWH Consultants involved in the recovery of Manawatu floods and the Recovery Facilitator of Matata floods were interviewed for this research. In relating to the objective 1 to examine the usefulness and applicability of commonly used NZ contracts in a disaster reconstruction situation, the questionnaire was finalised to include three major subjects: contractual arrangements; building, environmental regulations and legislation; and cost, quality, time considerations (detailed questionnaires used in each case study are included in the appendices).

The Indian Ocean Tsunami happened on the Boxing Day of 2004 is one of the most devastating disasters in recent history. Banda Aceh in Indonesia was the worst hit area during the disaster. About 170,000 people perished and there were 123,000 houses needed to be rebuilt in Aceh alone. The recovery in Banda Aceh was coordinated by the Indonesian Government and the driving force of the reconstruction came from the international NGO’s and humanitarian aid system. It is an example of community-based reconstruction with combination of international aids with local initiatives, which becomes a common mode of disaster recovery under the current international context. Two fieldtrips were carried out by the researcher under the internship provided by an international NGO, which was heavily involved in the reconstruction of housing units in various areas in Banda Aceh. The first trip was one-month and was accomplished in July 2006, in which the initial data collection was carried out using the main questionnaire developed in two previous New Zealand case studies through interviews, meetings, on-site consultations, documentations, accessing archival records, and direct observations. The effort was followed up two years later in 2008. Another two-month fieldtrip in Banda Aceh, Indonesia with the same NGO was made during March to May. This added to the longitudinal depth of the Indonesian case study, during which interviews were carried out with construction and procurement managers, UN agencies, local authorities, and members of the affected communities in Aceh aiming at achieving both objective 2 and objective 3 and answering relevant principal research questions (see Table 27: Disaster reconstruction case studies).
From the interviews and fieldtrips in both New Zealand and Indonesia, the theories of post-disaster reconstruction procurement and contractual arrangements, gradually took shape with the further case studies on two Chinese disasters conducted after the Indonesian one. These are the 1998 Yangtze River Flood and 2008 Wenchuan Earthquake. They are both significant disasters and the reconstruction works following both events are of interest to this research. Unlike all the other case studies, the 98 Yangtze River Reconstruction was a historical event and was already finished when this reconstruction procurement research started. The 98 Yangtze River Flood was the first major disaster that was experienced by the new generation of young Chinese, in which almost one-fifth of China’s population was affected. Lessons drawn from the floods of 1998 could be regarded as a major change point in matters such as the environmental protection and the climate change in China. Due to its significance, documents and archival records are easily accessible, and together with the materials and data collected through questionnaire that were sent out during the case study, contributed to the in-depth analysis and understanding of the specific procurement and contractual arrangements associated with the reconstruction process.

Wenchuan Earthquake of May 2008 was selected as the last case study in this research firstly because of the significance of the event. About 88,000 lives were lost, which makes it the worst disaster since the formation of the People’s Republic of China. Secondly, the reconstruction following the event was for the first-time opened to the outside world and has been managed by a new generation of Chinese leaders. Special policies were issued after the disaster regulating the overall reconstruction process and other aspects of the recovery. A trip to the disaster zone in December 2008 was facilitated with the help and coordination of Civil Engineering Department of Sichuan University, which is the largest university in southwest China and located in the capital city of worst-hit province, Sichuan. Since it is also the University where the author completed his undergraduate study, relationship and contacts were well set-up long before the actual fieldtrip. Before, during, and after the site visit and meetings, interviews were carried out using the same format of questionnaires applied previously in other case studies. These were also accompanied with document collecting, meetings, fieldtrips and direct observations. Interviews and meetings were carried out with the Chinese researchers, NGO representatives, reconstruction managers, government officials from local Bureau of Construction, and local residents on the site.

The two Chinese disasters in case studies span 10 years in the time, which provides a longitudinal point of view to see how the reconstruction procurement was managed over time. The strong
The coordinative role of Chinese government took in the recovery process makes the Chinese cases of interests in comparing with other disaster reconstruction experiences.

All these five case studies are highly relevant to the research theme of post-disaster reconstruction procurement and contractual arrangements. They also provide a diversity of contexts under which the reconstruction processes were managed. They represent the New Zealand local reality and contemporary international experiences over disaster reconstruction procurement. The examination of these case studies is an essential part of this research, which provides the in-depth real-world experiences of applicability of procurement systems and contractual models into the disaster reconstruction.

### 4.3.2.4 Case Study Chapter Structure

During the drafting of the case studies chapters, a structure of “overview – procurement and contractual arrangements – relevant regulations and guidelines – time/cost/quality considerations” is adopted. The procurement and contractual arrangement section is included as it is the main theme and the research objective in this PhD. Government regulations and guidelines are included as they significantly influence the overall management structure of disaster recovery, under which the reconstruction procurement are carried out. Since in all reconstruction cases, the major source of funding was from the public-sector subjected to relevant regulations, the importance of procurement guidelines issued both before and after the disaster over the reconstruction process is required studying. The time, cost, quality considerations are the basic criteria in evaluating various procurement options or generally the project performance in construction management literature (such as Cheung et al., 2004, Lauras et al., 2010, Lester, 2004, Melton, 2007). The section of time, cost, and quality aspects on the overall reconstruction process is thus also included into the chapter structure.

In the Banda Aceh case study, a different chapter structure is adopted because from the fieldtrip experience it was realised that the major obstacle for the reconstruction effort in Banda Aceh was the lack of supply of sustainable timber as a major building material. So a special section on timber procurement issues is dedicated to the analysis and possible solutions of the problem. In the Banda Aceh case study, the major focus of the research is still on the procurement and contractual
arrangements of the reconstruction. The funding/cost, time, quality aspects, government regulations and guidelines are also covered. These will be reflected and analysed in the research results chapter.

### 4.3.2.5 Data Collection

The sources of evidence most commonly used in carrying out case studies are documentation, archival records, interviews, direct observations, participant observation, and physical artifacts (Yin, 2003). A useful overview of the six major sources considering their comparative strengths and weaknesses is shown in Table 28.

<table>
<thead>
<tr>
<th>Sources of Evidence</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
</table>
| **Documentation**   | • stable – can be reviewed repeatedly  
                     • unobtrusive – not created as a result of the case study  
                     • exact – contains exact names, references, and details of an event  
                     • broad coverage – long span of time, many events, and many settings | • retrievability – can be low  
                     • biased selectivity, if collection is incomplete  
                     • reporting bias – reflects (unknown) bias of author  
                     • access – may be deliberately blocked |
| **Archival Records**| • (same as above for documentation)  
                     • precise and quantitative | • (same as above for documentation)  
                     • accessibility due to privacy reasons |
| **Interviews**      | • targeted – focused directly on case study topic  
                     • insightful – provides perceived causal inferences | • bias due to poorly constructed questions  
                     • response bias  
                     • inaccuracies due to poor recall  
                     • reflexivity – interviews gives what interviewer wants to hear |
| **Direct Observations** | • reality – covers events in real time  
                        • contextual – covers context of event | • time – consuming  
                        • selectivity – unless broad coverage  
                        • reflexivity – event may proceed differently because it is being observed  
                        • cost – hours needed by human observers |
| **Participant Observation** | • (same as above as direct observations)  
                               • insightful into interpersonal behaviour and motives | • (same as above for direct observations)  
                               • bias due to investigator’s manipulation of events |
| **Physical Artifacts** | • insightful into cultural features  
                         • insightful into technical operations | • selectivity  
                         • availability |
Table 28: Six sources of evidence in case study: strengths and weaknesses (Yin, 2003)

As can be seen from Table 28, no single source has a complete advantage over the others. In fact, the various sources are highly complementary, and a good case study will therefore want to use as many sources as possible. The major types of data collection methods used in the case studies of this research are, according to Yin’s categorisation, documentation, archival records, interviews, and direct observations.

By combining multiple observation, theories, methods, and data sources, [researchers] can hope to overcome the intrinsic bias that comes from single-method, single-observer, and single-theory studies (Denzin, 1989, p. 307). Triangulation, or the use of multiple methods, involves using a combination of methods, researchers, data sources, and theories in a research project (Liamputtong and Ezzy, 2005, p. 40). Triangulation method allows the research to develop a complex picture of the phenomenon being studied, which might otherwise be unavailable if only one method were used (Hammersley and Atkinson, 1995, Patton, 2002, Denzin, 1989). Triangulation method is used in conducting this research.

It is believed that the most important advantage associated with using multiple sources of evidence is the development of converging lines of inquiry (Yin, 2003). This is also supported by many other researchers in the field (Patton, 1987, Maxwell, 2005, Stake, 2006, Creswell, 2007). A diagram demonstrating the convergence of multiple sources of evidence is included as Figure 20 (COSMOS Corporation, 1983). Since the importance of using multiple sources of evidence, it is set out as the first in three principles of data collection (Yin, 2003). Followed by 2) create a case study database, and 3) maintain a chain of evidence.
The major data collection method in carrying out case studies in this research is interviews. It is one of the most important sources of case study information. The interviews appear to be guided conversations rather than structured queries. In other words, although there is a consistent line of inquiry, the actual stream of questions in a case study interview is likely to be fluid rather than rigid (Rubin and Rubin, 1995). It is reflected during the implementation of interviews, while the list of questions was gone through as a framework guide, the actual conversation was rather semi-formal to encourage the efficiency of communication. For example, revised questionnaires based on the original one were used in Indonesian case study to determine other factors influencing the actual reconstruction procurement practice (see appendix C.2 Indonesian Case studies interview questions and schedules). Detailed rationale of interview process could be found in the relevant sections in this chapter.

By conducting the field visits to the case study site, the researcher was creating the opportunity for direct observations. Since the phenomena of interest in this research is the reconstruction procurement and contractual arrangement post-disaster, which is not historical, relevant behaviours or environmental conditions were available for observation. Such observations serve as yet another important source of evidence in case studies carried out in this research. For example, the researcher was working directly with the procurement department of a reconstruction agency in Banda Aceh and participated in their daily meetings with potential suppliers and contractors. The results of this direct involvement within the reconstruction procurement process served as a valuable source of evidence in drafting the relevant case study chapters.

Besides interviews and direct observations, document and archival records collected during the case studies process are proved to be important components of evidence as well. These may be the maps and charts of the geographical characteristics or layouts of disaster reconstruction zone; the actual contracts that have been used in procuring engineering projects post-disaster; or copies of government regulations and guidelines on procurement; organizational structure of the reconstruction agency and its role in the overall recovery; or even the past accomplished project records stored in the internal database.

The other principles of case study data collection are also considered, such as creating case study databases. These may include case study notes, documents, tabular materials, and narratives. A diary
was kept by the researcher for each fieldtrip conducted in this study. Paper documents are filed and some of them are scanned and stored together with other digital materials collected in each case study. The maintenance of a chain of evidence is the third principle in relating to the reliability of the information obtained in a case study. In the research, each case study was managed separately and could be referred to with a chain of evidence of case study database, case study questions, and case study report.

4.3.2.6 Data Analysis

The analysis of case study evidence is one of the least developed and most difficult aspects of doing case studies. Unlike statistical analysis in quantitative study, there is no fixed formula to guide the process. Instead, it much depends on an investigator’s own style of rigorous thinking, along with the sufficient presentation of evidence and careful consideration of alternative interpretations (Yin, 2003). This is supported by other researchers in qualitative study field, such as Boulton and Hammersley (1996).

The data collected in a qualitative case study will most likely to be unstructured data. Sometimes the term “unstructured data” and “qualitative data” are often used interchangeably. The most obvious difference between analysing unstructured and structured data is that, whereas the latter come ready coded, the former do not. In other words, structured data are collected in a form whose relevance to the focus of the enquiry is obvious while this is not the case for unstructured data, such as in this case. However, there are certain general steps (Boulton and Hammersley, 1996) that are typically followed in grounded theorizing and the forms of qualitative data analysis analogous to it:

1. a close reading of the data – careful examining the data with a view to identifying aspects of them that may be significant, the researcher notes down topics or categories to which the data relate and which are relevant to the research focus.
2. gathering together of segments of data from different parts of the data record that are relevant to same category
3. compare and contrast all the items of data that have been assigned to the same category (Strauss and Corbin, 1990)
Similarly, Stake (2006) advocated the major forms of data analysis techniques in case study research, which include categorical aggregation; direct interpretation; pattern establishment; and pursuing a correspondence between two or more categories. In categorical aggregation, the investigator seeks a collection of instance from the data and expects that issue-relevant meanings will emerge. Direct interpretation on the other hand is a process of pulling data apart and putting them back together in a way that is more meaningful.

Other theories in analysing qualitative data include the three general strategies developed by Yin (2003):

1. Relying on theoretical propositions – the first and most preferred strategy is to follow the theoretical propositions that led to the case study. The propositions would have shaped the data collection plan and therefore would have given priorities to the relevant analytic strategies.
2. Thinking about rival explanations – a second general analytic strategy tries to define and test rival explanations
3. Developing a case description – an alternative to the propositions and rival explanations strategies

And specific analytic techniques include pattern matching, explanation building, time-series analysis, logic models, and cross-case synthesis. One of the most desirable techniques for case study analysis is using a pattern-matching logic to compare an empirically based pattern with a predicted one. If the patterns coincide, the results can help a case study to strength its internal validity. Pattern matching technique is employed in this research as a major focus in each case study is to determine the procurement systems and contractual models used in practice and compare it to the patterns that have been identified before in the literature review part to further determine the advantages and suitability of such model to the reconstruction situation.

For explanation building, this is in fact a special type of pattern matching. The analysis of the case study is carried out by developing an explanation of the case. This is also an iterative process, which starts with a theoretical statement, refines and revises the proposition, and repeats this process from the beginning. This is carried out in the case studies of this research as description of characteristics associated with reconstruction procurement and the comparison between those with the theoretical
propositions recognized in the literature of which contractual path suits the description better. The trends of using *time-series analysis* and *cross-case synthesis* are also evident in this research. These are similar to the categorical aggregation technique mentioned earlier in Stake’s model (2006) and Boulton and Hammersley’s general steps (1996). Since the main set of questions for case studies is applied to all the case studies, the segment of data from different parts of the record that are relevant to the same category could be compared. For example, the time, cost and quality considerations of the reconstruction works in all cases could be extracted into one category and compared against each other to give further insight to the overall procurement environment.

To summarize, the main data analysis techniques used in the case studies part of this research include categorical aggregation, direct interpretation, pattern matching, and cross-case synthesis. Additional to these, as Creswell (2007) suggested, a detailed description of the case and its setting, procurement and contractual arrangements in this research, is analysed as well. The researcher then is able to develop naturalistic generalizations, which will be applicable to future disaster reconstruction procurements.

### 4.3.3 Interviews within case studies

As mentioned earlier, among all others, such as documentation and archival records analysis, direct observations, and participant observations, the major data collection method in carrying out case studies in this research is interviews. It is one of the most important sources of case study information. Interview approach gives interviewer the opportunity to explore the reasons for a person’s response (Keats, 2000). This section is concerned with methods of data collection within case studies that explicitly involve interviewing or questioning individuals.

#### 4.3.3.1 Interview methods

As defined by Wilson (1996), major data collection techniques involved in interview and questionnaire methods are: 1) face-to-face interviews employing an interview schedule; 2) the telephone interview; 3) postal questionnaires; 4) face-to-face interviews in a free format. These methods are different in three dimensions: procedural, structural, and contextual and are all used to some degree in this research.
Face-to-face interviews employing an interview schedule is a standard schedule used for each respondent, in which the questions have the same wording and are asked in the same order. This was in consideration when the standard format of question list was developed in this research. But later during the case study, especially these fieldtrips to the disaster zone, the format of the interview was changed to the last method: face-to-face interviews in a free format. These are conducted, approximately, like natural conversations between two people, and if conditions allow, usually recorded in full for later analysis. The ideal in this naturalistic or unstructured interview is to approximate the ‘feeling’ of the unforced conversations of everyday life, which is believed to be a more encouraging setting for the participants to communicate with the interviewer and reflect the reality in practices. In terms of the procedural dimension, the naturalistic interview is at the opposite end of the spectrum from the experiment. These interviews are managed by the interviewer, who sets the agenda of questions, probes more deeply into issues of interest with supplementary questions and records the answers and the discussion. A list of topics and general questions are followed even if the wording of specific questions is not standardized.

Due to the constraints of time spent in the actual reconstruction site or geographic limitations, some of the interviews were conducted in postal-questionnaire with follow-up telephone conversations. However, whenever the conditions permit, face-to-face interviews are preferred as this format allows details and follow-up questions to be administered and provide interactive naturalness. Therefore, a respondent tends to provide more than brief, undeveloped answers to an interviewer’s questions, which provide great effectiveness with complex issues (Keats, 2000, Kvale, 1996). Furthermore, in-person interview provides more thoughtful responses and more accurate results than telephone interview due to lower interviewer workload (Shuy, 2001). However, these are balanced in this research as either postal questionnaires or telephone interviews are used as an assistant way to the interviews method. Relationships with the interviewees are already established through previous contacts before they are asked to participate in the interviews. As for the remote interviewees, such as in the Yangtze River case study, they were contacted beforehand either through email or telephone and all agreed to participate before the questions were posted to them for their written responses. After the answers were received, further telephone calls are made to confirm and clarify their answers to the main questions list.
4.3.3.2 Interview questions

The interview questions were first drafted at the beginning of the case study phase, used and revised in the initial pilot case studies in New Zealand. They were developed based on the 3 research objectives and related principal research questions on procurement systems, contractual models, standard contracts, and government regulations. The overall list comprises 6 sections including contractual arrangements, building, environmental regulation and guidelines, funding and cost, quality, time, and general conclusion to the reconstruction process (appendix C). Under each section heading, detailed questions are asked to help determine the theme under investigation in the section.

During the case study, special revised versions of questions were used to clarify certain points in relating to the overall procurement context that are answered unclearly when using the standard form questions. For example, the organizational structure of the reconstruction agency was investigated in some questions of the later version questionnaires in the Indonesian case study (appendix C2) to determine the administrative environment under which the reconstruction procurement was carried out. The translated version of the main research questions is used in the Chinese case studies and the whole interview was administered in Chinese as the interviewees are more comfortable with their native language and some terms are unique in the Chinese construction management context.

4.3.3.3 Choices of participants

The participants to the interviews are chosen in each case study under the considerations of their relevant knowledge and experience in reconstruction procurement, their backgrounds (to have a balanced point of view from different stakeholders to the reconstruction) the roles they played in the reconstruction, their position and influence to their organisation or functional department in decision making, and the willingness and availability to be interviewed.

Detailed interview and meeting schedules in each case study are in the relevant appendix, an overall summary is provided in Table 29. It should be noted that the case studies associated with fieldtrips (both Banda Aceh cases and 08 Wenchuan Earthquake one) are generally accompanied by numerous meetings on site with representatives from other parties involved in the reconstruction process, such as the project managers, procurement managers, reconstruction authorities, contractors and suppliers, etc.
For example, there are 21 recorded meetings the researcher participated in during the Banda Aceh case study in a total three months period, which provides valuable insight for the research. The feedback from those interviews are reflected in the discussion and drafting of the relevant case study chapters.

<table>
<thead>
<tr>
<th>Case studies</th>
<th>accompanied by fieldtrips?</th>
<th>interviewee categories</th>
<th>Number of interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>No</td>
<td>MCDEM Recovery Manager</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reconstruction Coordinator/ Contractor</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Consultant</td>
<td>1</td>
</tr>
<tr>
<td>Banda Aceh</td>
<td>06 fieldtrip</td>
<td>Project manager</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(procurement manager, team leader, coordinator)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supply chain facilitator</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>08 fieldtrip</td>
<td>Government Officials</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project manager</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(procurement manager, coordinator, program leader)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Financial administrator</td>
<td>1</td>
</tr>
<tr>
<td>Chinese</td>
<td>98 Yangtze Flood</td>
<td>Researchers</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>Government Officials (also engineers)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>08 Wenchuan Earthquake</td>
<td>Government officials</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Reconstruction Project Managers</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Researchers</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 29: Summary of case study interviews (see relevant appendix for details)

4.3.4 Research workshops, conferences, exercises and other fieldtrips

Besides the major research methods of literature review and case studies, there are other workshops, conferences, disaster response exercises, and fieldtrips to other disasters that the author have been involved in, which helps the understanding of the overall perspective of disaster reconstruction and recovery and the theory development, data analysis and finally drafting of this thesis. This section summarises those efforts that have been made contributing to the accomplishment of this research. Some of them may not be directly included into the scope of this thesis, such as the fieldtrip to Samoa after the 2009 Tsunami, but these experiences and observations are invaluable to the analysis of other case studies as they would confirm or challenge the conclusions that have been made previously and thus contribute to final result of this research.
4.3.4.1 Workshops and Conferences

Conferences

A list of important conferences the author has attended during this PhD research is included in Table 30 as follows:

<table>
<thead>
<tr>
<th>Date</th>
<th>Conference</th>
<th>Paper presented</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 23~24, 2006</td>
<td>*7th New Zealand Natural Hazards Management Conference 2006: From Science to Practice, Christchurch, New Zealand</td>
<td>An Analysis of The Alliancing Procurement Method for Reconstruction Following an Earthquake</td>
</tr>
<tr>
<td>May 14~18, 2007</td>
<td>*CIB World Building Congress 2007: Construction for development, Cape Town, South Africa</td>
<td>A Tale of Two Floods: Reconstruction after Flood Damage in New Zealand</td>
</tr>
<tr>
<td>July 2~3, 2007</td>
<td>*Australasian Natural Hazards Management Conference 2007: From Warnings to Response and Recovery, Brisbane, Australia</td>
<td>Supply Chain and Material Procurement for Post-disaster Construction: The Boxing Day Tsunami Reconstruction Experience in Aceh, Indonesia</td>
</tr>
<tr>
<td>February 10~15, 2008</td>
<td>CIB W89 International Conference on Building Education and Research, BEAR 2008, Heritance Kandalama, Sri Lanka</td>
<td>A project management perspective in supply chain management during post-disaster reconstruction</td>
</tr>
<tr>
<td>Oct 23~25, 2008</td>
<td>*Building Abroad Conference 2008: Procurement of Construction and Reconstruction Projects in the International Context, Montreal, Canada</td>
<td>Supply Chain Analysis and the Sustainability of Post Disaster Construction</td>
</tr>
<tr>
<td>November 26~28, 2008</td>
<td>The 3rd Asia-Oceania Top University League on Engineering (AOTULE) Postgraduate Conference, Auckland University, New Zealand</td>
<td>Post-disaster Reconstruction Procurement and Contractual Arrangements</td>
</tr>
</tbody>
</table>

Table 30: Conferences attended during the PhD research

Among the conferences the author attended during his PhD research, the stared five are the most important ones that together form a clear line of research development and showcase the results obtained from the case studies at that point. The first paper on Matata Flood reconstruction experience was presented at 2006 i-Rec conference, which showed the initial results from the pilot case study carried out in New Zealand in favouring a relationship-based contractual system to be used for disaster reconstruction. From the feedback received, the author revised the initial questionnaire in the pilot

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8 i-Rec is a web-based international network focused on the study of reconstruction after disasters. i-Rec deals with information exchange between its members in order to contribute with knowledge related to building activities in situations of crisis, particularly disasters in developing countries. It holds international conference on the topic of disaster reconstruction every two years.
study to incorporate more subjects that are relevant and of research interest and conducted further interviews with the MCDEM Recovery Facilitator for Matata reconstruction and finalised the results in the case study. This was presented together with the Manawatu case in the CIB World Building Congress in 2007 concentrating on the subject of reconstruction after flood damage in New Zealand. Between these two, the second conference held in August 2006 served as an introduction to the overall picture of natural hazards management (NHM) in Australasia and internationally. It helped the author finalising the scope of this research on the subject of procurement systems and contractual models for post-disaster reconstruction as there was genuine need, but lack of research, in this field presented in that conference. Other research showcased in the natural hazards management field was inspiring to the author, for example, in understanding the overall management structure of New Zealand government towards the disaster recovery. The author presented a paper on the possibility of utilizing the alliancing procurement system post-disaster in that NHM conference.

The research result from the first Indonesian fieldtrip was originally expressed in the fieldtrip report (Zuo, 2006). In 2007, it was then summarised, updated and published in the second Australasian Natural Hazards Management (NHM) Conference in July. The conference theme of integration of hazard information into effective risk management was well presented by the wide range of the topics at workshops and main conference papers, covering different aspects from initial responses to the long term recovery. The author’s paper on the importance and application of modern supply chain management theories on the procurement routes for disaster reconstruction was well received. Besides the traditional focus of study on technical response to disasters, research into social impacts on vulnerable communities was well emphasized in this conference to form a more holistic approach towards disaster relief.

As confirmed by the case studies in Banda Aceh, the relationship-based integrated and management procurement systems are preferred over others for reconstruction, the result from the second Banda Aceh fieldtrip from March to May 2008 was presented together with the findings from the first trip in Oct 2008 at Building Abroad Conference 2008: Procurement of Construction and Reconstruction Projects in the International Context. The author focused on the supply chain and sustainability issues generated from the Banda Aceh case studies and finalized the procurement and contractual arrangement theories before the overall thesis drafting started from 2009. The paper was later selected as the top five conference papers to be published collectively in a special issue of International Journal of Managing Projects in Business (Zuo et al., 2009).
Workshops

The important workshops the author has attended during his PhD research are summarized in Table 31.

<table>
<thead>
<tr>
<th>Date</th>
<th>Workshop</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 11, 2006</td>
<td>Industry Forum “Barriers to Post-Disaster Reconstruction”, hosted by Resilient Organisation</td>
</tr>
<tr>
<td>Sep 8, 2006</td>
<td>Planning for risks from Natural Hazards in New Zealand – the legal and administrative framework for disaster recovery in New Zealand, hosted by Dr. Ljubica Mamula-Seadon.</td>
</tr>
<tr>
<td>30 May, 2007</td>
<td>Industry Summit “Hot Market Procurement – Driving Change”, hosted by Property Council of NZ</td>
</tr>
<tr>
<td>Oct 16~17, 2007</td>
<td>New Zealand National Lifeline Forum, hosted by Dave Brunsdon</td>
</tr>
</tbody>
</table>

Table 31: selected workshops during the PhD research

At an early stage of this PhD research, a workshop was held to identify the challenges and barriers to post-disaster reconstruction in New Zealand to help guiding the research under Objective 3, legal and contractual framework for post disaster reconstruction, of the Resilient Organisations project. The workshop brought together people with relevant experience in post-disaster reconstruction and/or specialist knowledge of the regulatory, legislative and contractual issues that could influence reconstruction. The participants to the workshop were from government agencies (Manukau City Council, Tauranga City Council, Local Government NZ, Greater Wellington Regional Council, MCDEM, EQC, etc), insurance companies (IAG, AMI), lifeline groups (Telecom, Transit NZ), consulting engineering firms (Beca, Connell Wagner, etc.), and other interested parties. It was the first major workshop the author attended focusing on the practicality of the research results and direction by listening to the practitioners in the field. It identified four areas of research under the heading of legal and contractual framework: legislative and regulatory issues, coordination of reconstruction, contractual issues and resource issues. This PhD research was concentrating on the third one: contractual issues. The research objective and target output were identified as “to examine international experience for how contractual issues have been managed”, thus led to the output of “Recommendations on contractual arrangements for disaster reconstruction”.

Later in 2006, the other workshop held at Auckland University Architecture and Planning Department on the introduction and discussion of the legal and administrative planning framework for disaster recovery in New Zealand was informative in the sense that it provided an overview of the planning
administrative structure for post-disaster reconstruction in New Zealand. It is understandably important to the research of procurement and contractual arrangement within this national administrative framework, especially at an early stage of this PhD research. The workshop host Dr. Mamula-Seadon was later appointed as the Team Leader of MCDEM Sector Development.

The “Hot Market Procurement” was the other industry summit the author attended in the middle of this PhD progress. It was clearly emphasized in this summit the trend and initiatives from the construction industry of shifting to relationship-based procurement systems from the traditional ones. For example, representatives from a Auckland-based consulting engineering company (Fahey, 2007) promoted the use of CWA – Collaborative Working Agreement – Project Framework, an alliancing procurement model, in the construction of public facilities. The National Procurement Manager of then Transit NZ (Doherty, 2007) showcased and encouraged the use of alliancing model in complex infrastructure development projects. These presentations from the industry summit confirmed and supported the research direction of this PhD of using the integrated and management-orientated procurement systems for post-disaster reconstruction.

The New Zealand National Lifeline Forum in late 2007 involved all the important public services providers and government agencies that would be the driving force in any natural disaster response phase in New Zealand. The author participated in the Forum and took notes during the meeting for the Forum organizer. This experience was beneficial to this PhD research as the relationship framework involving these engineering lifeline groups⁹ and interfaces with government agencies at different levels were more fully understood by the author. This later contributes to the participation in the national disaster response exercises and the understanding of the overall disaster recovery environment and operation in New Zealand.

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⁹ Such as Telecom, Transit NZ (now NZTA), Transpower, Vector, MCDEM, EQC, GNS Science
4.3.4.2 Disaster response exercises

During the process of this PhD research, the author has also been involved in two national disaster response exercises organised by MCDEM and New Zealand Central Government. These exercises provided this research with a practical sense of what an actual disaster recovery and administrative structure would be like in the New Zealand environment. These two national disaster exercises are 2006 Capital Quake Exercise (Earthquake) in Wellington and 2008 Ruaumoko Exercise (Volcanic eruption) in Auckland.

2006 Capital Quake Exercise

The Capital Quake Exercise was held on the 14th and 15th of November 2006 to test arrangements for managing a major earthquake on the Wellington fault. This exercise tested central and regional civil defence emergency plans, and provided an opportunity for key organisations to practice their response arrangements. The exercise assumed that an earthquake took place at 5:30am on the morning of the 14th of November, and role-played the first two days following the earthquake. The author participated in the exercise as an observer in one of disaster response depots in the outskirt of Wellington.

During the exercise, the author noticed several issues relating to the decision making process in the response phase, these were expressed in the report after the exercise debrief focusing on three aspects: Consistency in the structure of communication; Changing from a one-person strong leadership to a more balanced and swift team decision making; and Using existent Incident Action Plan (IAP) in response to uncertainty. Although it is not directly related to the reconstruction procurement and contractual arrangements which is in the later recovery phase rather than the initial response phase, the experience with the capital quake exercise proved that the contractual arrangement should be set up and agreed upon before the actual disaster happens, and the national exercises like this one is an opportunity to emphasize the importance of those contractual links and facilitate the forming of those links and relationships. It might take the form of a MoU about the possible procurement systems, or pre-registration of contractors and suppliers. Planning for disaster reconstruction should be facilitated
before the event and the actual preparation of the procurement and contractual arrangement of reconstruction should be planned for.

2008 Ruaumoko Exercise

The major aim of conducting Exercise Ruaumoko in March 2008 was to test New Zealand’s all-of-nation arrangements for responding to a major disaster resulting from a volcanic eruption in Auckland. It was a joint local government and central government exercise involving various CDEM groups. The specific objectives of the exercise were: 1) Roles and responsibilities: understand, develop and practice the respective roles and responsibilities of local, regional and national agencies in response; 2) Arrangements: embed the planning arrangements in agencies’ standard processes; and 3) Connections: confirm the connections between local, regional, national and international agencies.

The author participated in the exercise as the assistant to the evacuation coordinator giving injects to various city/regional councils simulating the response phase following a volcanic eruption at Auckland Region. In the debrief afterwards, the author contributed to the report on several issues observed during the exercise: 1) Proactive management over the keystone vulnerability; 2) Information sharing problems among organisations; 3) Resources allocation decisions and response priorities; and 4) Pre-planning and categorization of evacuees for the later assistance in the recovery phase. From the experience in the Ruaumoko Exercise, the author further familiarized himself with the New Zealand administration and management structure of the post-disaster response.

4.3.4.3 Other fieldtrips and training

There are some other activities the author has participated in during this PhD process that contributed to the final research results but are not directly incorporated into the scope of this thesis. The important ones that will be briefly introduced here include 1) the fieldtrip to Samoa after the 2009 Samoan Tsunami; 2) the academic trip to Chinese universities in Sep 2007; and 3) The one-week live-in RedR\textsuperscript{10} training course in April 2007.

\textsuperscript{10} Register of Engineers for Disaster Relief (RedR), website: www.redrnz.org.nz
2009 Samoan Tsunami Fieldtrip

In the later stage of this PhD research, the author joined in a team from the Faculty of Engineering, University of Auckland, to assess what New Zealand academics and engineers could do to assist the Samoan tsunami on 29 Sep 2009 that devastated the south-eastern coast of Samoa. During the fieldtrip from 10-15 Oct 2009, the team was able to help with the efforts of the Disaster Management Centre; to collect data on relevant research topics to form a baseline for future assistance and help; to meet with Samoan engineers, academics, and government officials to discuss the forthcoming recovery operations and develop cooperation from The University of Auckland. The fieldtrip include meetings with the Prime Minister and Deputy Prime Minister of Samoa, Director of Institute of Professional Engineers Samoa (IPES), and the Vice-Chancellor of National University of Samoa.

This fieldtrip and data collected were not included into the scope of this thesis because it was at a later stage of the thesis drafting and also the timing of the fieldtrip is still at the initial response phase rather than the reconstruction phase. However, the early involvement of the research baseline to be formed in this case would be beneficial for the follow-up trips in the future for longitudinal research and the understanding of the overall reconstruction progress. It would be helpful to test the results from this research to the reconstruction process follows the Samoan Tsunami.

2007 Academic Trip to Chinese Universities

In 2007, the author participated in an academic trip organised by Civil Engineering Department of The University of Auckland to visit 6 top Chinese universities and 2 research institutes in mainland China from 3~15 Sep. These include the Chinese number 1 ranking university, Tsinghua University, and the number 1 ranking research institute, the China Academy of Sciences (CAE).

The author was then in the progress of the 1998 Yangtze River Flood reconstruction case study. So the trip to various Civil Engineering Departments of the top ranking universities along the Yangtze River provided an opportunity for data collection. Most of institutes and universities the author visited in this trip have been directly involved in the reconstruction planning or design after the 1998 floods, actually, one of the professors the team visited in Beijing at the Centre for Water Resources Research, CAE was
in charge of a large part of water resources facility reconstruction after the 1998 event. The meetings and interviews conducted, and relationships set up in this trip is crucial for the analysis of the Yangtze River Case study and helped the author to gain a more practical understanding of the disaster reconstruction process in China.

**2007 EHP Course**

The Essential for Humanitarian Practice (EHP) course in April 2007 was delivered by the Register of Engineers for Disaster Relief (RedR) in Auckland. The author had just finished the first fieldtrip to Banda Aceh and was planning for a possible follow-up visit, which was later carried out in March 2008. The course was professionally designed, informative and practical. The author feels that the success of the fieldtrips to disaster zones conducted in this research (two in Indonesia, one in China, one in Samoa) owes to the training he received in this course.

The course provided an understanding of the international context of emergency relief works, explaining the distinctions between natural disasters and conflict-induced emergencies and provided an introduction to the international humanitarian system. Other aspects of the humanitarian aid works, such as personal safety, logistics planning, dealing with media, and radio communication, etc. were also covered.

**4.4 Relevant issues with Research Design**

**4.4.1 Reliability and Validity**

Design problems include a variety of issues that can threaten the confidence of the findings. The assessment of research findings is primarily centred on the issues of validity and reliability (Fellows and Liu, 2003, Bryman, 2008, Neuman, 2006).

Research findings are considered reliable if similar findings are revealed time after time in repeated applications of the research (Kalof et al., 2008). This study attempts to ensure reliability by asking multiple questions on the same subject, as is suggested by other researchers (Blaikie, 2000, Esterberg, 2002). These multiple observations can be combined into an overall measure that is more reliable than any single question would be by itself (Sapsford and Jupp, 2006).
Validity is concerned with congruence between the details of the research, the evidence, and the conclusions drawn by the researchers. Normally, two aspects of validity – internal validity and external validity are considered in a study (Denzin and Lincoln, 2000). Internal validity means that the study is drawing appropriate conclusions from the data at hand. External validity is the ability to generalize from a study to a larger population. These two issues are addressed in this research and will be discussed in the next section as the special issues related with qualitative research.

4.4.2 Special Issues related with Qualitative Research

A variety of special issues need to be taken care of in this research due to the choice of qualitative approach. Kalof et al. (2008) discussed four criteria to judge qualitative research that better reflect the issues confronting this orientation: credibility, transferability, dependability and confirmability.

Credibility is how accurately the data reflect reality (Kalof et al., 2008). This research deals with this issue by use of triangulation of methods and data sources when collecting data to create a more complete understanding of the subject matter. For example, combining observations, secondary data analysis and in-depth interviews assists to improve the credibility of the findings. In addition, the study participants are given the chance to review their interview transcripts and the preliminary analysis to see if they agree with the data and if they have anything else to add (see participant information sheet in the relevant appendix). Moreover, as mentioned previously in section 4.1, critical realism epistemology philosophically places research endeavour in context in theory and practice, hence encouraging critical evaluation and reflection on research endeavours (Smyth and Morris, 2007). This is partially reflected in this research, among other things, as using combination of literature review and case studies as one of the research methods. Using multiple-case studies to investigate the research problems from different cases is conductive to improve the credibility since the synthesized conclusions of extracted from diverse case studies appear to be more convincing than the discussions from one case study.

Transferability, which is the extent claims can be made from the findings to a population, is a component for a strong research design. Qualitative studies use non-probability samples and small sample sizes, both of which limit the ability to generalize or perform statistical inference (Yin, 2003).
This study makes effort to tackle this issue by conducting multiple case studies from three jurisdictions where significant natural disasters and following reconstructions occurred.

Dependability emphasis on reliability or how accurate the data are. It also reflects how truthful the researcher and how truthful the research is (Guba and Lincoln, 1989). In the fieldtrips for the case studies in this research, the researcher conducted interviews and obtained follow-up feedback from the previous interviewees, which serves as effective tools to ensure the reliability and accuracy of the data they provide.

Confirmability is the degree to which others can confirm the results. In particular, observational methods have an element of subjectivity since they rely on researchers’ accounts, notes, and interpretations (Guba and Lincoln, 1989). During the process of this research study, the researcher has carefully documented a trail of the data, (including information sources, detailed notes, fieldtrip diaries, interview schedules, fieldtrip reports, etc). The documentation serves as an effective tool for this research to trace back the original data, which enhances the reliability of the data used to derive research findings.

4.5 Ethical Considerations

Since this research involves the participation of human beings in the interview process, it is necessary to take ethical issues into consideration (Mertens and Ginsberg, 2009). The nature of this study indicates that there are some ethical issues involved in the data collection process, especially with those victims of affected communities after natural disasters. A series of ethical issues which are related to this research are detailed discussed in the following paragraphs together with the measures taken to address them.

The Nuremburg Code, one of the first clearly articulated codes for the ethical treatment of human participants (International Sociological Association, 2001), included the necessity of conducting research only with those who give voluntary consent and ensuring research projects are designed to avoid all possible harm to participants. This requirement is fulfilled in this research through presenting Participant Information Sheet and Consent Form (included in appendices section) to the prospective
respondents so that they can be acquainted with the objectives and natures of the research, as well as any risks and benefits for participation.

Confidentiality is another issue that needs to be considered in the process of data collection. This research copes with this problem by means of removing all identifying information about individuals from research records and reports. The use of interview methods dictates that it is impossible to keep anonymous of the respondents. In addition, the researcher needs to obtain follow-up information, re-contact those who do not initially respond or link different sets of data on the same individuals. Thus, complete anonymity is neither practical nor effective in the context of this research. The scope of the research does not seek financial, psychological or other confidential information about the participants. Therefore, participants are not confronted with any negative effects on their health and interests. The minor problem that interviews may affect the participants’ employment status is addressed by ask for consent from the directors or chief executive of their organizations.

The ethics approval for this research has been obtained from The University of Auckland Human Participants Ethics Committee at 2007. The ethics approval was given for a period of three years. The detailed information can be found in the relevant appendix.

In the next part of the thesis, five case studies of disaster reconstruction, including their contractual arrangements, relevant regulations on procurement, and cost/time/quality considerations, will be analysed and discussed in chapter 5, 6 and 7.
CHAPTER 5: NEW ZEALAND CASE STUDIES

5.1 Case studies objectives and approach

New Zealand is vulnerable to various natural disasters, including floods. Disastrous floods have struck many parts of New Zealand and they are the most common cause of a civil defence emergency. Several so-called “100-year” floods can happen in quick succession. Two recent floods that happened in New Zealand are the 2004 Manawatu floods and the 2005 Matata floods (also known as Bay of Plenty floods). Both these events caused major damage to infrastructure, and as a result, required general recovery procedures and reconstruction strategies to be implemented.

As demonstrated previously in the overall research procedure flowchart in the Methodology chapter, the primary aim of this chapter relates to research objective 1, “to review the literatures on construction contracts and examine their usefulness and applicability in a disaster reconstruction situation”. To be more specific, this chapter answers the principal research question “Are the commonly used New Zealand construction contracts still useful in the aftermath of natural disaster?” It also touches on the objective 2, “To examine current procurement systems, contractual models, and existing regulations on procurement and their relevance to the disaster reconstruction.” Similarly, it intends to answer the principal research question of “the relevance of procurement systems, contractual models, and procurement regulations in a disaster reconstruction situation.” Since the two New Zealand cases are the first ones to be examined in this research, they also serve as pilot case studies. The format used here would be the basis for other international case studies in this thesis.

Multiple sources of evidence are utilized in these two case studies to form converging lines of inquiry. These include the methods of documentation, archival records, and interviews (please refer to the Methodology chapter for further details on those methods). The documents and archival records examined include review reports, newsletters, suggestions, business cases, and recovery action plans from MCDEM, Transit New Zealand, involved consulting engineering companies, and district councils for both events. The Transit New Zealand Regional Manager and the consulting engineering firm’s representative involved in the recovery after Manawatu flood, and the MCDEM Recovery Facilitator in charge of the Matata Rehabilitation Program were interviewed in 2005 and 2007 respectively. Most of the reports and review papers concerning the two events concentrate on the overall arrangements of responses and recovery or the technical aspects of debris flow mitigation. The
analysis in this chapter focuses on the procurement and contractual arrangements in the reconstructions following these two events. This is the first time these events have been examined from this angle.

5.2 2004 Manawatu Flood Reconstruction Overview

5.2.1 Overview of the February 2004 Floods

According to the Review Team Report (Reid et al., 2004a) on the Manawatu floods, the storms and floods in February 2004 created the largest emergency management event in the past 20 years. This was also the first major event since the passage of the Civil Defence Emergency Management (CDEM) Act in December 2002. The events were so widespread and of such severity as to seriously stretch the response and recovery capabilities of the local authority and emergency management agencies involved (Reid et al., 2004b). Intense rainfall and gale force winds from 15 - 23 February 2004 affected the lower North Island and the top of the South Island - in particular the regions of Taranaki, Manawatu-Wanganui, Marlborough, Wellington, and the Hawkes Bay (refer to the map below). Up to 300 mm of rain fell on the already saturated ground of the lower North Island over two days. Rivers rose quickly, inundating unprotected farmland and properties.
The flooding caused hundreds of people to be evacuated from their homes (with 2300 people evacuated at the height of the event), farmers lost sheep and cattle stock, many rivers breached their banks and considerable areas of farmland were inundated by silt and floodwaters. There was also significant damage to infrastructure such as roads and bridges, and rail services were disrupted (Van der Zon, 2005a). In addition, there were telecommunication, power, gas and water supply outages to tens of thousands of people. Remarkably, no lives were lost as a direct result of the event. Group recovery costs are estimated at $160-180 million for rural sector and $120 million for roads and council infrastructure (Kumaran, 2004). It is generally accepted that the end of day three, day four and part of day five involved Response phase work. Day five onward involved Infrastructure Recovery.

The focus of this case study is the reconstruction works resulting from the flooding damage. In order to understand the contractual systems used in this case, a table demonstrating the different parties involved in the reconstruction process of the Manawatu floods is provided in Table 32.
Transit New Zealand (Transit NZ) was the direct client involved in a procurement relationship with the contractors. Transit NZ is responsible for the management of 10,786 kilometres of state highway network, which has a replacement value of around $15.6 billion NZD (Transit New Zealand, 2005). Transit NZ is split up into a number of regions. Within each region they have a number of networks. East Wanganui Network was involved during the reconstruction after the floods. It covers the local authority areas of Rangitikei, Manawatu, Palmerston North, Horowhenua and Tararua. A photo showing the Aorangi bridge debris in Manawatu floods is included below as Figure 22.

<table>
<thead>
<tr>
<th>Client</th>
<th>Contractor</th>
<th>Other parties involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCDEM</td>
<td>Higgins</td>
<td>Automobile Association</td>
</tr>
<tr>
<td>Regional Council District Councils</td>
<td>Road Transport Association</td>
<td>Police</td>
</tr>
<tr>
<td>Transit New Zealand</td>
<td>Whittakers Construction</td>
<td>Road users</td>
</tr>
<tr>
<td>MWH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Transport NZ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 32: Involved parties in reconstruction process of Manawatu floods 2004
5.2.2 Transit NZ’s procurement systems

Transit NZ developed three asset management procurement models within its network for the procurement of suppliers to manage and maintain these networks. These procurement models were applied during reconstruction after the Manawatu floods. These models (Transit New Zealand, 2005) are traditional, hybrid, and PSMC (Performance Specified Maintenance Contract):

The services within the traditional model are separated between professional services and physical works. In a disaster event like the Manawatu floods, the limited ability of such a framework to quickly respond to rebuilding could be a disadvantage. Traditional procurement systems usually result in a longer completion time and a higher cost, which is inappropriate in the situation of reconstruction, as financial resources are already stretched. However, industry familiarity with the system and a quality output would be an advantage in such a situation.
The Hybrid Model utilises output-based contracting, relying on performance measurement, reporting and self-auditing to ensure supplier performance. The model relies on a co-operative environment between the contracted parties and seeks to maximise the skills, expertise, innovation and systems of the roading industry. If compared to the “Broome’s model” (Broome, 2002), it would be regarded as a management procurement approach which is between the traditional and integrated ends, and it is more like a partnering or alliancing relationship.

The PSMC Model consists of a single contract for providing all the products or services associated with state highway network maintenance and management. In a similar way to the Hybrid model, the PSMC model utilises output-based contracting, relying on self-compliance by the supplier to ensure performance. It seeks to maximise the skills, expertise, innovation and systems of the roading industry to attain more efficiency and improved value for money. This model is similar to the integrated procurement methods used in a normal situation like Design-and-Build.

The difference between the traditional contracts and the Hybrid contracts is that the contractor takes more responsibility in day-to-day activities in a Hybrid contract. MWH (a consultant of Transit NZ) and Transit NZ had the ability, if required, to use all different contract forms. An example of this occurred during the recovery of the Manawatu Gorge, a section of State Highway 3 that links Manawatu/Palmerston North with the East Coast of the North Island and Tararua District. In the Manawatu Gorge, initial work was focussed on getting the road opened. This meant that MWH worked on plant hire on an hourly basis with their contractor Higgins. Higgins hired plant from another contractor to meet the needs of the emergency work. Other emergency activities included procuring specialist services: for instance, Maurice & Baley were contracted to do some bridging and guardrail work. However, generally the reconstruction work was, where possible, managed within the existing contractual organisations.

5.2.3 General contractual arrangements

During the recovery process, the existing contract types were used, but some special arrangements were also made. For instance, MWH stepped outside that arrangement and tendered in the open market for restoration work on the later construction sites such as underslip 4 and underslip 5. A separate contract was also let for the restoration works on State Highway 54 in the Rewa Hill area that covered
six slip sites. The consultant invited tenders and targeted people in the other contracts to undertake the work.

In other areas, MWH had let a contract for one site and subsequently they extended it to cover other sites. An example of this was the contract for the repairs of underslip 2 in the Gorge. This work was won by Whittakers Construction through rather straightforward conventional procurement. Only two parties tendered and Whittaker was considerably lower priced than the other tenderer. After Whittakers Construction finished their first task, the contract was extended to include underslip 5 as well. When that was successfully completed also underslip 6 would be included in the contract.

During the reconstruction phase the involved parties were almost the same as in the normal situation. Transit NZ led the process and made the critical infrastructure reconstruction decisions (either directly or through its consultant). Working with existing consultants meant that the contract approaches did not differ from the normal situation but the circumstances of the reconstruction did differ from normal construction. In particular, emergency services, civil defence and council maintenance crews were involved. Various utility providers, consultants and contractors worked 24-hour days to repair damaged roads and bridges, and restore disrupted services. The focus was on rebuilding quickly, hence the need to try and use existing contractual relationships, ones with a proven track record and relationships often based on mutual trust.

To summarize on the contractual paths that have been used in Manawatu Floods reconstruction, three major factors had to be agreed upon: Procurement Systems, Contractual Models and Standard Contracts. As discussed previously, most simple and straightforward reconstruction works were carried out using the traditional separated procurement system. Some of the road reconstruction works procured under the Transit NZ’s Hybrid or PSMC models, could be categorised as within the integrated procurement systems. The associated contractual model used most frequently was the traditional lump-sum one. This led to the use of the standard contract of NZS3910 in most cases and Transit NZ’s own specific contracts with some road reconstruction works.

The rest of this section will focus more specifically on the detailed aspects of the procurement and contractual arrangements of the Manawatu floods reconstruction in general, namely, the contractual arrangements, building and environmental regulations and legislation, cost, time and quality considerations.
5.3 2004 Manawatu Floods Reconstruction - Detailed Analysis

5.3.1 Contractual arrangements

The major purpose of this section is to review the contractual arrangements of reconstruction works after the 2004 Manawatu floods. Based on the previous overview section, more insight will be given to the relationships between different parties involved in reconstruction and their expectations in the contractual arrangements.

As mentioned previously, the different parties involved in the Manawatu recovery phase are:

a. Regional Council
b. District Council
c. Transit New Zealand
d. MWH
e. Land Transport NZ
f. Higgins
g. Road Transport Association
h. Whittakers Construction
i. AA
j. Police
k. Road-users

The roles of some of the parties in the recovery process are as follows:

a. Regional Council
The major regional council involved in Manawatu Flood Reconstruction is the Horizons Regional Council, which fully encompasses Ruapehu, Rangitikei, Wanganui, Manawatu, Palmerston North, Tararua, Horowhenua districts and also some parts of Taupo, Stratford and Waitomo districts. The Regional Council’s role is usually more about the general aspects of environmental protection and strategic planning for flood prevention.

b. District Councils
More District Councils were involved during the recovery phase. Their major task was to manage the reconstruction of the non-state-highway roads within their areas.

c. Transit New Zealand
Transit New Zealand was the major client involved in the reconstruction of the state highway networks. The procurement strategies developed by Transit NZ were generally utilised in the reconstruction.
d. **MWH**
As the consultant of Transit NZ, MWH was mainly involved in the initial response phase, which includes the assessment of the road damages and cleaning the roads for later access.

e. **Land Transport NZ**
Land Transport NZ was the roading funding agency (formerly Transfund)

f. **Higgins**
Higgins is a physical work contractor in normal situations, but also during the reconstruction after the Manawatu floods of 2004. Higgins was involved in the initial response.

g. **Road Transport Association**
After the floods the roads were covered with land slip. The Road Transport Association (the truck industry) was responsible for cleaning the roads.

h. **AA**
The AA was instructed by the authority to close some of the roads after the floods.

i. **Police**
The police were responsible for guiding traffic to alternative routes after the roads were closed and they were also involved in the emergency response.

j. **Road-users**
Road users were affected by the reconstruction and closure of the roads.

Considering the situations in the reconstruction of the roading networks, the parties involved were almost the same as in the normal time construction. Transit NZ was leading the process and making the critical decisions under their long-term procurement plan. The contract process did not differ much from the normal situation (please refer to the discussions in 5.2.3).

### 5.3.2 Building, environmental regulations and legislations

The major legislation applied during the recovery of the disaster were as follows:

- The Civil Defence Emergency Management Act 2002
- The Civil Defence Act 1983
- The Land Transport Management Act 2003
- The Resource Management Act 1991

For the local authorities of the Manawatu-Wanganui region the event was coordinated through their new CDEM Group arrangements under the provisions of the Civil Defence Emergency Management
Act (CDEM Act) 2002. For the other territorial authorities the event was managed through their Civil Defence Act 1983 arrangements. The Civil Defence Emergency Management Act 2002 provides a structure appropriate for dealing with events such as the February 2004 floods. According to the review team report (Reid et al., 2004a), the CDEM Act does not introduce any structures or procedures that seem to have hindered authorities at any level in dealing with the event. The involved parties of the road reconstruction did not notice much influence of the CDEM 2002. Most of the reconstruction works were carried out under the normal time regulation and legislation.

Variations in the application of the emergency works provisions of the Resource Management Act 1991 (RMA) were commented upon by members of the community and utility representatives. This issue principally related to the need for rapid clearance and disposal of slip debris to enable road opening, particularly for isolated valleys, in the days immediately following the initial floods. The regional council initially decided that no deposition of slip material was allowed. The consequence of this decision was that it would slow down the recovery process (in particular the recovery process of the Manawatu Gorge), because it would take a long time for the loaded trucks, trailers and carts to drive to an official deposition site. Finally the Regional Council withdrew that requirement, because the river was carrying thousands of tonnes of debris and silt material down and the added small amount of slippage from the roads was insignificant. Work undertaken by the Manawatu-Wanganui Road Access Committee some weeks after the event in conjunction with Horizons Regional Council Compliance Section established that it was acceptable for material to be pushed off the road in order to obtain basic single lane access only if there was no practical alternative and there was a need to re-establish access. Additional criteria for spoil disposal were also usefully established and promulgated to all road controlling authorities in the region. It is consequently recommended in the review team report (Reid et al., 2004a) that a nationally agreed guidance note should be prepared on the practical application of s330\textsuperscript{11} of the RMA.

\textsuperscript{11} The emergency works provisions in s330 of the RMA enable a consent authority (i.e. a regional council) to suspend formal process and some customary physical practices in emergency situations where rapid actions are required to assist the community. Any authority or agency undertaking such action must advise the appropriate consent authority within seven days of the activity being undertaken, and resource consent is then required to be obtained if there is an ongoing environmental effect.
5.3.3 Cost, time, quality considerations

5.3.3.1 Funding and Cost

Government Funding

The Government agreed to provide assistance based on estimates, with any shortfalls considered at the beginning of the year after. The Government also agreed to a special funding of over $800,000 to support a catchment scheme for the Lower Kiwitea Stream, which in February 2004 washed away kilometres of farmers’ river bank erosion protection works, flooded paddocks and contributed to flooding in Feilding township.

The $669,000 paid to the Wellington Regional Council covered costs relating to the damage to Wairarapa river systems, and on the Hutt, Wainuiomata, Otaki and Waikanae rivers, as well as damage to water supply assets at Kaitoke and Wainuiomata. The funding also covered response costs incurred in providing emergency access to power and communication facilities.

Previously announced assistance, to affected people, councils, farms and other businesses was estimated to cost the Government over $160 million. After affected district councils had finished identifying their costs in repairing essential infrastructure, further assistance was given. The Government announced additional financial help of over $12 million for lower North Island areas affected by the Manawatu floods. Agriculture Minister Jim Sutton and Civil Defence Minister George Hawkins announced additional funding for Wellington and Manawatu-Wanganui Regional Councils affected by the floods. The Cabinet confirmed over $10 million for the Manawatu-Wanganui Regional Council to help repair flood protection and drainage schemes damaged by the floods. Traditionally, the Government provides assistance after costs have been estimated and confirmed, but in this case the Government took a flexible approach.

Funding by Insurance Companies

After the 2004 Manawatu floods, insurance companies paid up and repair work began before central and local governments agreed on the composition of the funding. The total amount of insurance claims was $112 million for this event.
**Transfund**

Transfund's role includes funding for construction and maintenance of state highways and local roads, passenger transport services, commuter trains, buses and ferries, rail freight and barging. It also includes walking and cycling projects, and funding of projects supporting regional development. Transfund is the nation’s main funding authority for infrastructure.

The Land Transport Management Act 2003 set a challenging new framework for Transfund to follow in allocating funding. It reflects a new multi-modal approach, encourages long term planning and allows funding flexibility in implementing the government's New Zealand Transport Strategy. In the state highway network Transit New Zealand is 100% funded by LTNZ (Land Transport New Zealand). The local roads are funded with a component of local rates money and government funding, which may be up to 60%.

**Funding process**

The following funding process is used during a recovery after floods: Make an application with as much details as possible (basic restoration work) to the funding authority. Once approved the work can begin and, as time goes by, a reapplication and review can be made with appropriate supporting information and details.

Taking the funding process of reconstruction of the roading as an example, when an event happens, MWH does a preliminary assessment and makes an application to LTNZ through an emergency request for funding. The initial request in this case was $3,025,479 but later exceeded $9 million. After the real costs were confirmed, it was possible to make a permanent reinstatement.

During the recovery after the Manawatu floods, the funding process was satisfactory but still could have been completed better. The insured should have involved the insurer within a matter of days after a large event. However, in this case, the management group involved Transfund at a relatively late stage. Because Transfund has direct access to the government, it is likely that more could have been done to obtain the certainty over funding in the early stages of roading recovery and this would have further helped with the physical works prioritisation process. It would have been better if Transfund
took a leadership role, because of the overview, funding control and general roading expertise they have.

Manawatu District Council said that their road and bridge repairs would cost about $20 million over three years and, without special government help, its ratepayers would have to meet nearly $3 million of that, even after Transfund had applied its higher-than-normal disaster funding formula. Rangitikei District Council, with its extensive damage and a small number of ratepayers, may fare proportionally better under Transfund’s formula.

A rather difficult part of the recovery has been prioritising cleanup works and flood protection measures within the financial constraints. The estimated uninsured damage was $200 million. In the rest of this section, the major focus will be on the costs of the damaged properties, infrastructure and future reconstructions and risk mitigation.

Cost of damaged properties and infrastructures

Damage estimates for Manawatu-Wanganui (Reid et al., 2004a, Van der Zon, 2005b):

- At the height of the event it was estimated that around 2,300 people had been evacuated from their homes in the Manawatu-Wanganui region. On 23 February 2004, there were still 750 evacuees in the region.
- Three months after the event, 400 homes were still uninhabitable and 922 people were still out of their homes by then.
- 1014 farms flood-damaged
- $24 million damage to rivers
- $10 million damage to soil conservation work
- 20,000ha of farmland under water

Group recovery costs are estimated at:
- $160-180 million for rural sector
- $120 million for roads and council infrastructure

Certain price escalations of plant and equipment were experienced during the recovery phase. The cost arose as a consequence of the shortage of available plant resources.

About half of the regions’ roads (about 9,300 km) were closed during the event. The Manawatu Gorge was closed for 2 months. There was also damage to more than twenty bridges. The cost of the damage
to roads and bridges was estimated as $77.6 million. The group recovery costs were estimated at $120 million for roads and council infrastructure.

The first information about the estimated damage of the roads came by day 4. 15.3% (1,427 km) of the region’s roads were closed, with a further 1.1% marginal and 0.4% accessible by 4-wheel-drive vehicles only. After eight days the total infrastructure damage was estimated at $112 million across 24 utilities. As at 4 May 2004, the estimate of expenditure to fix roading damage was (Van der Zon, 2005b):

- $ 25 million to 30 June 2004
- $ 46 million in 2004/05 financial year
- $ 8 million in 2005/06 financial year

These were extra costs to the normal expenditure on similar works over the same period of around 60 million. Resource shortage was the major issue experienced by the recovery agencies.

The other issue associated with the recovery was the extra cost resulting from the closure of the major access routes. One example was the closure of the Manawatu Gorge. Although alternate routes exist on both sides of the Gorge, these local roads were not constructed to the same design level as the State Highway and therefore tended to suffer a significant amount of damage by heavy vehicles using the routes. As part of the emergency response plan, Transit NZ used to fund maintenance repairs on those roads as a consequence of the increased traffic. In an earlier flood of 1995 $ 1 million – $1.5 million was paid to the District Council to cover this damage. After the Manawatu floods of 2004 the funding was significantly less: $69,000 (Van der Zon, 2005b).

To reduce the costs of transportation, it was important to open the roads as quickly as possible (in particular the Gorge). It cost the recovery agencies a lot not only because of the longer route the trucks had to take, but also because of the cost of repairs to those routes afterwards. The good relationship between MWH and the Road Transport Association played an important part in reducing the costs of the recovery process. For example, when Manawatu Gorge could be opened one way, the preference of the Road Transport Association as to which side of the road to open to minimize the overall costs was consulted because of their expertise and experience.
As for the future cost to the flood mitigation in the region, the Horizons Regional Council represented the directly affected region in 2004 Manawatu floods and came up with the Lower Manawatu Flood Control Scheme (LMS) to improve flood protection across 28,000 ha of low-lying land between the Manawatu Gorge and the sea. In order to support this scheme financially, a new rating system determining who should pay and how much they should pay in rates was put in place and took effect from July 1 2009. It replaced the old one which based on the legislations of the 1950s. Between June and November 2005, the Horizons Regional Council went through the public consultation process of their proposed $28.8 million Lower Manawatu Scheme upgrade project. The Council’s Catchment Operations Committee meeting of 13 August 2008 endorsed for public consultation a revised upgrade programme. A new estimate of just over $40 million was calculated, taking into account the expanded works programme and increased construction costs over the 2005 – 2008 period (Horizons Regional Council, 2008).

5.3.3.2 Quality and Time

Quality issues

In terms of efficiency of the reconstruction process, the first goal of opening the road was done effectively and efficiently. Due to the wide scale nature of the event and the large pressure that was placed on the capacity of the contracting industry, the long term reconstruction of a number of sites took more time than expected. A structured recovery management plan should have been in place before the event in order to achieve an efficient delivery of the reconstruction process.

In the initial reaction to the event, the impact of the disaster was underestimated. The parties tried to manage it in the same way they managed previous local events. However, this was inappropriate for the scale of Manawatu floods. MWH delegated the work out and relied on the contractor to plan and programme the road clearance works on their own. The scale of this disaster was significant and that caused other problems. The contractor did not have the skill set to organise such extensive works. MWH changed their management style later and became more involved in the day-to-day on-site management. They had set up a separate base and disaster recovery office in Palmerston North City to be closer to where the work was taking place. In this way they could have closer contact with the contractors, handle on-site management issues and coordinate the overall response effort.
The Government was impressed with the sustainable initiative developed by Council and farmers whereby a council-administered scheme would be developed rather than previous ad-hoc works restored. During this flood disaster, there was a lot of slip material, the clearance of which became the major issue during the initial response to re-establish access. Three steps of road clearance were identified:

1. Restoring supply chains to communities and basic access for emergency services
2. Restoring full access where significant economic and social impact continued to result from only basic access being available.
3. Once full access had been restored, a need for permanent works remained.

The Manawatu floods indicated the vulnerability of bridges over rivers to flood events: 23 were significantly damaged in the floods. In many instances, the abutment design was inadequate to withstand the turbulence associated with floodwaters. As bridges carry other critical infrastructure (such as water or telecom pipelines), it is not only loss of access that results from bridge failure.

Building supplies and construction equipment were in short supply, which affected the speed of recovery. Also, for structures on the floodplain, rebuilding as before only recreates the problem for future events. This required rapid planning during the recovery phase by people still dealing with the consequences of the current event and often without the information needed for future planning. For example, houses in Scotts Ferry needed to have floor levels raised above the flood levels. However, the appropriate flood level had to be recalculated because sedimentation had changed the river flood capacity, and therefore the required floor height.

Material supply was an issue, although not a major problem after the floods. Most of the materials required were supplied locally in the area or from other parts of New Zealand. Workloads were also sufficient. People tried to help and the contractors worked very hard to recover as soon as possible. It was a serious flood caused by an extreme storm which resulted in significant damage to the infrastructures, but the reconstruction post-disaster was still managed by the recovery agencies within the existing conventional contractual system.
**Time issues**

Earlier involvement of reconstruction agencies, including their designer and planner, into the response phase is an effective way to speed up the project duration. It would also enable a better appreciation of issues and prevention of the initiation of uncoordinated solutions by infrastructure providers. Transition from response to recovery can also be made sooner in this way.

For the network consultant the first objective was to get the roads open. In the case of the Manawatu Gorge it took 75 days before traffic was allowed through the Gorge. State Highway 54 Kiwitea No. 2 was opened on day 53. This could be considered as the transition point from initial response to long term recovery.

Throughout the rest of the network the only outstanding work was the repair of the Jamison Bridge. This bridge’s abutment pier collapsed during the storm event. It was not until late 2006 when the reconstruction was completed. The Bailey bridge was in place there within 12 days after the flood and remained for as long as the reconstruction of the Jamison Bridge took.

Speeding up the reconstruction processes and procedures was not easy because of the funding process and constraints on availability of resources for reconstruction. The possible ways to expedite the overall tendering process in the Manawatu case could be:

- pre-identification and registration of suitable contractors and tenderers for reconstruction
- pre-warning and relationship building between the client and the potential tenderers and contractors
- earlier involvement of the reconstruction contractors into the emergency response phase and maintaining good communication with them
- pre-event agreed appropriate risks allocation between the client and contractor
- pre-event memorandum of understanding / emergency management contract signed with potential contractors and regular relevant exercises to test and reinforce this relationship
- prioritising vulnerable areas such as the Manawatu Gorge
5.4 Conclusions - Manawatu

There was little difference between contractual arrangements for pre and post disaster construction because of the scale of the flood. The parties that are normally involved during the construction projects are also involved during the reconstruction process. This reduced problems because the collaboration of existing relationships is based on trust.

During the overall reconstruction procedure, the standard legislation and policy framework was effective. Diverging from normal regulations and legislation was not necessary during the recovery, making the reconstruction process quite similar to the regular construction process. Especially for post-disaster situations, the CDEM Act 2002 can be applied. The Act did not seem to have hindered at any level in dealing with the situation.

In post-disaster situations, decisions about funding have to be made very quickly, in comparison with regular projects. A detailed funding request was impossible in the beginning of the process because not all items could be taken into account immediately. The reconstruction process is dependent on funding availability from the government. The funding to compensate for the damaged local roads was significantly less in comparison with an earlier flood.

The supply chain is more difficult to maintain in post-disaster situations than in normal construction projects, because roads are damaged and need to be closed. Efficient reconstruction work and re-establishing the access route is therefore important and of high-priority. Underestimating a disaster has consequences for the quality of the rebuilding process. A disaster of large scale needs the coordination of an experienced management team. Early involvement of the contractors is more important during the reconstruction process in comparison with a normal construction process. The reconstruction is dependent on the efficiency of the early stage of the response phase. The delivery time of material supply is crucial for reconstruction. However, during the reconstruction after the Manawatu flood, the delivery time was similar to that of normal construction.
5.5 2005 Matata Flood Reconstruction Overview

5.5.1 Overview of May 2005 Floods

On 18 May 2005, a band of extremely heavy rain passed over the catchments behind Matata. It triggered many landslips and several large debris flows, which, with their associated flooding, destroyed 27 homes and damaged a further 87 properties in Matata. Damage resulted in the townships of Matata and Awakaponga, and there was flooding in Edgecumbe. State Highway 2 was closed in and around Matata, the railway line was severed and rural land flooded. Whilst it is fortunate that no lives were lost, over 500 people were evacuated and 28 houses were listed as unsafe for occupation. A detailed list of major damage and disruption in Matata and environs included (Whakatane District Council, 2005b):

- the evacuation of 538 people;
- extensive damage to local roads;
- closure of State Highway 2 to the west and east of Matata;
- closure and significant damage to the railway line at a number of points in and around Matata;
- flooding of rural land;
- flooding in Edgecumbe;
- disruption and damage to water and electricity supplies;
- damage to storm water and septic tank sewerage disposal systems; and
- an estimated 700,000 m$^3$ of debris$^{12}$ of all kinds, ranging from silt to large boulders and trees, deposited in and around Matata and in the Matata lagoon.

The Whakatane District Council’s (WDC) Emergency Operations Centre had been operational from approximately 8am on 18 May in response to the localised impacts of a period of heavy rain. A state of Civil Defence Emergency was declared at 6:43pm on 18 May 2005 for the Edgecumbe-Tarawera Ward (which includes the community of Matata) when it became evident that the scope of the event was beyond the resources of local emergency services organisations. A photograph showing the distribution of the damage at Matata after the May 2005 event is included as Figure 23.

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$^{12}$ Debris flows are a type of landslide in which water and debris of all sizes, including large boulders, are mixed. Broadly speaking, debris flows are more destructive and dangerous than floods.
5.5.2 The initial response to the May 2005 Floods

According to a business case (Whakatane District Council, 2005a) prepared in November 2005 by the Whakatane District Council to support their funding request from the central government, a Recovery Centre was established at Matata Rugby Football Club on 20th May 2005 and Welfare Support was established at Matata Resource Centre. The event that affected Matata and surrounding area was part of wider flooding that occurred in the Bay of Plenty region and which also resulted in a declaration of Civil Defence Emergency in Tauranga City. Community organisations, lifeline utilities, emergency
services, local government and other government agencies quickly went into action in response to the event. The WDC local civil defence organisation responded quickly to the May 2005 event. Agencies worked extremely well together, and resources were promptly directed to where they were needed. The Government also provided $250,000 to a joint Bay of Plenty Mayoral Relief Fund\textsuperscript{13} set up to assist victims adversely affected by the event.

The May 2005 floods left a major recovery task to be performed in and around Matata. Debris needed to be cleaned up, and damage to property and infrastructure needed to be dealt with. Some of this work could begin straight away but other types of reconstruction could not start until assessments and longer term decisions had been made. Much of the initial cleanup work took place while the declaration for the state of civil defence emergency remained in place. This enabled agencies including Transit New Zealand, ONTRACK, WDC and Environment Bay of Plenty to get priority reinstatement work under way and people whose property had been affected to commence the job of assessing damage, clearing properties and returning to their homes.

The State of Civil Defence Emergency for the Edgecumbe-Tarawera Ward was lifted on Monday 30 May 2005, some twelve days after the event. A photo showing the flooded area in Matata after the event is included as Figure 24.

\textsuperscript{13} Including Tauranga City, Western Bay of Plenty and Whakatane District
5.5.3 General Contractual Arrangement

The Recovery structure (used during the Recovery phase after the Matata flood) lists the different parties involved. Five work streams reporting to the recovery manager were: (1) Communication; (2) Rural; (3) Hazards/Risks consisting of: Tonkin and Taylor Ltd (leader), Environment Bay of Plenty, Whakatane District Council, Department of Conservation, Iwi, ONTRACK, Transit NZ, Opus; (4) Infrastructure Task Group consisting of Whakatane District Council (leader), Transit New Zealand, Environment Bay of Plenty, Horizon Energy, Transfield, Transfund, Iwi representatives, and ONTRACK; (5) Welfare.

Other parties involved were: Government, Insurance companies (AMI), Land Transport New Zealand (subsidy), Task Force Green, Smithbridge Limited. Whakatane District Council (WDC) appointed Tonkin and Taylor Ltd (T&T) to assist with disaster recovery activities and coordinate hazard and risk management investigations following the debris flows, flooding and widespread damage.
Programmes of work were managed by the Whakatane District Council. The district councils were responsible for developing plans and recovering the lifelines such as roading, electrical services, and telecommunications. Four engineering companies were contacted to put forward pricing and proposals for recovery of the closed Northern end of Herepuru Road. The companies investigated all options and the costs of each option. Opus Consultants were awarded the tender to investigate long-term roading options for Herepuru Road and were engaged by Whakatane District Council to progress these options. From the moment that the floods occurred in May, Transit NZ took a lead role working with Whakatane District Council on roading infrastructure. Along with roads, rail networks were affected. Ontrack is the owner and manager of New Zealand’s railway infrastructure. This team was concentrating on removing debris from Matata and after that they considered longer-term rail infrastructure reconstruction.

The Government was looking for an integrated recovery plan for Matata with Whakatane District Council and other relevant agencies. To facilitate this process the Ministry of Civil Defence and Emergency Management appointed a recovery facilitator. This facilitator worked together with the Recovery Manager to rehabilitate Matata and provided an interface between central Government and Whakatane District Council.

A Hazard Task Force was appointed whose original scope of work prepared by WDC included identifying what action plans and processes needed to be put in place to address the short term and long term risks still facing Matata as a result of the event. This team worked with the Infrastructure Task Force whose responsibilities were to clear debris, to sort out roads and to get water on and back to a standard for use. As both Ontrack and Transit NZ owned a significant part of the infrastructure in the area affected by the event, these organisations needed to work collaboratively with the Hazards and Infrastructure Task Group to identify long-term solutions.

The contract to construct a new two-way rail underpass for State Highway 2 traffic was awarded shortly before the floods struck in May, but construction was delayed by the flooding. The contractor, Smithbridge Limited, won the contract for the underpass including the construction of the new underpass and a new rail bridge, realignment of the highway on both sides of the underpass, demolition of the old underpass, removal of the traffic signals, and installation of a speed threshold.
The recovery phase started one week after the event and parties came into action to clear the roads and the land from rocks, stones and debris. There was no tendering of work during this period. Parties had their own contractors and it was not necessary to involve new parties. When the reconstruction after 4-6 weeks took place, new parties were required for the work. The tendering was fast-tracked and the parties approached were those with an existing relationship with the client. This had the effect of minimizing disruption and the reconstruction work was accomplished using existing contractors with an already established relationship. It also meant that the same contractors could be used during the reconstruction process.

5.6 2005 Matata Flood Reconstruction – Detailed Analysis

5.6.1 Recovery Structure and Contractual arrangements

The main purpose of this section is to introduce various stakeholders involved in the reconstruction process after the 2005 Matata floods, their relationships with each other and their roles in the overall contractual system. As mentioned previously in section 5.4.3, the recovery structure is illustrated below in Table 33.

Table 33: Recovery Structure of 2005 Matata Floods (Whakatane District Council, 2005b)

The Response Phase did not have a definite “cut off”, rather it merged into the Recovery Phase. The establishment and briefs given to the Task Teams, particularly Welfare and Infrastructure, ensured a high level of response and a clear process of transition from the response to the recovery.
As demonstrated in Figure 33, a committee structure was established comprising the Task Team Leaders for each recovery group, the Recovery Manager and the Recovery Facilitator. The Recovery Manager monitored the work of the Task Teams through each Task Team Leader. The Recovery Manager was supported by the Recovery Facilitator and the provision of a contract personal assistant for administrative and office support. Both the Regional Council and District Council continue to provide appropriate data in regard to the disaster, land use issues and future planning requirements to complete the recovery phase. Five work streams reported to the Recovery Manager were:

- Task Group 1: Hazards and Risks
  a. Tonkin and Taylor (leader)
  b. Whakatane District Council
  c. Environment Bay of Plenty,
  d. Department of Conservation
  e. Iwi representatives
  f. ONTRACK
  g. Transit NZ
  h. OPUS

- Task Group 2: Infrastructure Recovery
  i. Whakatane District Council: Roading, Utilities (leader)
  j. Transit New Zealand
  k. Environment Bay of Plenty
  l. Horizon Energy
  m. ONTRACK
  n. Transfield
  o. Transfund
  p. Iwi representatives

- Task Group 3: Rural Recovery

- Task Group 4: Welfare

- Task Group 5: Communication

The Hazards and Risks Task Group was the most important one in terms of the recovery process. It was set up to coordinate the necessary information in relating to the natural hazards and risks to support decision making on the short, medium and long-term solutions. The major focus of the Hazards and Risks Task Group was to find out 1) the cause of the disaster, 2) the nature and extent of short and long term risks still facing Matata, 3) possible action plans and processes, 4) future land use
provisions, and 5) seeking input and providing information in a timely manner to the property owners and community affected.

The Infrastructure Recovery Task Group was set up to work together with the Hazards and Risks Group to firstly ensure that initial infrastructure needs were addressed, including debris clearance, and then ensure a systematic process to identify and manage infrastructure recovery. It was embodied in the completion of a Regeneration Plan by the Infrastructure Task Group for the reinstatement of all services to pre-event conditions. As the name suggests, the Rural Task Group was responsible for monitoring needs and coordinating the rural recovery effort for people, livestock and property in the Edgecumbe-Tarawera Ward. The Welfare Team was the informal gathering of central government and other welfare agencies to ensure a consistent and coordinated approach to the recovery. Some representatives of the Welfare Group were: Housing New Zealand, District Health Board, Salvation Army, Inland Revenue Department (IRD), police, Whakatane District Council, and counselling services providers such as Victims Support and Children & Young Persons Service. The Communication Task Group was mainly responsible for preparing Situation Report (SITREP) to the Recovery Manager and to the community in a timely and appropriate manner.

Considering the contractual relationships between the stakeholders of the recovery process, the clients here are the owners of affected properties and infrastructural assets. They were represented by Whakatane District Council, ONTRACK, Transit NZ and Environment Bay of Plenty. During the initial response to the disaster, there was no tendering of the works. Recovery agencies had their own contractors and all the jobs were naturally procured within the network based on existing long-term relationships, the same as normal time construction. When the reconstruction took place after 4-6 weeks, new contractors were required, and tendering was carried out through invited/ negotiated tenders. Due to the limited size of the local construction market, most of the works were procured among a few capable and experienced contractors using integrated or management-orientated procurement systems and D&B or PM/ CM contractual models. The standard contracts used were the same as normal time construction contracts. Works were accomplished by existing contractors and some contracts were extended from response works to further include the long term reconstruction works with the same contractor.
5.6.2 Building and environmental regulations and legislations

The following legislation applied during the recovery of the Matata floods (Tonkin & Taylor Ltd, 2005):

- Building Act 2004
- Local Government Act 2002
- Civil Defence and Emergency Management Act 2002
- Earthquake Commission Act 1993
- Resource Management Act 1991
- Resource Management and Electricity Amendment Bill
- Public Works Act 1981
- Soil Conservation and Rivers Control Act 1941

The following plans were reviewed by the relevant authorities during the recovery:

- Proposed Regional Water and Land Plan as amended by decisions (4 May 2004)
- Operative Regional Coastal Plan (8 December 2003)
- Proposed Whakatane District Plan (30 March 1998 [Rural] and 14 February 2003 [Urban])
- Operative Bay of Plenty Regional Land Management Plan (1 February 2002)
- Bay of Plenty Regional Policy Statement (1 December 1999)

The significant regulatory issues that resulted from this disaster were future land use planning, in particular where sub-divisions and housing can be located in the town of Matata. These should be determined by the District Council according to relevant regulations and legislations. It was recommended in the Matata Recovery Action Plan (Whakatane District Council, 2005b) that both the District Council and Regional Council will need to review policies in respect to regulatory and non-regulatory matters, in terms of identifying the cause of the disaster, and mitigation of it along with future management processes. The rest of this section will discuss some of the issues arising from the recovery work of the Matata floods as it relates to several pieces of the legislation mentioned above.

In relation to the Local Government Act 2002, community consultation during the process of developing options for the rehabilitation of the community was of ultimate importance. After the disaster, the affected community was closely involved in the recovery process. Public meetings were
held to update people about the causes and effects of the event. Everyone impacted by the disaster was encouraged to attend. Information was provided through the weekly Recovery News, meetings were held with individuals and groups, as requested, and submissions were also made to the proposals. Those who made submissions were also provided with an opportunity to present their submissions to the Council.

As for the decision making process of the local authority, normally it would be expected that extensive work would be needed for decisions of such significance. However the work was undertaken under extreme circumstances. Accordingly, the Council had no option but to fast track the process. This was expected by the affected community and also by the government. The Recovery Manager’s report (Turner, 2005) concluded that no decisions were made that were inconsistent with current policies. It is likely that any inconsistency was a result of the Council’s need to make decisions to benefit a community that had been adversely affected by a natural disaster. Inconsistencies may have arisen because of the need to fast track the rehabilitation process, such as decisions having to be made on land use in advance of planning provisions being in place. In general, if decisions are made outside the regulatory framework, they will be made by agreement and are likely to have financial consequences.

One issue arising with the use of the CDEM Act 2002 was that it was the only piece of legislation reviewed that requires specific identification of hazards. The CDEM Act takes a broad view of hazard identification and requires that both technological and natural hazards are identified. However, the scope of natural hazards identification is limited to those hazards already identified through the RMA (Resource Management Act) process. The Act does not provide mechanisms for Councils to take action to avoid damage caused by natural hazards other than general ‘readiness’ provisions.

Similar to the situation in the previous case study of the Manawatu floods’ reconstruction, Section 10 of the Resource Management Act (RMA), relating to existing land use rights, might also limit a District Councils’ ability to manage rebuilding in hazard areas. It is useful to have a nationally agreed guidance note prepared on the practical application of the RMA in the form of emergency provisions.

The methods in the District Plan for managing hazards are mainly regulatory. There is also a scope for other non-regulatory approaches. Through the District Plan, the Council’s ability to control rebuilding activities in areas such as Matata is limited. The Plan does identify some properties as being subject to natural hazard provisions of the plan. However, the extent of this zone does not appear to cover all the
areas affected by the 2005 flooding and debris flows. Until such time as the District Council can affect a plan change to extend the hazard area, the control of development is limited to District Plan performance standards.

**5.6.3 Cost, time, quality considerations**

**5.6.3.1 Funding and Cost**

*Government and District Council Funding*

Within guidelines set down in the National Civil Defence Plan, central government reimburses the local authority for a portion of some defined types of recovery costs. The remaining costs are met by the local authority, which must cover them out of its usual revenue, primarily from rates, or from insurance income.

After the 2004 Manawatu floods insurance companies paid up and the reconstruction work began before the central and local government agreed on the proportion of their contributions to the fund. However, in the Bay of Plenty (Matata) it happened the other way around. The Government would only release funding when the local authority takes a measure to reduce their future risk.

A brief timeline of the events within the funding process is as follows. On 18 May 2005, the disaster happened, causing landslips, leading to large debris flows and associated flooding. The Whakatane District Council began working with other agencies to develop a package to regenerate Matata. On 25 August 2005, three months after the disaster, the Whakatane District Council presented the Matata/Edgecumbe Recovery Action Plan to the Government. The Plan identified the Council’s preferred options for recovery and risk mitigation for Matata and sought a Government Contribution to the costs of implementing the plan. Three weeks later, on 14 September 2005, the then-Minister of Civil Defence, the Hon George Hawkins, delivered the Government’s response: The Government was prepared to look at special policy to support the regeneration of Matata. It was aware of the need for urgency and it needed further information to support the request, in particular, a formal business case.

The work began immediately in the Whakatane District Council (WDC) after receiving the Government’s response to prepare the business case. WDC commissioned a cost benefit analysis (CBA) from the New Zealand Institute of Economic Research (NZIER) to be included as part of the
business case. The final CBA report was completed in November 2005 and subsequently the business case was presented to the Government.

As a result (Whakatane District Council, 2005a), a total of $5,229,300 was proposed to be spent for the Matata regeneration package. Of this total, $1,333,100 was sought from Government through the business case prepared and $2,746,200 would be met by Whakatane District Council. The Matata Regeneration Package was funded by central Government (24%), Whakatane District Council (53%), and the rest (23%) was met by Government agencies such as ONTRACK and Transit NZ and other sources.

**Donations**

As mentioned previously in the overview section, a joint mayoral relief fund was set up after the disaster for the Whakatane, Tauranga and Western Bay of Plenty districts. Nationwide publicity was given to this joint mayoral fund to attract donations from around New Zealand. Any individual, homeowner or householder, farmer or grower, small businesses or non-profit organisation that suffered loss or incurred costs as a result of the May 2005 flooding event was eligible to apply. The joint mayoral relief fund received donations totalling of $635,000 after the Matata floods.

**Insurance**

There has been a lot of discussion about the insurance implications of whether the 18 May ‘Debris Flow’ was to be classified as a storm, a flood or a landslip. Claims received were separated into three areas:

1. damage to land
2. damage to housing (and outbuildings)
3. damage to personal belongings

Different to most of other countries around the world, New Zealand has its own special insurance provider for natural disaster, the Earthquake Commission (EQC). EQC was established by the Government in 1945 to provide earthquake and war damage cover for purchasers of fire insurance.
Later, cover for other natural disasters was included and, later still, cover for war damage dropped. The modern EQC is a Government-owned Crown Entity (EQC, 2009). Its natural disaster insurance policy, called “EQCover”, insures homes (including flats and holiday homes), personal belongings, and the land the homes are on. EQCover applies only to residential homes that are insured against fire. Anyone who buys an insurance policy for their home or personal belongings, his/her insurance company has to charge a disaster insurance premium, which it passes on to the Earthquake Commission and this provides the person with EQCover. It insures against earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami, a storm or flood (in the case of residential land), and fire caused by any of these.

EQC insures the home on a replacement value basis, but there are limits on the amount one can claim. The Earthquake Commission provided cover up to $112,500 for the dwelling and outbuildings and $22,500 for personal belongings in 2005 when the Matata floods occurred. It has been lowered since then, with current claim limits of $100,000 per dwelling and $20,000 for personal belongings (EQC, 2009). The Earthquake Commission Act 1993 requires claims to be lodged within three months of the damage occurring - EQC can only accept claims if made within 30 days of the damage occurring. This can be extended in some circumstances to 3 months. But EQC has no discretion to accept notification of a claim after 3 months from the damage occurring (EQC, 2005). During the recovery period of the 2005 Matata floods, the EQC liaised with all insurance providers and the Insurance Council of NZ to ensure that all the people insured would be reimbursed, either by EQC or their insurers. The Earthquake Commission was also visiting affected properties in Matata. They reported that 98 claims had been received with a total value of $1,770,496 (Whakatane District Council, 2005c).

*Costs of damaged properties*

Whakatane District Council Building Inspectors had checked a total of 124 properties in Matata and Awakaponga, and a further 11 in Edgecumbe and Otakiri. Of a total of 50 properties in Matata subject to the Flood Path Hazard, 36 were considered unsafe and 14 were in the Restricted Use category. A letter was hand-delivered to each property advising its current status. The Government valuation of those identified as unsafe was $8,363,000 and $2,467,000 for those subject to restricted use.
Costs of damaged roads

One of the most damaged roads during Matata Floods was Herepuru Road. The Council resolved to spend $1 million to restore the road’s northern access to State Highway 2. Herepuru Road is approximately 12 kilometres long and the 18 May event caused one massive under-slip and several smaller under-slips that closed the road for about 1 kilometre from where it joins State Highway 2 near Murphy’s Motor Camp. Herepuru Road serves some 36 properties with 22 houses, and joins Manawahe Road at its southern end. The first step was to repair the smaller slips at the bottom of the road (near State Highway 2) to give access to the massive under slip further up the road. Two teams were completing these repairs. The estimated cost of roading damage was $2.95 million (Whakatane District Council, 2005), but excluded any costs to the infrastructure within Matata.

Costs of Matata Regeneration Package (future mitigation)

<table>
<thead>
<tr>
<th></th>
<th>Costs (in NZD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Waitepuru Stream Management</td>
<td>850,000</td>
</tr>
<tr>
<td>2. Waitepuru Debris Management</td>
<td>2,799,300</td>
</tr>
<tr>
<td>3. Awatarariki Debris and Stream Management</td>
<td>n/a</td>
</tr>
<tr>
<td>4. Project Manager</td>
<td>200,000</td>
</tr>
<tr>
<td>5. Ohinekoao Stream Improvements</td>
<td>850,000 + 50,000/y</td>
</tr>
<tr>
<td>6. Central township</td>
<td>Nil</td>
</tr>
<tr>
<td>7. Waimea Stream Catchment Management</td>
<td>450,000</td>
</tr>
<tr>
<td>8. Waimea Debris Management</td>
<td>Nil</td>
</tr>
<tr>
<td>9. Awakaponga flooding and debris flows management</td>
<td>Not to proceed</td>
</tr>
<tr>
<td>10. Matata Wildlife Refuge</td>
<td>n/a</td>
</tr>
<tr>
<td>11. Regulatory Measures</td>
<td>80,000</td>
</tr>
<tr>
<td>12. Early Warning Systems</td>
<td>n/a</td>
</tr>
<tr>
<td>Total</td>
<td>5,229,300+ n/a items</td>
</tr>
</tbody>
</table>

Table 34: Costs of items in the Matata Regeneration Plan for future hazards mitigation (figures obtained from the CBA analysis commissioned by WDC in Nov 2005)

Decisions must be made on reducing risk to the community to an acceptable level and selecting solutions that are cost-effective and sustainable in the present and in the future. The present value of the total cost of the preferred options chosen by the Whakatane District Council was more than $5 million. This excluded the costs of those items that had not yet been estimated (such as the Matata Wildlife Refuge, Early Warning Systems, in the above table). The actual present value of the total cost may exceed $15 million, including all capital costs and operating costs over a 50-year period. For example, one decision made to reduce the risk for the Matata community was the building of a debris
dam. The Whakatane District Council approved the funding of this dam to protect Matata from further debris flows and debris floods from the Awatarariki Stream. This option came at a considerable cost estimated at $2.3 million.

5.6.3.2 Quality and Time

As previously discussed, the speed of the reconstruction process is usually dependent on the speed of the funding approvals. In the “Government and District Council Funding” section, a brief timeline of the major events in the funding process has been reviewed. It took Whakatane District Council almost three months after the disaster (18 May to 25 August 2005) to come up with the Action Plan for regeneration of the affected area in Matata and requested for funding from the Government. After almost another month of consideration, the Government then gave the response that “it was aware of the need for urgency” but it needed future information to support the request and asked the Whakatane District Council to prepare a business case for it. After nearly another 2 months of preparation, the funding for the reconstruction projects detailed in the Regeneration Package had been allocated and the work formally started. Altogether, it took almost 7 months after the disaster for WDC and Government to formulate and agree on the solution and to allocate funding for it. The frustration from the affected community was understandable, given that the country was donating money and goods to the US in the aftermath of Hurricane Katrina, all while the region was waiting for the funding approval for Matata recovery.

Compared to the somewhat slow reconstruction process, the initial response phase was carried out effectively and efficiently. The quality of the reconstruction works were also completed to a high standard. It was found that it was not necessary to waive statutory procedures to accelerate the process as the decisions about the reconstruction were consistent with existing policies. Inconsistencies may have arisen during decisions on land use, in advance of planning provisions being in place, but these were not significant.

There were several reasons for the delay during the reconstruction process. The scale of the event was unprecedented to the area and out of the control capability of Whakatane District Council. It took some time before the recovery plan could be finalised due to the time needed for community participation and consultation for the proposed plan to ensure a community-driven recovery process. A long-term
mitigation plan needed to be considered to guard the affected community from future similar disasters. Uncertainty of the funding sources (i.e. WDC, Central Government, Insurance, and other Government Agencies) and their distributions for recovery also caused the delay of the programme. Once the funding was in place, the recovery projects could be commenced immediately as the supply chain was intact and the existing trust-based procurement and contractual relationships were unchanged.

5.7 Conclusions - Matata

The procurement and contractual systems used during the reconstruction process after the Matata flooding was quite similar to a normal construction process. Work was tendered where needed. There may have been some expediency and short cutting, but in general terms all work was finished within the existing contractual framework. The small differences between the normal building process and the reconstruction process were due to the fact that the investigated disaster was of a small scale. The parties that were normally involved during the construction projects were also involved during the reconstruction process. This had the advantage of industry familiarity and thus ensured the smooth delivery of the project under a post-disaster situation.

The significant regulatory issues that resulted from this disaster were future land use planning, and in particular where sub-division and housing could be located in the town of Matata. These should be determined by the District Council according to relevant regulations and legislation. No decisions have been made by the Whakatane District Council that are inconsistent with current policies, and any inconsistency would be a result of the Council’s need to make decisions to benefit a community that has been adversely affected by a natural disaster. Inconsistencies may arise because of the need to fast track the rehabilitation process. Both the District Council and Regional Council will need to review policies in respect to regulatory and non-regulatory matters, in terms of identifying the cause of the disaster, and mitigation of it along with future management processes. However, generally speaking, during the overall Matata recovery process, the existing legal and contractual framework was operating effectively, and diverging from normal regulations and legislation was not necessary during the recovery.

The financing of a normal building process differs from a post-disaster reconstruction situation because considerable time is needed to react and develop solutions to the disaster, not only for
rebuilding but also to use the opportunity to mitigate future hazards and build back better. The time required for post-disaster reconstruction is usually highly dependent on the relevant funding approval process. While the responses process of the Matata Floods was accepted as effective and efficient, the following recovery process could have been quickened. The quality of the reconstruction works in the Matata Regeneration Package was guaranteed by the relevant building regulations and code compliance and would not be regarded as a problem. Even better results could have been expected in post-disaster reconstruction due to the closer collaboration of leading companies in the market that do not usually work together and the support to the reconstruction projects from the District Council, central Government, affected community and general public.

5.8 New Zealand Case Studies Discussion and Conclusions

In the Manawatu floods and the Matata floods the use of established relationships was evidenced when procuring reconstruction work. This has the advantage of the parties knowing each other and having familiarity with the contract types. However, disaster reconstruction requires the management of other external relationships, especially those with the councils and governments. General legislation which applied during the recovery of the disasters was the Civil Defence and Emergency Management Act 2002, the Civil Defence Act 1983, the Land Transport Management Act 2003, and the Resource Management Act (RMA) 1991. For the local authorities of the Manawatu and Matata regions the events involved arrangements under the provisions of the Civil Defence and Emergency Management Act (CDEM Act) 2002. According to the review team report for the Manawatu flood (Reid et al., 2004a), the Civil Defence and Emergency Management Act 2002 provided a structure appropriate for dealing with events like this.

There was little difference between contractual arrangements of post-disaster reconstruction and normal time construction. Packages of works were tendered where needed. There was a focus on expediency but, with the existing strong relationships, much of the work could be done within the existing contractual frameworks. The parties normally involved during the construction projects in the areas were also involved during the reconstruction process, and this was certainly an advantage due to the industry familiarity and enhanced level of trust-based collaboration of existing relationships. Encouraging this form of relationship-based contracting within the industry generally would improve the ability of New Zealand construction industry to respond post-disaster. This requires collaboration
among involved parties and a higher level of industry familiarity and trust between the parties. As discussed previously, selecting the appropriate procurement systems, such as the integrated or management-orientated procurement system would strengthen and make full use of the existing relationship between contracting parties.

The key lesson from the reconstruction efforts in the Manawatu and Matata floods was that the use of informal relationship-based contracting facilities quickened post-disaster reconstruction. The growing interest in, and use of, these types of contracting procurement strategies will improve the ability to respond to rapid reconstruction needs following a disaster. The case studies show that, due to existing contractual and trusting relationships, collaboration between the parties was quickly established and contracts let. In the case of both floods, relationship-focussed contracting played a key part in the recovery and reconstruction.

As for the cost, quality and time tradeoffs post-disaster, the time required for the response and reconstruction is of ultimate importance to the affected community and the success of the overall recovery programme. It is usually dependent on the associated funding process. It is recommended that a swift decision on funding sources, composition and consequent approvals should be made to accelerate the reconstruction process and this arrangement could be formalized through MCDEM regulations and be fully understood by the recovery agencies pre-event. The source of the funding for public facilities should be determined before any of the disasters. It is preferred that a single authority would take the whole responsibility in funding or collecting and managing the funding of the reconstruction to avoid unnecessary confusion in an emergency response situation (i.e. avoid the central government versus regional council scenario). Central government should also take a more proactive role and cooperate more closely and quickly with the District Council’s initiatives in this regard. The early involvement of the reconstruction agencies, including their design and planning teams, into the initial response phase is also necessary, not only to speed up the reconstruction phase later but also to ensure a high-quality and sustainable recovery output in the long term.
CHAPTER 6: INDONESIAN BANDA ACEH TSUNAMI RECONSTRUCTION CASE STUDY

6.1 Case Study objectives and Approach

The major focus of this case study relates to the overall research objective two and three, “to examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstruction; and to examine international experience of disaster reconstruction with a focus on the procurement and contractual systems used”. This chapter answers the relevance and applicability question on the procurement systems, contractual models, and procurement regulations to the disaster reconstruction setting. It also aims to answer the principal research question under the objective 3 on international experience: “what are the procurement systems that have been used in reconstruction in other vulnerable zones in the world?”

The basic premise underpinning the case study was to determine the applicability of procurement philosophies and contractual arrangements to facilitate the reconstruction procurement process in Banda Aceh after the Tsunami. During the fieldtrip, the problems associated with the timber procurement in Banda Aceh stood out as the major obstacle in the overall recovery process. Therefore, management concepts in the construction supply chain management, such as communication needs, supplier base reduction, supplier and logistics integration, long-term relationship management and sustainable practices were also explored as possible solutions to the timber procurement problems.

The author and one of his supervisors spent a one-month fieldtrip in Banda Aceh, two years after the Tsunami, from 4th July to 31st July 2006. They then followed this up one year later with another two-month fieldtrip from 16th March to 16th May 2008. The study involved working with the Indonesian branch of an international humanitarian aid organisation (hereafter referred to as “NGO C”) involved in the house reconstruction project for local refugees. During these trips, 12 formally-structured interviews and 21 official meetings were carried out and attended by the author with construction and procurement managers of different NGO’s, United Nation agencies and their local staff, representatives of local authorities overseeing the reconstruction process and members of the Village Development Committee (VDC) and affected communities in Aceh. These were also accompanied with documentation and archival records review, participant observations and direct observations,
which developed converging lines of inquiry using multiple sources of evidence. Research diaries were kept for both fieldtrips and separate databases were established for both cases. A chain of evidence was maintained.

Major obstacles associated with construction materials procurement were identified during the interviews. Two procurement methods representing local and international supply chains for timber were selected out for detailed analysis. Data collected and ideas generated from this series of interviews and case studies were incorporated and expressed in the discussions within the following sections. Several recommendations are made in the conclusion to tackle the problems encountered as a way of streamlining the timber supply chain and the overall reconstruction procurement programme.

6.2 Overview of 2004 Tsunami impact on Indonesian Banda Aceh Province

Banda Aceh in Indonesia was one of the worst hit areas during the Boxing Day Tsunami in 2004. About 130,000 lives were lost and a further 37,000 unaccounted for. 3 months later, in March 2005, another 1,300 was added to the death toll in Nias, Simeulue and the Southern Coastline of Aceh as the result of 2005 Sumatra Earthquake. This cycle of natural disasters have left families homeless and caused untold hardship across the region. It is estimated officially (Badan Rehabilitasi dan Rekonstruksi - BRR, 2006a) that about 123,000 new houses were required to re-establish, relocate and resettle victims of the Tsunami together with the need to provide supportive social and infrastructural facilities.

According to the official figures (BRR, 2006a, BRR, 2005), there were approximately 290 NGOs and donor organizations operating in Aceh and Nias in 2006 managing as many as 828 projects. In order to generally coordinate and manage the reconstruction effort in an overall prospective, the Agency of the Rehabilitation and Reconstruction for Aceh and Nias (BRR) was established by Indonesian Government Regulation No. 2/2005 on 28 April 2005, 4 months after the Tsunami. It is estimated that at least US$5.8 billion will be needed in the recovery phase for Aceh and Nias. The situation when the

14 3Rs: Re-establishment – housing on the original site; Relocation – housing not on the original site but close by and certainly in the same neighborhood; Resettlement – housing distant and certainly outside the original village.
15 BRR: Aceh and Nias Rehabilitation and Reconstruction Agency, representative and coordinating body of Government of Indonesia in tsunami reconstruction process.
first fieldtrip was conducted in 2006 was that US$4.4 billion had already been allocated to different projects, and the people of Aceh and Nias may had a chance to better build back their livelihood with total pledges of US$9 billion (3 billion more than least budget required). The major issue was becoming how to spend this money wisely and in the most needed areas.

Many non-governmental organisations (NGOs) were involved in reconstruction projects around Aceh. These projects were scattered across the breadth of the disaster affected area with the consequence of a spike in construction materials requirement. A major problem faced by almost every organization involved in the Aceh reconstruction was the supply and procurement of legal and sustainable construction materials, especially the massive needs of timber. Timber procurement was a source of frustration. The supply of timber was fraught with delivery delays and quality issues. There were other logistical and legitimate issues that had to be addressed, which in turn influenced the decision making on the selection of alternative procurement sources and procurement processes. These complexities of issues are common to post-disaster reconstruction which is characterised by chaos and often reconstruction objectives and priorities remain unmet.

Aiming at reviewing the procurement and contractual arrangements that has been set up post-disaster in Banda Aceh for reconstruction, this chapter first introduces different stakeholders that have been involved in the overall disaster recovery in Banda Aceh, their roles and contractual relationships with each other, then the problems experienced in the overall procurement context, especially the timber supply chain problem. In the next section, it analyses the causes of the procurement problems and explores remedies. It further presents the findings and result obtained through the investigative study of two alternative process models for timber procurement. At the end of this chapter, it concludes with the discussions and subsequent recommendations and suggestions on the overall procurement and contractual arrangements and how basic Supply Chain Management philosophies of ensuring stakeholder integration and collaboration could reduce the problems in the post-disaster procurement in Banda Aceh.

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16 US$4.4 billion: The Government of Indonesia has allocated 1.1, NGOs 1.5 and official donors 1.8 billion in US dollars.
6.3 Reconstruction Procurement Structure and Contractual arrangements

In order to have a clear picture of the overall reconstruction process, 4 major groups of parties were identified: **The Client**: i.e. beneficiaries, this group was represented by the Village Development Committee (VDC) in the contractual relationship; **The Engineer**: this role was usually filled by a NGO or other reconstruction agencies. It provided the design and managed reconstruction projects and it liaised with The Client, The Contractor and other parties for the coordination and management of the overall project; **The Authority**: in Banda Aceh case, it was represented by the BRR, the specially formed Government Department overseeing the Tsunami Recovery in Indonesia; and **The Contractor**, its role either was performed by a capable NGO through forming its own project management team and procuring with various material suppliers, or in a design & build contract, a construction company as in the normal situation.

Although they were grouped using the names as the client, contractor, engineer, etc. as in the normal construction contracts, the relationship between them was actually more complicated in a post-disaster situation. For example, the engineer is typically hired by the client and is responsible to the client’s needs. However, in a post-disaster reconstruction situation, the engineer, if it was in a NGO, was usually financially supported by and responsible for its donors, typically from overseas. The Contractor was not usually a construction company, but instead, a newly-formed local branch of an international NGO. It did not necessarily had the expertise and skill in construction and sometime it could be easily caught up in the conflicting interests from its headquarter managing authority and local authority. Sometimes, even the design code, from which their reconstruction work was based on, was different to what was required in the local reality.

In the rest of this section, the role of The Authority, BRR, will firstly be reviewed. Then its contractual relationships with other parties involved will be analysed. A typical reconstruction scenario will be considered as a NGO branch acting as both the engineer and the contractor, realizing its material supply through local and international suppliers and sub-contractors. Different functional departments and their relationships within the reconstruction agency organisation will be analysed in details. Conclusions will be made in relating to this section at the end of the chapter.
6.3.1 Recovery Authority, BRR

The fieldtrips were sponsored by an international NGO (NGO C) worked in Banda Aceh for Tsunami reconstruction. According to the progress report (14 July – 21 July 2006) the author obtained in his first fieldtrip in Banda Aceh, 71.5% of total 1763 NGO C’s housing targets on mainland (excluding future NGO C-BRR targets) were then still under construction. The reconstruction work on 18.2% (320) of those mainland targets had not started yet. The situation on Simeulue Island was even worse given the remoteness thus increased difficulties in material procurement and comparatively limited attention from BRR and the central government. As the reconstruction/recovery phase officially ends by the end of the year 2009 as the target set out by the Indonesian Government, all the unfinished reconstruction projects need to be transferred from international NGOs to the local reconstruction authority BRR by late 2008. The NGO C where the author worked for was also among them. The emphasis of this section will be focusing on the opportunities and challenges NGO C was then facing and contractual relationship of the new partnership with BRR and other stakeholders in the reconstruction process.

6.3.1.1 BRR: who, when and how

Since its establishment under the Indonesia Government Regulation No. 2/2005 on 28 April 2005, the Agency of the Rehabilitation and Reconstruction for Aceh and Nias (BRR) soon took over the leadership in reconstruction effort within the broad Aceh and Nias territory. Although been consequently denied in many occasions, BRR was actually changing from its initial setting as a coordinating body into an official implementing authority after the first two years, especially when given the power to contract directly. In order to have a better understanding of BRR and its role in this complicated reconstruction market, a series of important events in relation with BRR will be reviewed and the major policies and guidelines generated along those events will be analyzed in a sequent timeline.

Right after the emergency response phase following the Tsunami finished in 2005, the Government of Indonesia assigned the National Development Planning Agency (BAPPENAS) to coordinate the establishment of the rehabilitation and reconstruction plan for Aceh and Nias, which later became the well-known “Master Plan” (Rencana Induk) for Aceh recovery. Apart from reviewing the needs for the
redevelopment of the areas affected by the disaster, the Master Plan also outlined the need to establish an agency responsible for the coordination and implementation of the rehabilitation and reconstruction plan for Aceh and Nias. One day after the Master Plan was set in law on April 15, 2005, the Indonesian President Susilo Bambang Yudhoyono declared the establishment of BRR in Government regulation in Lieu of Law No. 2/2005. Two weeks later, three administrative bodies were established in order to govern and provide guidance to the agency, namely, an Executing Agency, an Advisory Board, and a Supervisory Board.

The responsibility of the agency to redevelop Aceh and Nias, as emphasized in the Law No. 2/2005, was embodied in its principle assignments being to manage projects funded by the Indonesian Government’s National Annual Budget (APBN) and to coordinate projects funded by donors and foreign NGOs. This dual role requires capacity in terms of human resources, organizational structure, decision-making procedures as well as the ability to supervise coordination on the ground. In the beginning phase of the assignment, a series of implementation policies, an organizational structure and various standard operating procedures were developed by BRR to enable coordination, leadership and quality control of the numerous activities being implemented by government agencies, donors and NGOs. Some representatives of its policies and guidelines are: “BRR Policy Guidelines for the Provision of Resettlement Assistance to Victims of the NAD/Nias Tsunami and Earthquakes” regarding the right of return and housing based on Master Plan and earlier BRR Guidelines on land mapping, village planning, and house rebuilding; “BRR Guidelines for Infrastructure Redevelopment in Tsunami Affected Areas” together with “BRR Infrastructure Implementation Plan” defined the basic rules for village reconstruction and dimensions and price limits for construction of the main house and repairs, set up practical scenarios for the implementation of infrastructure with different involvement levels from various agencies; the final English version of “Village Planning Guidelines” provided a detailed elaboration on a series of separated guidelines issued by BRR in June 2005 known as the “BRR General Guidelines for Planning and Construction of Villages”.

With respect to its implementation strategy, BRR identified a sequence of priorities for the redevelopment of Aceh and Nias which spanned its four-year mandate from 2005 to 2009. The energy was divided and devoted into 6 major aspects: the first and foremost one was the need of housing. Besides this, the other five areas were the recovery in Land; Infrastructure; Education and Health; Social Institution and Human Resource; and Business and Economy. Among those, Housing, Land, Education and Health Infrastructure were aiming at finish before the end of 2007. The associated
infrastructure construction would be finished in 2008. At the same time, local government capacity building would consistently be developed and intensified in the last two years of BRR’s mandate until 2009 when the handover of power and responsibility to local government took place. A blueprint of steps of key areas development from BRR’s one year report (BRR, 2006a) is shown in Figure 25.

Figure 25: Steps of key areas development of post-Tsunami recovery set out by BRR (BRR, 2006a)

As illustrated, the housing construction plan which was an immediate priority reached its peak in 2006 and would be completed first set out by mid-2007, later extended to the end of the year. The year of 2005 was mainly focused on the initial response and rescue, the main task was to provide infrastructure support for supply access, clean water and availability of sanitation facilities, tents, temporary shelters etc. After BRR was established during this stage, a program aiming at providing job opportunities to tsunami victims was conducted in Aceh based on a cash-for-work initiative. 2006 was a critical transformation stage from initial response to long term recovery, a temporary shortfall of energy in direct construction to infrastructure and support logistics development was experienced in Aceh and caused some frustration among the communities and various agencies involved in reconstruction. However, without a doubt, construction of housing was certainly on the first place of BRR’s priority list, especially as the agent itself has been given the power to contract directly for the reconstruction. All the housing units were targeted to be completed in 2007/8, as well as the reconstruction of associated physical infrastructures. BRR was expecting to finish all the matters related to the reintegration of refugees at the end of 2007 thus a stronger sense of integration between on-the-ground activities and the implementation planning (BRR, 2006a) could be obtained for future
recovery works.

6.3.2 Contractual relationship

By transferring its unfinished housing projects to BRR, NGO C was expected to draw back from various troubles ranging from on-site construction problems to materials procurement associated with implementing its house models on both mainland and Simeulue. NGO C would only need to provide professional advices on management and supervision of contractors/ construction groups to the future NGO C-BRR targets while BRR would take over the responsibility of identification, assessment and payment of material suppliers and contractors using its own budget. Without a doubt, it was a good chance for NGO C, BRR and involved communities, NGO C could devote more to its other important missions within the region such as livelihood, health systems and communities rebuilding. BRR could further establish its leadership and gather more experiences in reconstruction practice at more targeted areas to better serve its country. The involved communities could receive their promised newly-planned infrastructure and reconstructed houses to settle down.
In a presentation given by NGO C during the first fieldtrip, a series of flowcharts were demonstrated to introduce the future construction process according to BRR’s housing and human settlement policy. This decree clearly defined the criteria of beneficiary selection according to different conditions\textsuperscript{17}. A list of eligible beneficiaries would be decided by involved community and village development committee (VDC) before the pre-construction process could start. In the following stage (Figure 26), NGO will work closely with involved community, VDC and other consultants through a series of “on-site socializations” (or “community participations”) to develop an appropriate village site plan and individual house and infrastructure designs for the examination and endorsement of BRR in order to have the building permit approved.

When all the above processes were successfully accomplished, formal construction could start. As can be seen from Figure 26, the principal/ the client in this construction process is the Village Development Committee who obtains its granted budget from BRR through BRI\textsuperscript{18} or other commercial banks designated for this purpose. Unlike the previous NGO C house targets, the construction budget of future BRR-NGO C targets would come solely through this mechanism from BRR. The responsibility and energy of NGO C will then draw back from its previous role as both the

\textsuperscript{17} Rehabilitation, reconstruction and resettlement of House Owners and Renters/ Squatters (Policy No. 18, 19 /PER/BP-BRR/III/2006 and No. 20, 21 /PER/BP-BRR/V/2006)

\textsuperscript{18} Bank Rakyat Indonesia (BRI), a government commercial bank that began as an agricultural development bank and now as the major bank designated for BRR budget
principal and the contractor and concentrate to the right polygon in the flowchart as to provide suggestions and assistances to VDC on management and supervision of contractors.

Compared to the triangle relationship\footnote{The Principal, the Contractor and the Engineer} in a typical construction contract, the role of The Principal would be taken by BRR and VDC, where the latter could be regarded as the executive principal or the on-site representative of the funding principal BRR. The Contractor would be the construction companies contracted directly by BRR in Aceh, or more likely from outside provinces. The only place left for NGO C would be the role of the Engineer. As defined in various standards, the Engineer has a dual role as an expert adviser and representative of the Principal on the field, giving directions to the Contractor on behalf of the Principal, at the same time, independent of either contracting party, fairly and impartially make the decisions under the contract documents, value the work and issue certificates (if any) at due times. The responsibility of the NGO involvement in this circumstance should be clearly defined not only in the contract with BRR but also in the contract between BRR and its future contractors. Generally categorized, the contractual relationship could be seen as a typical management-orientated procurement system. As discussed previously in the literature review, it is illustrated in the following diagram (Figure 27):

\begin{figure}[h]
  \centering
  \includegraphics[width=\textwidth]{management_orientated_procedure.pdf}
  \caption{Management-orientated procurement system as in Banda Aceh reconstruction}
\end{figure}

\footnotetext{The Principal, the Contractor and the Engineer}
Here in the Banda Aceh post-Tsunami reconstruction, the client in Figure 27 was represented by VDC (beneficiary) and BRR (authority) and the role of the management contractor was filled by the NGO involved in the reconstruction. The NGO then hired its own in-house design team and project management team, and contracts the local physical work contractors and material suppliers to accomplish the job.

As discussed previously in the literature review part, Management-orientated procurement systems are generally more suitable for 1) complex projects involving numerous different specialist subcontractors; 2) client does not have sufficient resources to manage the project itself; and 3) the project is on a tight schedule and the clear functional or performance requirements are not easily available to the client at project commencement. It suits the post-disaster reconstruction conditions. Some major advantages when using this type of procurement and contractual arrangement are: more control towards the project cost and higher standards of quality required by the client, together with the demand of earlier commencement and completion times. These are also desirable features in a disaster recovery situation.

6.3.3 Organizational structure/ matrix of NGO C

The general contractual arrangement could be regarded as a management-orientated procurement system. It is also helpful to examine the inner structure of the recovery agency itself in order to have an overall understanding of the reconstruction procurement process. In this section, the organizational structure of the NGO C will be analyzed and discussed as it represents the typical structure of a reconstruction agency, which, together with hundreds of other similar organizations, formed the major driving force that took initiative and led the recovery process in Banda Aceh.

In order to have a better understanding of the procurement process, an overall organigram was identified during a series of interviews within different sections of NGO C. Although it is far-fetched and unrealistic to categorize the overall structure into a certain kind of existing model, a projectized pattern within NGO C could still be recognized. As many other projectized organizations, NGO C was then suffering from several inherent setbacks of this model, such as duplication of efforts on similar projects; lack of horizontal communications within different functional divisions (e.g. procurement to technical team, financial department to project team, etc.); inconsistency in the ways in which policies and procedures are carried out in different project groups; growing sense of “we-they” divisiveness;
stockpiling equipment and technical assistance to ensure future availability within the team; and
uncertainty about what will happen when the project is completed. Some of those were easily
visualized, some were not while remained as a potential threat to the ongoing projects. However,
advantages were also observed with this kind of projectized organizations: higher level of staff
commitment, swift decision making, centralized authority, shortened vertical communication lines, etc.
How to make full use of the favoured features of the projectized organisational structure should be
considered alongside of reconstruction mission. An analysis of NGO C’s organisational structure was
carried out using different matrix models to identify the information flows and operating pattern
between different sections of NGO C and relationship of this pattern to the overall procurement
process.
Figure 28: Organisational structure of NGO C

The above organisational structure is based on sketches from several interviews during the first fieldtrip. As mentioned before, a projectized pattern could be recognized as the coordination lines (usually the same as information flows) of the project are vertical between various project managers and their own staffs. The opposite model of this would be a functional organisation where the project coordination line is horizontal between different functional managers. The projectized form is preferred when the organisation engages in a large number of similar projects, which was the case of...
the housing program carried out in Banda Aceh.

In a typical process of material procurement (see Figure 28), firstly, the requirement is estimated and reported to on-site construction supervisors. A detailed quantity list is then prepared and submitted with standard documents to the project manager. She/he then reviewed and approved it, submitted to program manager for approval. The list is subsequently submitted to Beudoh program coordinator. After his checking, finally it would be forwarded to Tsunami Program Director at top for approval. The approved requirement list would then be sent down through PSU (program support unit) to the procurement manager to prepare a detailed procurement plan accordingly. If in a large volume, consequent tenders and negotiation with potential vendors are necessary. Financial department is then involved for funding code designation for final funding approval. If all the above steps were successfully accomplished, materials finally get purchased and delivered either directly to the construction site or to the warehouse.

During the interviews, it was found that duplication of orders was common given there were more than 3 reconstruction projects going on simultaneously. This was a small example of lack of horizontal communication. This specific problem could be easily solved by PMs simply checking the warehouse stock before placing a new order. But similar problems may arise between other critical horizontal links if this communication is not facilitated by the structure. Other complaints were heard about cooperation between project teams and other departments. Someone in the project office complained he had to shuttle several times a day on his motorbike to get approvals or just submit required documents to financial department located in main office, sometimes due to the errors in figures or false formats been used, his whole day would be spent on the road. One single financial staff in the project office would have saved the whole trouble.

When the project requires the integration of inputs from several functional departments, such as financial, procurement, etc. and does not require all the technical specialists to work on a full-time basis, then the matrix form is the only satisfactory solution. Put into the organisational structure of NGO C, a matrix form is a more balanced structure with emphasis on horizontal coordination line where the vertical project system still remains the first priority. Take the structure under PM level in Figure 28 for example, a matrix form will require 3 APMs in livelihood from different projects coordinated by a livelihood manager (could be one of them) and sometimes even work together for one project apart from their own to cater for the need of whole program.
6.4 Timber Procurement Issues

As mentioned previously, during the case study in Banda Aceh, it is found out and agreed by all the reconstruction agencies that has been interviewed that one of the major obstacles faced during the procurement process is the lack of sustainable timber supply. In the following section, the timber procurement problems associated with Banda Aceh reconstruction will be reviewed and two alternative procurement routes will be introduced.

6.4.1 The timber procurement problem in Banda Aceh

Although coastal areas were seriously damaged during the 2004 Tsunami, 70 percent of mainland Aceh is still covered by natural tropical forests (BRR, 2006a) - the best remaining tropical forests in Indonesia and rich in biodiversity. One can see the beautiful green land under the plane when flying over the Sumatra Island. It is the natural gift inherited by generations of Indonesian people but now is forced “open for exploitation” (Indonesia-Relief News, 2005, Sep 16). In spite of a moratorium on logging in Aceh, implemented pre-Tsunami, extensive illegal logging was then taking place in Aceh forests. This was usually referred in relation to a so-called “Timber Mafia” situation: a term used to describe a consortium of government officials, army, police, businessmen, etc. who allegedly conspire together to gain large profits from the illegal logging of the forest estate. Problems in getting a legal and sustainable timber supply for reconstruction were a frustrating experience for almost every reconstruction agency for a considerably long time.

The Government of Aceh (represented by BRR regarding reconstruction) reviewed its timber policy in light of the tsunami and the need for timber for recovery. The acting governor was in favour of a “Green Aceh,” with no logging and supported World Wildlife Fund and other conservation NGOs’ programmes promoting the use of imported timber from sustainably managed forests for reconstruction. These were also supported by the Ministry of the Environment in Indonesia. On the other hand, the Government of Aceh realized the tremendous need for legal timber supply within the area. At the end of 2005, Indonesian Ministry of Forestry decided to restore forest concession (HPH) to 11 companies in Aceh to enable them to supply timber needed for the Aceh reconstruction and agreed to increase timber quota for Aceh to 400,000 m³ for 2006. This decision had to be made since timber suppliers from other provinces, such as Riau and Kalimantan, were reluctant to cater for the
needs in Aceh due to a high cost of transportation and the complicated process of applying for legal documents to facilitate transportation.

It is estimated in a survey conducted by BRR and The World Bank (BRR, 2006c) that the bribes and illegal payments that truck drivers pay on the Banda Aceh – Medan road with corrupt police, military, state officials, and preman (criminal) groups at various security posts and weigh stations were Rp. 340,000 on average (approximate US$36 according to the 2006 exchange rate, single trip in either direction). This not only constituted an additional cost for timber transportation but also had negative influences to potential timber dealers from outside provinces. However, the number of illegal payments experienced a significant decline with the pull-out of troops and police from the Aceh Province mandated by the Helsinki Peace Agreement\(^{20}\).

There were other specific problems in timber procurement in Aceh, such as the legitimacy of importing timber and associated timber treatment methods. It was partially due to confused and sometimes conflicting information from different government sources, which could only be explained as internal uncertainty and inconsistency with Indonesian timber policies or failure in execution of established standard regulations. A list of 25 local timber supplier companies approved by BRR was given to representatives from various NGO’s during a BRR’s timber policy meeting in July 2006, which, several days later was reduced to a list of five and handed out to local project managers during another local staff meeting. These were only recommended as reliable and not guaranteed as legal. The responsibility of ensuring the legality of procurement with those companies remains on NGOs’ shoulders. It was almost impossible for any organisation to take on such a big risk (even one piece of illegal timber would result in the whole package being confiscated) and continued to operate.

6.4.2 Feasible timber procurement procedures

In spite of these difficulties, timber for Aceh reconstruction was still procured legally and sustainably, or at least non-illegally and non-unsustainably, from some sources to some organisations. All of them

\(^{20}\) Peace settlement – Helsinki Memorandum of Understanding (MoU), signed in August 15, 2005 in Finland. At the heart of the agreement was acceptance by the Free Aceh Movement (GAM), of expanded autonomy for Aceh within Indonesia. For its part, the Government of Indonesia (GoI) made concessions on matters including the formation of local political parties and security arrangements in Aceh. It marked the official ending of a nearly 30-year civil war.
can be categorized either as locally supplied or internationally imported/donated. The procedure followed in each will be introduced and generally reviewed.

### 6.4.2.1 International timber procurement

A sequential steps of international timber procurement procedure has been identified by the author as shown in Table 35, based on an introductory paper of suggested purchase flow prepared by Douglass (2006) from British Red Cross.

![Table 35: International Timber Procurement Procedure for Aceh Reconstruction](image)

Imported timber from New Zealand or Canada using the above procedures has usually been treated as a Hazard Class H3.1 standard for an above ground application. The specific treatment method is Light Organic Solvent Preservative (LOSP) rather than Chromium-Copper-Boron and Chromium-Copper-
Fluorine (CCB/CCF)\textsuperscript{21} used in Indonesia. The prices ranged from US$420 to 590/m\textsuperscript{3} cartage, insurance and freight at Medan depending on required grade, treatment and processing options, while local timber prices were usually within US$350-550/m\textsuperscript{3} from legal sources. Although the price of imported timber is understandably higher than the local supplies, there are several advantages of importing timber for the Aceh reconstruction.

The first advantage is the longer and guaranteed durability, protection from weather changes and protection from insects and fungi attack under Indonesian conditions. It has an internationally recognized guarantee of sustainable management and production of timber as well as with other internationally recognized third party certification and audit of treatment standards, certificate of origin and chain of custody. Another advantage is the large amount available (30,000-40,000m\textsuperscript{3}/month if long-term orders are placed) while uncommitted local supply is limited to approximate 1/10 of that from international sources. The supply chain is simplified and complicated, often confused, process of applying SKSHH\textsuperscript{22} and other legal documents from the Government of Aceh could be avoided. Most importantly, for every log sourced internationally for use in Aceh, one tree from local tropical forests could been saved.

However, some disadvantages are obvious and make this option less attractive when decisions are made at an individual organisational level. Besides, the higher prices, the longer delivery schedules (at least 4-6 weeks, but generally believed as ten weeks) often excludes it as an option. The required amount of timber is limited at each time of procurement, thus, the large availability of international sources is no longer an advantage. This is partially due to the lack of overall SCM and communications between procurement and project teams. A large order of timber could be streamlined and procured at a lower price, rather than subdivided into small packages with only several hundred cubic meters each and procured once in a while, however this creates a longer and complicated timeline. Storage of a large amount of international timber is another problem because of the associated demurrage charges that are extremely expensive if the shipment has to be left at the port. Timber is a natural product that must be kept dry and out of direct sunshine if possible. Thus,

\textsuperscript{21} CCB/CCF are water-borne preservatives in which the arsenic has been replaced by Boron or Fluorine. These salts show less intense fixation and are less effective than Chromium-Copper-Arsenate (CCA). The retention required is 5-12 kg/m\textsuperscript{3} for CCA, compared to 5-15 kg/m\textsuperscript{3} for CCB/CCF.

\textsuperscript{22} Surat Keterangan Sahnya Hasil Hutan (SKSHH) – Legal Forest Product Transportation Permit - a legal document for cross-provinces timber transportation in Indonesia, only valid per truck per travel.
warehousing facilities are essential in the logistics of transporting timber from port to construction site while, local timber could be delivered to the site at vendor’s expenses as required each time. The uncertainty of legitimacies within the Indonesian context related to imported timber together with issues related to donation and standard treatments required, further contribute to the unpopularity of international timber procurement in Aceh.

6.4.2.2 Local timber procurement

Similarly, in order to understand the local timber procurement procedure, a flowchart developed and handed out as a suggested guideline by BRR is shown in the following figure. Although aiming at providing recommendations for timber transportation, this flowchart could also be used as a guideline for local timber procurement and associated logistics. There are some terms used only in Indonesian timber industry that are worth explaining. The big circle in the flowchart represents Timber Helpdesk and Tim Terpadu (Forestry Department) at BRR headquarter: the most important interface to users, suppliers, shipping agencies and other departments in Government of Aceh. Timber Helpdesk was designed by BRR in order to address timber issues for reconstruction and rehabilitation in Aceh and Nias. It has a dual role to facilitate the demand and supply of timber and to monitor the timber used for reconstruction within this region. SKSHH appears many times within the flowchart, as explained in footnotes before, it is a set of documents used to define the legality of timber and it is required when the log is transported from the concession companies to the industry or when semi-wood products are ready to be marketed and transported to their final destination. It is worth noting that SKSHH is not required for imported and donated timber.
A typical procedure for local timber procurement could be categorized in three steps, with different contractual relationships between timber user/purchaser and other involved parties, shown in the Figure 30.

As can be seen from above table, in order to procure local timber, the user has to contact a potential supplier based on the names registered with BRR in Step 1. Then the classic tendering process needs
to be completed within this step and an agreement or formal contract needs to be entered into with the preferred supplier. After this, the user moves to Step 2 and submits a request to Timber Help Desk in BRR for a letter of recommendation to purchase timber. In order to process this request, BRR has to check with its Housing Unit and/or Infrastructure Unit for the project clarification and validation to make sure that the user is permitted to order timber and that the amount and type of timber requested is in accordance with their needs. Photocopies of the user’s Project Concept Note\(^{23}\) and the contract in previous step are required in order to issue the recommendation letter. Then in Step 3, the user has to provide photocopies of documents gained from Steps 1 and 2 (contract and letter of recommendation) together with an order request to the timber transporter and enter into another contract for transportation. The transporter recommended by BRR to reconstruction agencies in Banda Aceh is the shipping services provided by World Food Programme.

Overall, it is important that timber users understand the definition of legal timber and the assurance measures in obtaining only legal timber. Legal timber as defined in a BRR guideline (BRR, 2006b) means that the timber is harvested from legal concessions in accordance with national regulations. Legal concession is a legal timber company that holds a permit for forest utilization from the Ministry of Forestry. The user can purchase timber or timber products directly from merchants, but the responsibility for obtaining legal timber remains that of the user. It is recommended that all the timber bidders for the Aceh reconstruction are required to provide valid forestry permits as well as SKSHH as a pre-qualification for tender.

### 6.4.3 Review of other options

Alternatives to limited timber supply and other options for sourcing materials for construction were explored and reviewed by organisations involved in the Aceh reconstruction. Those alternative methods and suggestions include using steel trusses (or steel high-pitch roofs) windows, doors and ventilation frames or coconut trees as structural component as replacements to timber products.

The high prices associated with using steel trusses as replacements for timber were the main obstacle. Several factors may contribute to the problem. It is understandable that steel is more expensive than timber but this shortfall could be reduced if less steel is needed for a roof than the amount of timber

\(^{23}\) Project concept note should be approved beforehand by BAPEL BRR, the executing agency.
needed for a timber truss. Actually, a steel high-pitch roof requires much less steel in volume than a traditional timber truss roof. The high price is partially because the mass produced steel roof systems commercially available mainly cater to the needs of factory storage and heavy industry buildings. The pricing of steel roofs for Tsunami relief houses could be significantly reduced if all the reconstruction agencies with the same intention in Aceh organize their individual requests into a bulk order and choose both local and international companies with reliable reputations for a competitive tender for mass production. This is easily said than done. However, the coordinating agency BRR had growing power and was in a position to do this for its prefabricated houses.

Another concern about the use of steel trusses was their acceptance by the community. People were more conservative in remote areas and it was unclear whether they were willing to move into a “light and shining” steel roof house. This required a significant amount of on-site community participation and socialization beforehand.

Coconut trees in the form of “palmwood,” as another alternative to timber, is a relatively new process but has huge potential to ease the pressure on the world’s rainforests, especially in Banda Aceh coastal area, as an ecological substitute to endangered and limited hardwoods. They usually come from farmed plantations of old coconut trees and really are an enormous source of timber that until now have been a wasted by-product from the fruit and food industry. In recent years people have recognized and explored the potential use of this vast, alternative supply of timber and found that it performs as well as or even better than traditional hardwoods.

Usually, the outer, harder part of coconut trees is used in structural materials for building construction, flooring/decking and furniture design, while its relatively soft inner core is suitable for cladding, screening, and homewares. These could be used as profitable by-products for the milling workshop owners if mass production of coconut timber for construction is feasible in Aceh. Another advantage is that the coconut palm is branchless; palmwood is free from knots, which makes it an ideal timber. The issues related to the level of acceptance by the affected community and forestry authority remain. The mass production of coconut timber in Aceh remains a good theory. As more and more research results and real life experiences in favour of this option become available internationally, it is a good opportunity to explore this idea further in Aceh using a government or community-based initiatives to cater the massive needs for timber.
6.5 Conclusions and recommendations

The major aim of this chapter is to review and analyze the procurement and contractual arrangements of post-disaster reconstruction in Banda Aceh, Indonesia after the 2004 Indian Ocean Tsunami. Various stakeholders involved in the Aceh recovery process have been introduced. Their roles and relationship with each other were discussed at the first section, especially the relationship between the client (i.e. VDC and BRR) and the managing contractor (NGO). Timber procurement problems were identified as the major obstacle associated with the reconstruction process in Banda Aceh. In the second half of this chapter, the causes of timber procurement problems were reviewed and alternative procurement routes were analyzed. It further explored other options available to tackle the timber shortage and used modern Supply Chain Management and Project Management theories to streamline the supply chain for future post-disaster reconstruction. The major findings and recommendations were summarized below:

The incorporation of sustainable considerations into the design of procurement routes for post-disaster construction is well recognised. This starts with the need for more effective and efficient communications along the stream of the overall supply chain and within each and every individual organisation forming this chain. Buyers and suppliers must commit a greater amount of information and be willing to share sensitive information to achieve increased levels of supplier performance. Good communication is the basis for building a long-term relationship with reliable suppliers. This should be encouraged in order to reduce the supplier base and minimise the administrative or transaction costs associated with managing a large number of vendors. Certain certificates or well-designed criteria for pre-qualification will contribute to the supplier selection process and supplier base consolidation (e.g. require timber bidders for Aceh reconstruction to provide valid forestry permits as well as SKSHH before further consideration of their tenders). Integration, another key principle in contemporary SCM, is suggested in the Aceh reconstruction practices at both supplier and logistic levels.

The overall procurement and contractual arrangements in Banda Aceh reconstruction could be categorized as a management-orientated procurement system, where the client is represented by the Village Development Committee and BRR while the managing contractor’s role is filled by the implementing NGO. It is believed that utilizing the management-orientated procurement systems post-disaster is suitable as it will facilitate an earlier commencement and completion for reconstruction.
projects and ensure more control towards the project cost and higher standards of quality required by the client. By analysing the organisational structure of the NGO C in a typical Aceh reconstruction setup, where the NGO acted as the managing contractor in a management contracting procurement system, it is suggested that the horizontal communication lines should be facilitated and supported by the organisational matrix structure in order to achieve a successful delivery of the procurement process in practice.

As relating to the specific timber procurement process, the procedures of international and local timber supply for reconstruction in Aceh are reviewed in this chapter followed by discussions on alternative ways of using steel trusses or coconut timber as solutions to the current problem. It is suggested that reconstruction agencies should seek every possible way of using local timber sources with policy clarifications and transportation suggestions from local reconstruction authority BRR, while exploring the legal, economic and logistic feasibility of imported timber. In order to facilitate the process, it would be better to have an overall procurement plan for the whole project rather than a range of small ones, before starting any negotiation with potential vendors. This should streamline the supply in later stages and result in a better supply arrangement. More studies are required as to the use of coconut timber. It remains an attractive potential for rural areas and isolated islands when policy barriers have been removed. The possibility of milling and use of seized timber or timber from other sources should also be investigated.

The use of familiar and locally available materials for reconstruction should be encouraged. The sustainability dilemma with regards to the use of timber is the balance between the preservation of the environment and the provision of housing. The supply of offshore timber might provide great relief at initial response but in long-term effects, it means that the important economical “kick start” provided by aid in country (and specifically in Aceh) is lost. The aftermath is people housed in a context of greater poverty. This leads to the need for alternatives such as the use of coconut timber and other possible substitutions for the major uses of timber in house reconstruction.

Recycling certain construction materials from damaged houses remains another possibility. Most steel doors and window frames post-disaster were not seriously damaged and are in large demand. Substitutions could be the use of light gauge steel sections, roofing that can span without the need for timber trusses and different door and window frames. Furthermore, there is also the option to use shorter life span materials for doors and windows with the idea that they would need to be replaced
earlier than usual (lowering quality). Although more expensive than timber, steel trusses could be a back up option given the short time and high demand. With a more integrated and sustainable supply chain, prices could be lowered with mass production. This could be made possible through the joint efforts of other reconstruction agencies.

This case study suggests a convergence of Supply Chain Management (SCM) and Project Management (PM) into a more reflective form of both. A reflective approach is perhaps at odds with the perception of a rapid, decisive, decision-making project manager in post-disaster reconstruction. Yet the issues addressed in the case study namely: stakeholder engagement; communication; costs and quality; procedural identification; resource and risk management; and ethics, all indicate a solid PM perspective. Moreover, there is also the sense of a greater level of critical reflection over the lessons learnt. The main theme for future development in both SCM and PM as suggested by Winter et al. (2006) is in the change from “practitioners as trained technicians” to “practitioners as reflective practitioners.” This is indeed important in the current international PM context, especially under a post-disaster reconstruction perspective.

A list of documents collected during the fieldtrips that are related but not directly referenced in the drafting of this chapter is included in the reference section as “Further readings for Banda Aceh Case Study”.
CHAPTER 7: CHINESE CASE STUDIES

7.1 Case studies objectives and approach

As with the Banda Aceh case study, this chapter on two Chinese disaster reconstruction cases relates to the overall research objectives two and three: “to examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstruction; and to examine international experience of disaster reconstruction with a focus on the procurement and contractual systems used”. This chapter answers the relevance and applicability question on the procurement systems, contractual models, and procurement regulations to the disaster reconstruction setting. It also aims to answer the principal research question under the objective three on international experience: “what are the procurement systems which have been used in reconstruction in other vulnerable zones in the world?”

Two cases of Chinese disaster reconstruction are included in this chapter, the first is the 1998 Yangtze River Flood reconstructions, and the second is the current reconstruction following the ’08 Wenchuan Earthquakes. The major sources of evidence in these case studies are documentation, archival records, interviews and direct observations. However, there are differences in the approaches. Unlike the historical event of 1998 Floods, the 2008 Earthquakes case study was accompanied by a fieldtrip to the disaster zone six months after the earthquake in December 2008. The fieldtrip was facilitated and accompanied by the Civil Engineering Department of Sichuan University, which is the largest university in South-east China and based in the capital city of Sichuan, the worst-hit province. The research team visited the township in Hanwang, Mianzhu, and Dujiangyan cities. These areas are severely damaged (see appendix D of fieldtrip photos) and massive reconstruction works are underway. Interviews and meetings were held with fellow Chinese researchers, government officials in the local Bureau of Construction, engineers, project managers, and local residents who were physically working on site for their future homes.

Postal questionnaires followed up by telephone interviews were used in both cases, especially in the 1998 Yangtze River flood reconstruction case study. There are nineteen interviews (four postal and fifteen face-to-face) carried out in those case studies involving the government officials, chief engineers overseeing the reconstruction process, local researchers and experts based in the disaster provinces, NGO representatives and project managers in charge of the actual reconstruction works.
These are accompanied by collection and analysis of the documents and archival records of relevant news articles, research papers, official reports, personal accounts, government regulations, and international responses and comments (a sample of returned answers to the questions is included as appendix D). The author also personally experienced the ’98 Yangtze River floods as he was then studying in his hometown, which is in the worst affected province, Hubei, during the flooding season of 1998. The research subject of procurement and contractual arrangements on those two reconstructions post-disaster have not been specifically studied before. Relevant discussions and conclusions could be found at the end of each case study.

7.2 1998 Yangtze River Flood Reconstruction Case Study

7.2.1 Overview of the event

7.2.1.1 Introduction

Seasonal summer rains devastated vast areas of China from June to August 1998. Around the end of July, torrential rains lashed central China causing the first of several serious floods. During the first week of August, new rains in central Hubei and Hunan provinces pushed water levels on the upper reaches of the Yangtze to a third flood peak, hit Hubei's provincial capital Wuhan where water levels rose to 1.25 metres above danger levels, and also cut power supplies. Floodwaters washed away a 3,000-metre section of newly constructed dikes in Hunan Province's Huarong County and opened a 600-metre crack in the embankment surrounding Caisang Lake (ESA Earthnet, 1999). Officials said that floods, landslides and mudflows affected some 240 million people - one-fifth of China's population.

Most of the flood damage was concentrated in three areas during the 1998 summer: along the Yangtze River in south central China; across extreme southern China in the area around the Gulf of Tonkin (Beibu Wan); and across the north near the former USSR border. The heaviest rainfall was reported at Qinzhou, with an incredible 68.28 inches of rain during the June-July period (NCDC, 1998). According to the final official Chinese government report (Ministry of Water Resources of the PRC, 2000), 4150 people were killed by the floods, the second worst to hit the country in more than 130 years. The floods left 14 million people homeless, affected 240 million people, destroyed 6.85 million houses, damaged 12 million houses, flooded 22.29 million hectares of farmland, and caused over $30
billion ($US) in estimated damages. A map showing the surrounding areas of the 1998 floods is included as Figure 31.

Figure 31: Damaged areas of the Chinese 1998 Yangtze River Floods

7.2.1.2 General Recovery Arrangements

Throughout its history, China has been susceptible to flood (and drought) disasters due to high inter-annual rainfall variability. From June through August 1998 – when China suffered its most damaging floods of last decade – extreme rainfall in the Yangtze River Valley was 37.5 percent above normal. However, the total flow volume of the river was even less than the one in the previous 1954 flood. But flood stages in 1998 were much higher. The Changjiang (Yangtze) Water Resources Commission (CWRC24) attributes this to the following factors (Li, 1998):

- The flood retention capacity of lakes adjoining the Yangtze has been reduced dramatically. The total surface area of lakes in the middle and lower Yangtze valley has shrunk from 18,000 square kilometres 50 years ago to 7,000 sq km today, owing to sedimentation and reclamation. The storage volume of these lakes has fallen by eight billion cubic metres.

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24 CWRC – The Changjiang (Yangtze) Water Resources Commission in Wuhan, Hubei province, is empowered by the Chinese Ministry of Water Resources to comprehensively plan, harness, develop, exploit and manage the water resources of the Yangtze River Basin. Established in 1950 as the Yangtze Valley Planning Office (YVPO), it has been, over the decades, the driving force behind the Three Gorges project and the proposed south-north water transfer project in China.
In 1954, much water was diverted from the river channel by dike collapses and breaches. Had this water remained in the channel, flood stages would have been much higher.

Other analysts have highlighted additional ecological factors contributing to the 1998 floods (US Embassy Beijing, 1999):

- Forest cover along the Yangtze has fallen by more than half since the 1950s.
- Marsh areas have shrunk more than 50 percent.
- Soil erosion has increased significantly.

According to another report issued by the US Embassy in Beijing during the flooding (US Embassy Beijing, 1998), sharp declines in natural reservoirs such as forests and lakes, increased silting of rivers and lakes from the de-treed lands in the Yangtze basin, and steady encroachment on river beds by Chinese farmers, have all combined to push the flood waters to record levels during summer 1998. Yangtze River flow rates are below historic highs but water levels are setting records because of silting. Satellite photographs taken over the past decade show increasing numbers of land-poor farmers moving into the most flood-prone areas. The encroachment by farmers onto natural flood-holding areas such as wetlands, lakes and even river beds is, like the encroachment of the cities onto farmland, an important problem in the formulation, regional coordination and enforcement of land use policy.

The State Council, on 5 August 1998, issued an emergency order which called for an immediate halt to all illegal logging and a one year moratorium on all conversion of forest land to other purposes. A USD two billion five-year reforestation program is intended to reduce soil loss on the upper reaches of the Yangtze and Yellow River to reduce silting, as well as flood risk, at the Three Gorges and Xiaolangdi dams. In addition, the state timber company work force was cut by one million workers and the wood production was reduced by ten million cubic metres. Many Chinese scientists (e.g. Chen et al., 2005, Hu et al., 2007, Qian and Zhu, 2001, Zhang et al., 2008) now believe that the very heavy rains, flooding and La Nina climate abnormalities of 1998 are related to global climate change. Lessons drawn from the floods of 1998 could be seen as a major change point which has come to affect Chinese priorities in matters such as environmental protection and climate change.

**The 32-character recovery plan**

After two consecutive years of damaging floods in 1998 and 1999, water authorities and government officials in China came to realize that a more earnest and comprehensive approach to flood prevention
was needed. The central government announced an eight-part flood-control strategy dubbed the "32-character policy plan" (four groups of two phrases, each expressed in the popular four-character form). The central government was providing RMB 10 billion (US$ 1.2 billion according to the exchange rate in 1998) a year over five years through a special bond issued to implement the plan. Provincial and local governments were also contributing funds.

About a fourth of the central government money was used to establish a special fund for correcting hidden defects in the dikes (e.g. seepage, structural weakness). Substantial funding was also allocated for long-term prevention measures, including alternative development (providing alternative sources of livelihood for those engaged in unsustainable, flood-inducing activities such as logging).

The 32-character plan\(^{25}\) comprises the following measures:

1. Plant trees and limit logging;
2. Return some cultivated land to forestry;
3. Prevent retention areas from being used for agricultural, commercial or residential purposes;
4. Return reclaimed farmland to lakes;
5. Support local industries to provide relief for affected areas (i.e. affected by logging bans, etc.);
6. Relocate towns (from flood-prone areas to higher ground) and build new towns;
7. Reinforce embankments;
8. Improve river courses, e.g. by dredging.

Among those eight requirements, the first two and number five in the above list were the major tasks that were led by the Ministry of the Forestry. The remaining five were the responsibility of the Ministry of Water Resources. Accomplishing them would require cooperation from other government departments such as the Ministry of Construction, etc. After the '98 floods, the State Development Planning Commission issued the Relocation and Reconstruction Plan for the middle and lower reaches of Yangtze River, from Table 36 one can have a general picture of the tasks involved.

\(^{25}\) The original 32-character plan in Chinese: 封山育林，退耕还林；平垸行洪，退田还湖；以工代赈，移民建镇；加固干堤，疏浚河道
7.2.2 Reconstruction Procurement and Contractual arrangements

7.2.2.1 Reconstruction Agencies and Management Structure

In order to have a clearer picture of the reconstruction agencies involved and the overall disaster management structure, it is necessary to understand the usual procedure of disaster response and recovery in China. According to Zou et al. (2002), it is shown below in Table 37.

1. Establish the disaster recovery centre/ task groups
2. Situation reports and damage verification
3. Agree on the disaster affected area and recovery plan
4. Establish, examine and authorize the overall reconstruction plan
5. Identify and approve detailed tasks involved in specific reconstruction projects
6. Prepare and authorize funding and material supply for the reconstruction
7. Carry out the reconstruction work under the planning
8. Quality Control and Financial Audit on the reconstruction works by relevant authorities

As can be seen in the list above, the first priority in response to the disaster is to establish the disaster recovery centre and task groups. It usually comprises, at both national and provincial levels, representatives of various government agencies and departments. To be specific, the 1998 Yangtze River Flood Recovery Centre comprises the representatives from the following authorities:
National Development and Reform Commission (NDRC)
State Planning Commission
National Land Resource Bureau
Urban Construction and Planning Bureau
Ministry of Water Resources
Changjiang(Yangtze) Water Resources Commission (CWRC)
Ministry of Agriculture
Ministry of Forestry
Bureau of Civil Affairs
Local Bureau of Finance
Auditing Bureau

The major focus of this research is on the reconstruction aspect of the recovery, relating to numbers six and seven of the overall 32-character plan mentioned earlier - to relocate the affected people, build new towns/villages, and reinforce embankments.  

Take the reconstruction works in Hubei Province for example. The overall reconstruction was led by the provincial branch of the National Development and Reform Commission (NDRC) with the participation of other government departments, mainly the Construction and Planning Bureau and the Ministry of Water Resources. These three (NDRC, Construction and Planning Bureau, Ministry of Water Resources), depending on whether the project is related to building construction or embankment reinforcement, were heavily involved in the pre-reconstruction planning and project approving, including checking designs and budget estimates. In the actual reconstruction phase, more parties were involved besides the contractor and material suppliers (some are state-owned). The local Bureau of Finance and Bureau of Auditing were responsible for overseeing the funding approval and financial auditing process of the reconstruction projects. The quality control division of the Ministry of Water Resources and local Construction Bureau were responsible for supervision during the construction, and for issuing the code compliance certificate on completion. Functionally divided, the parties involved in the reconstruction could be categorised as the client, the design company, the contractor, tendering agencies, project management company/team and authorities overseeing the quality and finance aspects of the reconstruction works.
7.2.2.2 Procurement Process and Contractual Path

Procurement Process

In a typical tendering system/process of engineering projects, the essential components involved are the so-called triangle parties of Client, Contractor and Engineer. In any disaster reconstruction, the government departments and authorities of affected areas are heavily involved, sometimes even directly appointed as the Engineer, Project Manager or concerned as the Client in the reconstruction projects. Activities involved in a typical tendering process are shown in the following list as Table 38.

<table>
<thead>
<tr>
<th>Professional Advisor (Engineer; Architect; Project Manager)</th>
<th>Client (Principal; Employer; Owner)</th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Preliminary Technical Investigation</td>
<td>1 Project Initiation</td>
<td></td>
</tr>
<tr>
<td>3 Economic Evaluation</td>
<td>4 Adoption of Project</td>
<td></td>
</tr>
<tr>
<td>5 Detailed Design</td>
<td>6 Final Evaluation</td>
<td>7 Approval</td>
</tr>
<tr>
<td>8 Compilation of Contract Documents</td>
<td>9 Preparation of Tender</td>
<td></td>
</tr>
<tr>
<td>10 Evaluation of Tenders</td>
<td>11 Award of Contract</td>
<td></td>
</tr>
<tr>
<td>12 Administration of Contracts</td>
<td>13 Use and maintenance of Works</td>
<td>12 Construction of Works</td>
</tr>
</tbody>
</table>

Table 38: Activities involved in the whole life cycle of a typical engineering project

The number in front of each item represents its sequence in the overall process. In most of the 1998 Yangtze reconstruction cases, the Client was one or more of the government agencies, such as the Ministry of Water Resources or the local government. The role of professional advisor was filled by the authorities’ own in-house design branch and professional project management team. A typical reconstruction process started from the project initiation by the appropriate government body (NDRC, CWRC or Ministry of Water Resources), then preliminary technical investigation and economic evaluation by the professional advisor(s), here probably the design institutions of Ministry of Water Resources and local Bureau of Finance. After the checking, the project was adopted and would require further detailed design and final evaluation for the final approval by the Client. Since the time frame
was limited and the Client and the Professional Advisor here were usually from one agency\textsuperscript{26}, the process described above would usually be accelerated from project initiation to approval.

After \textit{Compilation of Contract Documents} was also finished by the Advisor, the project was then open for tender. The tendering process was strictly administrated under the “Tendering Act” and provincial “Tendering Administration Regulation”. Any project for which 1) single construction single contractual price estimation exceed two million RMB; or 2) for equipment and material purchase, single contractual price estimate exceed one million RMB; 3) for professional services such as supervision, design etc, single contractual price estimation exceed a half million RMB; or single contractual price estimation less than standard defined in 1), 2) and 3), but total contractual price exceed thirty million RMB (Hubei Provincial Government China, 2001) would required to be openly tendered. Any contract less than these could be tendered using selective competition method. A few projects of relatively smaller size could adopt the negotiated contract method.

In the contractor selection process in China, all potential contractors are required to obtain a certain level in the national contractor pre-qualification system\textsuperscript{27} to enter a certain tendering competition. The specific tendering process is usually administrated by a professional agency employed by the Client, here the government department. The potential tenderers (contractors) access the tendering information from the government-specified media (e.g. China Economic Herald; Chinabidding.com.cn), or from the professional trade magazine (e.g. China Water Resources News) and decide whether they want to enter the tendering. Usually a bond is required when submitting the tender, and then the contractor’s team prepares the tendering document within the time frame specified in the invitation for tender notice. The tender evaluation process is conducted by a joint committee of representatives from the client, the advisor, the overseeing government officials, and the randomly-drawn experts from the professional database (e.g. the Ministry of Water Resources Expert Database). The potential contractors present their bids, and then the committee is closed for discussion, each

\textsuperscript{26} Even if not in one agency, they are likely to be from the same system/cluster and will be grouped under an umbrella organisation/team specially devoted to the disaster reconstruction purpose.

\textsuperscript{27} Chinese National Contractor Pre-qualification System: it comprises three parts: General Contractor, Professional Contractor, and Specialist Subcontractor Qualification Levels. In General Contractor category, it is sub-divided into 12 groups, such as building construction, road construction, railway construction etc; In Professional Contractor category, it is further divided into 60 groups: such as foundation, decoration, commercial concrete, landscaping and ancient gardening, etc. In Specialist Subcontractor category, it is divided into 13 groups, such as carpenter, painting, masonry, etc. All of the above sub-divisions in these categories need to obtain certain professional level to tender for business, there are 4 levels: professional level 1, 2, 3 and n/a, where professional level 1 is the highest level in any type. [CHINESE CONSTRUCTION ENGINEERING LAWYERS WEBSITE (2010) Chinese National Contractor Pre-qualification System (in Chinese). Beijing.]
member of the selection committee is required to fill in a standard evaluation form which comprises three parts: technical factors; financial factors; and overall factors, the final mark of every tenderer is the general consideration of these three aspects and is calculated by averaging the scores of all committee members ignoring the highest and lowest marks. Usually the highest one wins. The overall evaluation record will be filed in a tendering administration office at a local construction bureau for later references.

**Contractual Path**

As discussed above, in the 1998 Yangtze River Floods reconstruction situation, when the local government was in the role of the Client, the Professional Advisor was usually also from its in-house design branch. The process described above was under a typical traditional separated procurement system. However, in the actual reconstruction, the role of the leading contractor in key reconstruction projects was usually filled by the state-owned construction companies, most likely from the same government department/sector of the project initiator (the client and its professional advisors). The management contractor may then choose to subcontract some work packages to other contractors (from private sector with smaller sizes) under relevant government guidelines regulating the amount of subcontracting allowed (i.e. Tendering Act). If compared to the procurement systems and contractual models discussed in the literature review, one can see that it falls into the categories of integrated or management-orientated procurement system, in the contractual models, D&B or PM/CM models.

A Design and Build (D&B) contractual model enables a single-point contact between the client and one organisation (usually a contractor) fully in charge of the design and construction processes, this is highly desirable in a post-disaster situation. In a combined project management and construction management (PM/CM) contractual model, an organisation, previously referred to as “management contractor”, takes the responsibility of representing the client and leading the design team, plus providing advice to specialist contractors during the construction. However, the management contractor in PM/CM, sometimes referred to as “PM/CM entity”, acts only as consultant to the contracting parties rather than giving direct orders. The PM/CM entity may also undertake the work under a contractual arrangement in which it carries certain financial risk. On the other hand, the D&B contractor subcontracts or forms a joint venture with design firms to manage the project. In that sense, the differences between a PM/CM and D&B are quite subtle and a PM/CM entity that carries financial
risk is really a D&B contractor. Detailed contractual and functional relationships of both models are demonstrated in Figure 32 and 33:

![Diagram of D&B procurement system relationships](image1)

Figure 32: Integrated procurement systems' contractual and functional relationship (D&B)

![Diagram of PM/CM procurement system relationships](image2)

Figure 33: Management-orientated procurement systems' contractual and functional relationships (PM/CM)

In the reconstruction situation discussed before, the relevant government department acts as the Client, the Designer, and sometimes even the Management Contractor. It openly tenders out its physical work contracts to accomplish the reconstruction project. A construction management approach is more suitable for the client when the performance requirements are not yet well defined. When the certainty of the requirements is assured, the client may choose to change the management contracting method to
a D&B procurement route if it is willing to take a more “hands off” approach. Management-orientated procurement systems are generally more suitable for: 1) complex projects involving numerous different specialist subcontractors; 2) if the client does not have sufficient resources to manage the project itself; and 3) the project is on a tight schedule and the clear functional or performance requirements are not easily available to the client at project commencement. All of these fit the disaster reconstruction needs.

7.2.2.3 Government Guidelines and Regulations

After the 1998 Yangtze River Floods, the reconstruction work has been carried out under the existing legal framework (e.g. Chinese Construction Contract Act, Construction Act, Building Code, Urban Planning Act, Real Estate Management Act, etc.). However, the central government also issued specific regulations and guidelines relating to the recovery process. Major legislation about the tendering process of engineering projects was also passed in 1999 as a result of trying to standardize the industry’s practice for flood reconstruction.

State Council’s “Several Recommendations” – The primary guidelines

The programmatic document regarding the 1998 floods reconstruction was issued by the State Council in October 1998, titled: “Several Recommendations on post-disaster reconstruction, realigning rivers and waterways, and building water conservancy and irrigation projects - the Central Committee of the Communist Party of China and State Council Order No. [1998] 15 (State Council of the PRC, 1998)”. The 32-character recovery policy discussed earlier was first introduced in this document. The recommendations on the recovery were grouped into five parts. Under each heading, the strategic implementation plan has been explained in detailed steps. The first two parts of “The Recommendations” are about plans on planting trees and limiting logging; returning cultivated land to forestry; preventing retention areas from being used for agricultural, commercial or residential purposes; and returning reclaimed farmland to lakes.

The third part of “The Recommendations” is about relocating towns and supporting local industries to provide relief for affected areas. It calls on the overall planning and urban design of the relocated towns to comply with the national flood zoning plan and the population size of the new townships to be limited to ten to fifty thousands. It requires the means of tendering to carry out the reconstruction, which should be economical, and fit the local needs. The central government will proportionally reimburse some of the material costs of the reconstruction. It encourages the use of locally available
material, suggests methods of modern technology in building, and issues relevant policies to increase job opportunities for affected communities.

The next part of “The Recommendations” focuses on detailed measures to reinforce the embankments and improve the river courses. It specifies different types of embankments that need to be reinforced, the timeframe for it, the total workload, and how to provide funding for it. The last part addresses the immediate and long-term needs of affected communities and requires local governments to further facilitate all aspects of policies on rebuilding, relocating and recovery. It promises a total commitment of twenty billion RMB of financial bonds and state budgetary appropriation and urges local governments to come up with supporting funds.

**The Tendering Act 1999 and Flood Control Act 1998**

One year after the flooding, central government issued the tendering act on 30 August, 1999 and it took effect from 1 Jan, 2000. It was passed at the Ninth National People's Congress in an effort to regulate the tendering practices in construction markets and to further facilitate and manage the 1998 floods reconstruction.

It specifies certain types of compulsory engineering projects that are required to go through the tendering process, different types of tendering, functions and liabilities of supervising government departments, qualification requirements of the tendering agencies, prerequisites for any organisation to initiate a tender process, duties and responsibilities on both parties and detailed specifications on tendering procedure. It comprises six chapters: 1) general conditions, 2) tender offering, 3) tender submitting, 4) tender opening, evaluation and award of the contract, 5) legal liabilities, and 6) supplementary provisions. In the legal liabilities section, detailed penalties are defined according to different conditions of breach of the act. The supplementary provision article 66 specifies that under special conditions in disaster reconstruction to provide job opportunities for the affected community, or using social welfare funding etc, when it is inappropriate for open tendering, the tendering process could be skipped according to relevant government guidelines and regulations.

The other legislation worth mentioning is the Flood Control Act passed on 1 Jan 1998, which is the first piece of legislation for natural disaster prevention and reduction in China. It provides the means and power and clearly defines under what conditions and when the affected provinces can declare regional emergency and enter the flood response state. The flood control centre then has the power to
expropriate materials and equipment for emergency use, clear the barriers on the flood route, and replace and heavily penalize the officials who neglected their duties of flood control, etc.

**Other guidelines and regulations for 98 floods reconstruction**

In the implementation process of the 32-character recovery plan, besides the existing legal and regulatory framework, various government guidelines and policies were issued to tackle the practical problems encountered during the facilitation. With regard to the reconstruction, there was a combination of five policies, which was termed “5-regulations” in the popular Chinese expression. These were regulatory requirements on: 1) legal representative responsibility (emphasizing that the legal representative of the contractor will be held liable for any misconduct or breach of contract conditions), 2) construction tendering policies, 3) project supervising policies, 4) contract management policies, and 5) funding management policies. These were jointly issued by the National Development & Reform Commission (NDRC), Ministry of Water Resources, Ministry of Construction and Ministry of Finance. These policies covered various aspects of the reconstruction and funding management and provided detailed guidelines in almost every step in the implementation of the reconstruction procedure.

**7.1.3 Cost/ quality/ time considerations**

**7.2.3.1 Cost and funding**

After two consecutive years of damaging floods, including the worst of the twentieth century, in 1998, the Chinese Central Government was committing RMB 10 billion (US$ 1.2 billion) a year over the five years period, from 1998 ~2003, to flood control and prevention measures in the Yangtze River Basin. In addition to strengthening dikes and embankments and dredging the river channel, these funds were used for reforestation, soil conservation and relocation of people out of flood-prone areas. The sources of funding were clearly defined in the primary guidelines for recovery – The Recommendations (State Council of the PRC, 1998). These are

1. public donations, partly for affected communities’ living relief, the rest for rebuilding
2. funding from central government budget
3. adjust the overall government investment structure, cut down the normal industry project and increase the investment from local government to water conservancy projects
4. issue special national treasury bonds in 1998 and 1999 for disaster reconstruction
5. apply for long-term concessional loans from international financial institutions
6. through labour for relief program, organise and provide job opportunities to the flood victims in the reconstruction of local water conservancy projects
7. develop rural housing credits program to support rural communities to rebuild their houses

In Anhui province, for example, the total investment committed to relocation and reconstruction after the 1998 floods damage was 333.93 million RMB, a significant 49.8% was from affected communities’ self-raising funds, with 22% from local government and 19.5% from national subsidy (Zou et al., 2002).

<table>
<thead>
<tr>
<th>Funding source</th>
<th>Investment (million RMB)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-raising funds</td>
<td>166.39</td>
<td>49.82</td>
</tr>
<tr>
<td>Local government subsidy</td>
<td>72.09</td>
<td>21.59</td>
</tr>
<tr>
<td>National subsidy</td>
<td>65.00</td>
<td>19.47</td>
</tr>
<tr>
<td>Bank loans</td>
<td>19.48</td>
<td>5.84</td>
</tr>
<tr>
<td>Others</td>
<td>10.97</td>
<td>3.28</td>
</tr>
</tbody>
</table>

Table 39: Percentage of investment for relocation and reconstruction in Anhui Province

One of the interviewees in this case study research (engineering consultant, and project management) who was directly involved in the reconstruction process at Hubei Province was asked to give an approximate breakdown of the cost of rebuilding a house after the flood. According to him, the official national housing subsidy was 15,000 RMB per family in Hubei, with another 2000 RMB counterpart funds from local government. This 2000 RMB was handed out directly to the beneficiaries but used as a supporting fund for public facilities, such as schools, waste water systems etc. The annual average disposable personal income (DPI) in Hubei Province in 1998 was 4673 Yuan (Chinese National Bureau of Statistics, 1998), 15,000 was enough to build only an 80 m² house unit of relatively low quality. However, with other preferential policies issued towards the reconstruction, an average family would spend about 30,000 ~ 40,000 RMB for house rebuilding. The local government also raised, beyond that, 2000 RMB per family from other sources, for public facilities reconstruction at some resettlement-concentrated areas.
According to a government report given by the then Vice-Minister of Water Resources (Zhang, 1999), from 1998 to the period before the flood season in 1999, a total investment of 46.466 billion Yuan (about 5.81 billion US dollars according to the exchange rate in 1999) had been channelled to water conservancy projects by the Central Government, with the emphasis on regulation of large rivers and lakes, rehabilitation of risky reservoirs, flood control in major cities and reconstruction of damaged structures on the Yangtze and Songhuajiang Rivers in the 1998 floods.

Out of the total investment, 40.9 billion Yuan was for flood control projects, and 24.665 billion Yuan for large river embankment reinforcement and river course regulation, accounting for 53% of the total allocated amount. From 1998 to the end of July 1999, a total volume of 636 million cubic metres of earth, 33.03 million cubic metres of rock and 7.62 million cubic metres of concrete had been used, with a total of 6,084km of embankment cross-section improved to reach designed standards, 1,252km of embankment foundation treated and reinforced, 1,609km of unstable embankment treated, 1,528km of slopes protected, 1,885km of structures crossing dike strengthened, 1,762km of dike roads built, and more than 430,000 dangerous zones treated. As a result, the situation was much better in the 1999 flood season in Yangtze River, although again it witnessed the second highest water level since 1954, after the figure of the previous year.

### 7.2.3.2 Quality and time

Probably the most honest way to test the quality of reconstruction works is to put them under the same disaster impact again and measure their performance. The 1999 Yangtze River flood provided such an opportunity. As mentioned in the last section, the water level of the Yangtze in 1999 was the second highest since 1954, at Jianli hydrological station, the highest water was only 0.01m lower than that recorded in 1998. Compared to the 1998 flood damage, it was observed (Zhang, 1999) that after the reconstruction projects in the 1999 flood season, the emergencies occurring along the Yangtze River dike were reduced by 82%, severe dangers were reduced by 84%, piping and foundation breaks were decreased by 86% and 90% respectively. During the 1999 flood season, a total of 337 protective embankments were used to divert and retain water in the four provinces28 along the Yangtze flooding zone, with an increase of 2.35 billion cubic meters of water storage capability. This effectively lowered the water level in the 1999 Yangtze floods.

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28 Hubei, Hunan, Jiangxi, and Anhui Provinces
The “5 regulations” mentioned earlier in the guidelines and regulations section also contributed to the quality control effort of the 1998 reconstruction works, especially the policies on reinforcing the legal body responsibility of the contractor, and the tendering and supervision mechanism, etc. Under those new policies, the preliminary works must be carried out in strict accordance with the construction programs. Before the construction starts, the qualification of the work unit must be assured. The preliminary works of independent projects would need to be carried out by qualified work units, and that of the key projects shall be done by the authority-recognized contractors. Design supervision was to be put into practice to ensure the quality of design. Moreover, the design results of different stages were strictly examined and checked by the Ministry of Water Resources or CWRC.

Time was a major issue to consider in relocating and accommodating those who have been displaced, as the reconstruction of permanent housing would not be completed before the onset of the cold winter weather. The reinforcement of embankments was not too urgent, compared to the accommodation needs, as long as they can withstand the flood season in the following year. The relocation of towns was the first priority, while embankment reinforcement and river course improvement need to carried out at the same time. The other requirements in the 32-character recovery plan could be accomplished in a long-term strategic plan. For example, the first two goals, to plant trees and return cultivated land to forestry, were planned to be fully accomplished in thirty years, with immediate and short-term goals to be met (e.g. the first session of planting was from 1998-2010 with the aim of newly-created forestry coverage of 24.31 million hectares).

7.2.4 Conclusions - 98 Yangtze River Floods

Flood is a major disaster that has been experienced by the Chinese people dwelling along the middle and lower Yangtze region. According to the statistical data (Ye, 2001), in the last five decades in mainland China, annual flood-affected area is 7,804,000 sq km, on average, 1.9 million houses were damaged and 5,500 people was killed every year in China because of floods. The worst flooding in recent history was the 1954 Yangtze River floods in the middle reaches, where more than 30,000 people perished. The second largest was the 1998 Great Yangtze Flood, in this case study. It is remembered more vividly by the current generation of young Chinese because it was the very first major disaster for those born after the 1980s, when China entered its golden period of economic boost.
The floods of 1998 could be seen as a major change point, which came to affect Chinese priorities in matters such as environmental protection and climate change.

The general background and damage conditions have been reviewed at the beginning of the chapter. It is believed that besides the extreme weather conditions, the major causes of this disaster are the sharp declines in natural reservoirs such as forests and lakes, increased silting of rivers and lakes from the de-treed lands in the Yangtze basin, and steady encroachment of residential areas onto river beds. As a counter measure, the Chinese central government issued the 32-character recovery master plan, which focused on four aspects: planting trees, limiting logging and returning some cultivated land to forestry; returning reclaimed farmland to lakes and preventing the retention area being used for other purposes; relocating towns and building new towns; and reinforcing embankments and improving the water courses. Among those, relocation and reconstruction of new towns and embankment reinforcement are of interest to this research.

In the following sections of reconstruction procurement and contractual arrangements, the reconstruction agencies and their management structure were first reviewed. Comparing to a list of activities involved in the whole life cycle of a typical engineering project, the tendering procedure and participating parties in a reconstruction procurement process have been identified. After further categorising the stakeholders of reconstruction agencies according to their functions in the procurement system, a contractual path of integrated or management-orientated procurement system – D&B or PM/CM contractual model has been recognized. The features of projects associated with this contractual arrangement are: 1) complex projects involving numerous different specialist subcontractors; 2) insufficient client resources to manage the project himself; and 3) the project is on a tight schedule and the clear functional or performance requirements are not easily available to the client at the beginning of the project. These features are considered to be suitable for the needs of post-disaster reconstruction.

The next section was about government guidelines and regulations used in the 1998 Yangtze River reconstructions. The primary document, “The Recommendations”, was first introduced. The passing of the Tendering Act 1999 and the Flood Control Act 1998 were also reviewed. The “5-regulation” system jointly issued by the Chinese authorities, including corporate body responsible system, tendering and bidding, project supervision, contract management and financial management regulations, have all been adopted, thus ensuring the quality of reconstruction works.
The major focus of the last section was on the cost and funding for the reconstruction. The total commitment of governmental budget and actual usage were reviewed. Seven sources of recovery funding were summarized. A breakdown of relocation and reconstruction investment in Anhui Province, and an example of the cost of rebuilding a residential house in Hubei Province in 1998 were provided, and it is found that the total subsidy from different levels of government constitute about 40% of the actual reconstruction cost. The total amount of 1998 – 99 government relief funds, and how they were spent, were analysed with further comments on time and quality issues of reconstruction works.

7.3 2008 Sichuan 5.12 Earthquake Reconstruction

7.3.1 Overview of the event

7.3.1.1 Introduction

On 12 May 2008, a massive earthquake measuring 8.0 on the Richter scale struck Sichuan Province’s Wenchuan County. More than 120 million people in Sichuan and the adjoining provinces of Gansu, Shaanxi, Yunnan, and Chongqing were exposed to the moderate and severe shaking effects of the earthquake, which caused massive damage. The Wenchuan earthquake left 88,000 people dead or missing and nearly 400,000 injured\textsuperscript{29}. The earthquake damaged or destroyed millions of homes, leaving five million people homeless. The earthquake also caused extensive damage to basic infrastructure, including schools, hospitals, roads, and water systems. Aftershocks were also experienced in the following months. On 30 August 2008, a second earthquake measuring 6.1 on the Richter scale struck Sichuan and Yunnan Provinces, leaving dozens dead and hundreds injured. This earthquake struck near the same fault line as the Wenchuan earthquake, but was located further south, with its epicentre in southernmost Sichuan’s Panzhihua City. A map showing the affected provinces is included as Figure 34.

Wenchuan Earthquake is the most devastating earthquake disaster since the founding of new China in 1949. The seismic intensity measured during the earthquake was reaching an unbelievable eleven degrees, causing other secondary disasters, such as landslides, avalanches, debris flow, and formation of barrier lakes. The affected communities were widely spread covering more than 400 cities and towns and a total area of 500,000 sq. km (State Council of the PRC, 2008b, State Council of the PRC, 2008c). The most severely damaged zone was concentrated at fifty-one townships scattered across three provinces of Sichuan, Gansu and Shaanxi. The housing units were destroyed on a massive scale, some of the towns near the epicentre, such as Beichuan and Wenchuan, were literally flattened. It is estimated that there are more than six million houses in the rural areas and 102 million m$^2$ of apartments in the urban areas need to be rebuilt or reinforced (see Table 40 and 41).
<table>
<thead>
<tr>
<th></th>
<th>Sichuan</th>
<th>Gansu</th>
<th>Shaanxi</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To be reinforced</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households (million)</td>
<td>1.4438</td>
<td>0.1188</td>
<td>0.1210</td>
<td>1.6836</td>
</tr>
<tr>
<td>Houses (million)</td>
<td>1.9117</td>
<td>0.2298</td>
<td>0.0472</td>
<td>2.1887</td>
</tr>
<tr>
<td><strong>To be built</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Households (million)</td>
<td>5.7351</td>
<td>0.6893</td>
<td>0.1417</td>
<td>6.5661</td>
</tr>
</tbody>
</table>

Table 40: Reconstruction targets at rural areas after Wenchuan Earthquake (State Council of the PRC, 2008b)

<table>
<thead>
<tr>
<th></th>
<th>Sichuan</th>
<th>Gansu</th>
<th>Shaanxi</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To be reinforced</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area (million m$^2$)</td>
<td>44.3703</td>
<td>2.2006</td>
<td>0.5590</td>
<td>47.1299</td>
</tr>
<tr>
<td>Households (million)</td>
<td>0.6871</td>
<td>0.0285</td>
<td>0.0047</td>
<td>0.7203</td>
</tr>
<tr>
<td>Area (million m$^2$)</td>
<td>52.9097</td>
<td>1.7012</td>
<td>0.2820</td>
<td>54.8929</td>
</tr>
</tbody>
</table>

Table 41: Reconstruction targets at urban areas after Wenchuan Earthquake (State Council of the PRC, 2008b)

Besides the massive needs of both transitional and permanent housing, the associated infrastructure and public facilities such as transportation, power, telecommunication, and water supply systems were also required to be restored. The development of local industry was severely affected, cultivated farmland was destroyed, major industries and many companies suffered heavy losses. Above these, the environment has been seriously damaged in Sichuan Province. Large areas of natural forests and wildlife habitat were lost, which caused degradation of the overall ecological functions.

**7.3.1.2 General Recovery Arrangements**

The Wenchuan Earthquake happened in 2008 when China was busy preparing for the Summer Olympic Games scheduled to be held in Beijing only three months away. The devastating disaster shocked the country and international community into immediate response and mobilisation of all the resources available to cater for the disaster relief. This is also the first time when China opens to the outside world for its disaster recovery process. The reaction of the central government was swift and to the point, compared to the Myanmar Cyclone Relief which happened almost at the same time in the region, and the Chinese government won more praise from the international community for its effective response to the disaster.

The reconstruction targets set out in the Reconstruction Master Plan (State Council of the PRC, 2008b) issued by the State Council four months after the disaster, mainly focused on six aspects and was
expressed in a popular 5-character phrase on each target. The major tasks of reconstruction were to be finished within three years, aiming at restoring the basic living conditions and economic and social development, or to exceed the pre-disaster level in the disaster-affected areas, that:

- Every family has a house or an apartment unit to live in.
- Every household has at least one job, and the annual disposable personal income (DPI) exceeds the pre-disaster level.
- Everyone has one form or another of social supporting system in which it guarantees universal access to basic social security, and that everyone would be able to enjoy free education, public health and basic medical care, social welfare and other basic public services.
- The public facilities are upgraded.
- The economy is further developed.
- The ecological environment is improved.

### 7.3.2 Reconstruction Procurement and Contractual arrangements

#### 7.3.2.1 Reconstruction Agencies and Management Structure

To cater for this unprecedented reconstruction need, the central government reacted quickly and produced the “Post-Wenchuan Earthquake Restoration and Reconstruction Ordinance”. It was issued by the Prime Minister Wen Jia-bao less than a month after the disaster on 8th June addressing different aspects of recovery and reconstruction activities (State Council of the PRC, 2008c), such as transitional arrangements, survey and assessment methods, reconstruction planning and implementation, funding and policy support, supervision and management and legal liabilities of participating parties. The Reconstruction Ordinance took effect from its issuing day and became the cornerstone guideline for the regulatory framework managing the overall Wenchuan Earthquake recovery.

In Article 35 of Section 5, the implementation of reconstruction works, The Ordinance (State Council of the PRC, 2008c) defined the structure of reconstruction agencies, in which the National Development and Reform Commission (NDRC) took the lead and was in charge of the overall planning, policy making, funding scheduling, management and coordination of the key reconstruction
projects. Under the NDRC, various other government agencies were involved looking after different aspects of the recovery and reconstruction, these are illustrated as follows in Figure 35.

![Management structure of reconstruction agencies after Wenchuan Earthquake](image)

**Figure 35: Management structure of reconstruction agencies after Wenchuan Earthquake**

As can be seen from the above diagram, the recovery agencies were grouped into ten different task groups. Several important ones, relating to the purpose of this research, on reconstruction procurement and contractual arrangements, are briefly introduced below:

- **Construction task group** – comprises the Ministry of Construction and Local Province/City Bureau of Construction, organises and oversees the reconstruction of housing and public utilities.
- **Infrastructure task group** – includes Departments on Transportation, Water Resources, Railway, Electricity, Telecommunication, etc.
- **Funding Management Group** – consists of Ministry of Finance and Local Bureau of Finance, responsible for approval, allocation and management of the reconstruction funding.

At a post-earthquake multinational corporations investment exchange and cooperation meeting, held two months after the disaster on 16 July, 2008, the Vice-Governor of Sichuan Province said that in the reconstruction planning, it was initially estimated that 3.5 million units of rural housing and 1 million units of urban residential housing would need to be rebuilt, together with the infrastructure needs, such as restoring health care systems at both town and village levels, the total investment was expected to
reach 1.2 trillion RMB (about 176 billion US dollars at current exchange rate of 6.83). This shows that
the Wenchuan Earthquake restoration and reconstruction is a complicated and arduous task, not only
aiming at providing shelters to accommodate displaced people post-disaster, but also, through well
thought-out long term planning, to reach a balance point between immediate emergency responses and
strategic development of the region.

In the Reconstruction Ordinance, the post-disaster reconstruction was divided into transitional
settlement and permanent rebuilding. For the first part of emergency responses and transitional
settlement, the major tasks were already finished. For the long-term reconstruction, it was necessary to
consider the overall perspective of restoration of regional industrial and social functions and future
development, which required around three years as set out in the Ordinance.

As for the construction procurement and project management structures, a top-down headquarter-
commands mode was adopted during the transitional stage of reconstruction. It is suitable under
emergency situations which require swift mobilisation of resources, quick decision making and clear
guidance, coordination and constant supervision. It is proved to be successful and inarguably
contributes to the initial disaster relief works. However, for the long-term post-disaster reconstruction,
this top-down headquarter-commands mode would be inappropriate and will require other means of
reconstruction procurement and management.

7.3.2.2 Procurement Process and Contractual Path

The procurement process differs between the initial response phase and the long-term reconstruction
phase. In the disaster response mode, the procurement was carried out in an emergency atmosphere
and the aim was simple and straightforward. The parties involved could be easily coordinated and
generally they were all willing to help in some way. The top-down commands mode from the
authorities was then adequate and appropriate to manage the procurement. The long-term
reconstruction procurement is much more complicated, different individuals and organisations have
their own agenda to follow, and this needs proper coordination and balance. Reconstruction works also
differ from town to town, community to community, and therefore could not be simply duplicated.
Besides the reconstruction of buildings and accompanying infrastructures, there are also other non-
tangible restorations, such as the social functions and industrial productions, which need to be
implemented simultaneously to ensure the sustainable development of disaster-affected areas. The reconstruction after the Wenchuan Earthquake should be coordinated, supervised and supported by relevant state authorities, but led by local communities and local reconstruction agencies to allow differentiation and diversification among the reconstruction works.

From a project management prospective, post-disaster reconstruction requires a professional construction management team, which comprises different disciplines of civil engineering, has a clear division and understanding of the responsibilities among its functional departments and has an effective management structure. It should be capable of being responsible for the whole procedure of construction procurement delivery, from planning, design, tender, construction, supervision, inspection, to handover and maintenance. Professional construction management should be the best way to achieve long-term reconstruction procurement and to replace the headquarter-commands mode in the response phase.

In a construction management type of contractual arrangement, the owner employs a professional construction management company as the managing contractor to look after the whole process of project delivery. This usually includes the preliminary work preparation before the project begins (such as consent application etc.), the project tendering, the procurement of construction materials and equipment, construction supervision, quantity survey and cost control. Some of those, such as the tendering process and the construction supervision, could be contracted out to other agencies, but still under the management and coordination of the managing contractor organisation as they are held legally responsible for the overall project management. The management-orientated procurement system would be more suitable for the long-term reconstruction after the Wenchuan Earthquake.

There was another special feature of the Wenchuan reconstruction process. Less than a month after the disaster, the State Council issued the famous “Post-Wenchuan Earthquake Restoration and Reconstruction Counterpart Provinces Supporting Program (State Council of the PRC, 2008a)”, in which it required nineteen unaffected provinces or municipalities to devote not less than 1% of their previous year’s GDP to support twenty-four seriously damaged towns and cities in the disaster zone. Under such arrangements, a reconstruction management framework (Gao et al., 2008) was suggested as follows (Figure 36):
As can be seen from the above diagram, the Municipal Post-disaster Reconstruction Headquarter could be regarded as the leading organisation providing funding and guidance for the reconstruction works within its administrative region. It is a combination of different government authorities overseeing the reconstruction process, for example, it manages the overall progress and schedule of the reconstruction in the area, it provides the funding and looks after the administration of the funding including allocation, approval, cost control, auditing, and reconstruction financial reports, etc. The selection and supervision of different project construction management departments, and coordination with national reconstruction authorities to manage the local reconstruction, are also part of the Municipal Post-disaster Reconstruction Headquarter’s responsibility.

The Technical Consulting Teams on the left-hand side of the diagram in Figure 36 could be formed by employing commercial engineering consulting companies, or state-owned designing institutions by local government, otherwise these professional services could be provided free of charge from the counterpart supporting province to help with the local reconstruction. For example, in the villages of
Mianzhu town, different house designs were provided by Jiangsu province’s technical supporting team for the local residents to choose from. Once they had decided which type of the house they would like to be rebuilt, the technical supporting team, together with the Local Bureau of Construction would provide further building guidance and supervision during its construction.

The Village/Town Post-disaster Coordination Department was acting as a local branch of The Municipal Reconstruction Headquarter. It should be noted that, as the name suggests, its major function is to coordinate and provide services to the reconstruction works, especially to those construction teams from outside supporting provinces.

The main body carrying out the reconstruction works was the specific Project Construction Management Department. It was selected and appointed by the Municipal Reconstruction Headquarter through either competitive or negotiated tendering process. It was the driving force of reconstruction and could be seen as the managing contractor as in a PM/CM contractual model (please refer to the relevant sections in the literature review). The contractor within this type of management-orientated procurement arrangement does little of the physical works and is paid on a fee basis. The physical works are organised into packages and contracted out to subcontractors on a price-based lump sum or bills of quantities-based contracts. Cost-reimbursable or target contracts are also used for more innovative projects. The designer is subcontracted to the contractor or in direct contract with the client but reports to the managing contractor. Generally, in this model, the Project Construction Management Department was responsible for:

- Managing the progress schedule, cost, and quality of the reconstruction works.
- Selecting the designer, subcontractors, material and equipment suppliers through a tendering process.
- Coordinating different function departments and disciplines within the project team.
- Coordinating and communicating with local authorities overseeing the reconstruction process.

Those design companies, physical work contractors and material suppliers were selected through a tendering process and were contracted with the Project Construction Management Department. The Project Construction Management Department is the corporate body which is legally responsible for the reconstruction projects.
As discussed above, the procurement system used here is falling into the category of management-orientated system. The associated contractual model is PM/CM. In the literature review chapters, it is concluded that a construction management approach is more suitable for the client when the performance requirements are not yet well defined. When the certainty of the requirements is assured, the client may choose to change from the management contracting method to a D&B procurement route if it is willing to take a more “hands off” approach. Management-orientated procurement systems are generally more suitable for: 1) complex projects involving numerous different specialist subcontractors; 2) client does not have sufficient resources to manage the project itself; and 3) the project is on a tight schedule and the clear functional or performance requirements are not easily available to the client at project commencement. If we compare those conditions to the reconstruction situation: 1) key reconstruction projects are usually complex and involve different specialist subcontractors; 2) the client here in the disaster reconstruction situation is the local government department or the affected community, who certainly do not have sufficient resources and specialities to manage the project themselves, but need to contract it out to the professional managing contractors; 3) obviously, reconstruction projects are on a tight schedule and, besides the straightforward ones, usually the context of reconstruction is much more complicated than normal, and clear functional or performance requirements are not initially available to the client. So the contractual path here is clearly the management-orientated procurement system – Construction Management or Management Contracting contractual models, which are effective and suitable for long-term reconstructions.

7.3.2.3 Government Guidelines and Regulations

After the Wenchuan Earthquake, on 12 May 2008, the Chinese Central Government and various emergency response agencies reacted quickly and worked around the clock for the disaster relief. A series of government guidelines and regulations were issued, addressing different aspects of reconstruction once the initial search and rescue mission had come to an end. Several important guidelines and regulations are introduced, according to their issuing sequences, in the following section. Relevant provisions in relating to the reconstruction procurement will be discussed.
Post-Wenchuan Earthquake Restoration and Reconstruction Ordinance (June 8 2008)

As mentioned earlier, the Ordinance was issued by the Prime Minister Wen Jia-bao less than a month after the disaster, stipulating different aspects of recovery and reconstruction activities (State Council of the PRC, 2008c), such as transitional arrangements, survey and assessment, reconstruction planning and implementation, funding and policy support, supervision and management, and legal liabilities of participating parties. The Reconstruction Ordinance took effect from its issuing day and became the cornerstone regulation for the legal framework managing the overall Wenchuan Earthquake recovery.

It was drafted under the “The People's Republic of China Emergency Preparedness and Response Act” and “Earthquake Disaster Mitigation Act” and comprises nine sections with a total of eighty articles. The general principles of Wenchuan Earthquake reconstruction were defined as six combinations: 1) local initiation, self-reliance combined with national support and counterpart provinces supporting program; 2) government-led and social participation; 3) in-situ reconstruction and off-site relocation; 4) quality and efficiency of reconstruction works; 5) immediate needs and long-term development; and 6) economic and social development and environmental protection. In Article 52, it stipulates that, in the disaster reconstruction, the government procurement of goods, engineering works, and services should be carried out strictly in accordance with the relevant provisions of "The People's Republic of China Government Procurement Law". Although not too many articles directly stipulate the reconstruction procurement activities, the Ordinance generally covers other relevant aspects of the procurement process, such as the reconstruction funding sources and supporting policies, and legal liabilities towards the construction works, of the owner, the contractor, the designer, and the construction supervisor’s company.

Post-Wenchuan Earthquake Restoration and Reconstruction Counterpart Provinces Supporting Program (June 11 2008)

The Counterpart Supporting Program (State Council of the PRC, 2008a) was issued three days after the Reconstruction Ordinance on 11 June 2008. It stipulated a very important supporting mechanism from one unaffected province to one town in the disaster zone at the very beginning of the disaster reconstruction process. While the local government departments remain the leading force of the reconstruction works, the supporting province would provide not-less-than its previous year’s GDP’s funding or resources to help with the local reconstruction. It could be in the form of financial support,
human resources, materials, or professional consulting services etc. There are nineteen provinces/municipalities involved in this program to support twenty-four cities/towns in Sichuan, Gansu, and Shaanxi Provinces. The time span for this program is three years, finishing in mid-2011.

For example, Shanghai was supporting the reconstruction at Dujiangyan city by providing professional services such as urban planning, building design, engineering consulting, and construction supervision from its own design institutions or commercial companies from Shanghai. It invested directly to build residential houses, hospitals, schools, and other public utilities in Dujiangyan city. It also provided building equipment and materials for the reconstruction, or even teachers to local schools, doctors to local hospitals and helped with relevant training programs. The enterprises in Shanghai were also encouraged by preferential policies to invest in Dujiangyan and set up factories, or to participate in the local infrastructure construction in the form of PPP or BOT contractual model.

Until 8 January 2010 (Sichuan Disaster Reconstruction News Online, 2010b), under this counterpart supporting program, Shanghai has promised eighty-nine reconstruction projects with an estimated total investment of 6.066 billion RMB. Among those eighty-nine projects, eighty-six have already started with a total of thirty accomplished, accounting for 96.63% and 33.71% of the overall project quota. Accumulating investment reached 3.075 billion RMB, or 50.69% of the total investment figure with an actual amount of 4.999 billion RMB funds in place.

**Post-Wenchuan Earthquake Restoration and Reconstruction Master Plan (Sep 19 2008)**

This is a detailed plan covering almost every aspect of post-Wenchuan earthquake reconstruction issued by Chinese State Council four months after the actual disaster. Its draft was publicly issued on 12 August for feedback and suggestions and this consultation process lasted one month before the final version was officially released and implemented. It comprises fifteen chapters and addresses the physical reconstruction on both urban and rural housing, restoration of cities and towns, villages, public facilities, infrastructures, and local industries, plus the disaster mitigation and ecological and environmental restoration, even the psychological recovery is included. It also covers the supporting policies, funding procedure, and reconstruction planning implementation process.
On 16 July, the most affected Sichuan Provincial Government issued an official Notice (Sichuan Provincial Government, 2008) on the tendering practices involved in the reconstruction projects. The Notice mainly aimed at the reconstruction projects with national funding or investment and stipulated that reconstruction projects on infrastructure, public utilities that are significant to the social security and benefits, would need to be competitively tendered. No organisation or individual shall be allowed to split up the project, or in any other way to circumvent the tendering process required in The Notice. At the same time, it stipulated that urgent reconstruction projects could skip the tendering process provided that it was agreed by the municipal authority.

However, three months later, it had to issue another supplementary notice (Sichuan Provincial Government General Office, 2008) to the original document because some of the provisions were abused during its initial implementation. Some projects which should not be included in the official earthquake reconstruction plan were also using this regulation to circumvent the required tendering process. The Supplementary Notice further explained and clearly defined the scope, approval procedure, time limit on commencement, the size of investment, and filing requirements of reconstruction projects. It strictly stipulated that the projects which could be carried out without tendering must satisfy three conditions all at once, and conditions which do not allow the projects to circumvent the tendering. At the last section of the complementary notice, the legal liability of the supervising authority overseeing the tendering process was emphasized, and the tendering procedure was standardized in details.

**Summary on Government Guidelines and Regulations for Reconstruction**

Besides the government guidelines and regulations that have been introduced above, there are many more which have been issued by the Chinese government since the Wenchuan Earthquake reconstruction started, addressing different aspects of the process and supporting mechanism. Generally categorised, these policies could be grouped into five categories:
1) Policies and regulations on finance, tax, and economy

Those are the guidelines and regulations on reconstruction funding and overall economic context. One important aspect of the overall disaster recovery is the recovery of the economy. In general, the policies on finance were aiming at raising funds for reconstruction, reshaping the government expenditure structure, and utilising available international loans. Tax cut was granted to enterprises and individuals in the affected provinces. Other tax benefits were also provided for the Affordable Housing Program in urban area and Farmland Occupation Tax in the rural area to support the reconstruction of residential housing. Economic policies were focusing on restoring the economic services functions, reinforcing the credit system, and introducing new insurance policies to support the overall recovery.

2) Policies and regulations on land use

The policies in this category generally focused on adjusting the current land use plan to cater for the reconstruction needs, providing special lands under preferential policies, and supporting reclamation of farmland and sharing of public utilities in the urban plan to increase the land use efficiency.

3) Policies and regulations on industry

Aiming to regenerate the key industries in the disaster zone, the central government issued a series of policies on tourism, agriculture, and traditional industries. These regulations also aimed at supporting the trade environment, scientific innovation for future industrial development in the disaster zone.

4) Policies and regulations on supporting mechanism

Besides the Counterpart Provinces Support Program discussed earlier, there are other policies and regulations issued for the same purpose of supporting, but in the areas of education, social welfare, legal consulting, employment opportunities, etc.

5) Other policies and regulations
Those include guidelines on donation, transitional settlement, encouraging recruitment of local labours and selection of local contractor for the reconstruction works, and social participation, etc.

7.3.3 Cost/ quality/ time considerations

7.3.3.1 Cost and Funding

According to the Reconstruction Master Plan (State Council of the PRC, 2008b), the total cost of the reconstruction and restoration of Wenchuan Earthquake was estimated to reach one trillion RMB (about 146 billion US dollars according to the current exchange rate of 6.83). 30% of the cost would come from a special account of Central Government Post-earthquake Reconstruction Fund. The other 70% would be met by local government investments, counterpart provinces supporting program, public donations, domestic loans, international preferential emergency loans, urban and rural citizens’ own or self-raising funds, enterprises’ own or self-raising funds, and other more innovative ways of financing, such as the establishment of rural micro-credit finance companies and other credit unions.

The funding of physical reconstruction of housing units is usually from four sources: the government funding (Central Government Post-earthquake Reconstruction Fund); Counterpart supporting program; part of public donations; and domestic credit funds. The distribution of part of the government funding through the competitive tendering process was adopted by the reconstruction authorities and also supported by the researchers from China (Yang et al., 2009). As discussed above, there are specific regulation requirements (Sichuan Provincial Government, 2008) for certain reconstruction projects to go through the tendering process, not only in contractor selection, but also for the material or equipment procurements.

7.3.3.2 Quality and Time

After the initial shock of the Wenchuan Earthquake, the grief of the society turned into anger towards the collapse of poorly-constructed school buildings during the earthquake. This was sparked by the relevant reports from critical journalists on the subject of grieving parents over the allegations of possible corruption when the schools were originally built. On 26 May, Wang Xuming, a spokesman for the Education Ministry, stated that the ministry would complete a reassessment of school buildings
in quake zones and that those who had cut corners on school construction would be “severely punished (Xinhua News Agency, 2008a)”. The Ministry of Housing and Urban-Rural Development had sent 201 building safety experts to the quake-stricken regions in the southwest (Xinhua News Agency, 2008b). These experts, dispatched in three teams over the first week after the disaster, had evaluated the safety of buildings with a total area of 1.8 million square metres and trained more than 140 local staff. They reported that about 5.36 million buildings had been confirmed destroyed and more than twenty-one million were damaged in the earthquake.

As a result, the high quality requirements and strict quality control methods were applied to the newly-accomplished reconstruction works. In the overarching regulation of Wenchuan Reconstruction Ordinance (State Council of the PRC, 2008c), Article 45 – 50 are devoted to the quality control purpose. Article 45, calls on the relevant authorities to review and revise the current seismic requirements and construction standards. Article 48 reiterates the legal responsibility of participating parties in the reconstruction works, including the owner, designer, contractor, and supervisor’s organisation. All the key reconstruction projects are required to undergo an extra anti-seismic inspection before issuing the completion report from the overseeing authority. For the high-density public facilities, such as schools, hospitals, museums, libraries, cinemas, etc., they are required to be designed to a higher seismic-resistant capacity compared to other structures in the same region under the new regulation.

The time frame for the reconstruction was officially estimated by the State Council to be three years, but local provincial and municipal authorities were aiming to finish the reconstruction targets within two years. By the end of year 2009, the reconstruction of all housing units in the rural areas of Chengdu city, the capital city of worst-hit Sichuan Province, was finished. By the two-year anniversary, May 2010, all the urban reconstruction was expected to be finished in Chengdu (Hu, 2009). In Mianyang city, the overall number of rural permanent housing units to be reconstructed was 503,074, at January 2010, one month away from the traditional Chinese New Year. Of those 488,718, or 97.1% had already been completed, the rest were expected to be finished before the Chinese New Year so that the beneficiaries could celebrate the spring festival in the new homes (Sichuan Disaster Reconstruction News Online, 2010a).
7.3.4 Conclusions – 08 Sichuan Earthquake

Wenchuan Earthquake in 2008 is the worst natural disaster ever occurred after the founding of new China in 1949. The reconstruction process after it is unique in many ways, not only because of its massive scale, but also the open and swift reaction of the Chinese central government towards it. It is the first time China opens up to the outside world about its response and reconstruction process, it is also the first time a specially drafted government bye-law has been passed for the sole purpose of disaster reconstruction.

In the first section of this chapter, the damage of the Wenchuan Earthquake and reconstruction targets have been introduced, all of which are unprecedented. It is estimated that there are more than 6 million houses in the rural areas and 102 million m² apartments in the urban areas which need to be rebuilt or reinforced in three years. The procurement and contractual arrangements of the reconstruction works are discussed in the next section.

It begins with an introduction to the management structure of reconstruction agencies, in which the National Development and Reform Commission (NDRC) takes the lead, and is in charge of the overall planning, policy making, funding scheduling, management and coordination of the key reconstruction projects. Under the NDRC, various other government agencies are involved and can be categorised into ten different task groups looking after different aspects of the recovery and reconstruction. Among those, the construction, infrastructure and funding management groups relating to the physical reconstruction of housing units and accompanying infrastructures, have been selected for further analysis. It is believed that the top-down headquarter-commands procurement mode adopted in the initial response stage would no longer be suitable for the long-term reconstruction, which requires more appropriate procurement and contractual models to be applied. A reconstruction management framework is introduced, in which the participating parties in the reconstruction have been grouped into: technical consulting team, the actual project department, the designer, the physical work contractor and supplier, and overseeing authorities, including two levels of municipal reconstruction headquarter, and local reconstruction coordination department. Their various functions in the framework have been discussed. After comparing to the procurement systems introduced in the literature review, a contractual path of management-orientated procurement system and PM/CM contractual model has been recognized. Special features and the suitability of this model have been compared to the post-disaster reconstruction conditions and it is found that they fit in perfectly.
In order to fully comprehend the operation of this procurement and contractual system under the disaster reconstruction conditions, it must be set within the greater context of post–disaster legal and regulatory framework. Several excerpts from government guidelines and regulations, relating to the reconstruction process and project tendering, were introduced. The overall reconstruction policy framework was reviewed. In the last section, the cost and funding, quality and time required for the overall reconstruction were also discussed.
CHAPTER 8: ANALYSIS AND DISCUSSION

In this chapter, the results from the case studies chapters will be drawn together and compared across each other in accordance with different themes and factors identified and discussed in previous literature review chapters. The time/cost/quality considerations, procurement paths chosen, and the relevant guidelines and regulations on procurement in each case will be collectively discussed and compared in the rest of this section.

8.1 time/cost/quality considerations

When considering choosing any specific procurement path for a certain construction project, the time/cost/quality tradeoffs will always come first as these tradeoffs define the overall context and management framework under which the project will be carried out and the procurement path to be followed. In this section, the overall cost/time/quality of the reconstruction works after the disaster events in case studies chapters will be examined and compared.

8.1.1 Manawatu 2004

In the reconstruction works following the 2004 Manawatu Floods, the transition point between the initial response and the long-term recovery is estimated at day 50 after the event. The reconstruction of some of the infrastructure was not accomplished until late 2006, which could be categorised as the Reconstruction I phase in the Haas’ model (see Figure 12). The overall cost for the 2004 Manawatu Floods recovery was estimated at $280 million with $160 million for rural sector and $120 million for roads and council infrastructures. The quality of the reconstruction works is believed to be the same as in normal construction conditions because in general terms all works were completed within the existing contractual framework. The parties that are normally involved during the construction projects in the disaster area were also involved during the reconstruction process.

8.1.2 Matata 2005

A total of $5,229,300 was proposed to be spent for the Matata regeneration package in the business case prepared by the Whakatane District Council (WDC) after the 2005 Matata floods. This amount
was met by central government (24%), WDC (53%), and other government agencies (23%). Besides the financial assistance from the authority, the private sector contributed to the Matata recovery through donations and insurances. The joint mayoral relief fund served as a major source of the donation after the Matata Floods for up to a total amount of $635,000. The Earthquake Commission (EQC) reported that 98 claims were received with a total value of $1,770,496 after the event. As a result, the total cost for 2005 Matata Floods recovery was estimated to be 7.6 million. But if considering other items proposed in the business case for long-term mitigation purpose (e.g. early warning systems, construction of a debris dam, Matata wildlife refuge, etc), the actual net present value of the total cost would exceed 15 million NZ dollars.

The time estimated for the response phase is short, about 3-4 weeks after the event (with the State of Civil Defence Emergency for the area are lifted 12 days from the event). However, it took almost 7 months after the disaster for WDC and Central Government to come up with, and agree on, the regeneration package and allocate funding for it. The possible reasons for this delay during the reconstruction decision making were discussed in the case study chapter mainly as 1) the scale of the event was unprecedented to the Matata area and was out of the control capability of WDC; 2) considerable amount of time was spent for community participation and consultation about the reconstruction plan; 3) uncertainty of the funding sources and the distribution among them; and 4) the need for long-term planning for mitigation procedures to be implemented to guard the affected community from similar future disasters. Once the plan and the funding were in place, the reconstruction projects were commenced right away as the supply chain was intact and the existing relationship-based procurement and contractual arrangements were unchanged. The quality of the reconstruction works after the Matata event was considered to be above the average level.

**8.1.3 Banda Aceh 2004**

Compared to the pilot case studies in New Zealand, the scale, impact and severity of the 2004 Indian Ocean Tsunami in Indonesia are much bigger. It was estimated at least US$5.8 billion (about NZ$8.2 billion then) was needed in the recovery phase for Aceh and Nias region in Indonesia.

Some 4 months after the Tsunami, the Master Plan for Rehabilitation and Reconstruction of Aceh and Nias was established. This could be seen as the changing point from the response phase to the
reconstruction phase. The Reconstruction I phase of all the housing was aimed to be finished by the end of 2007 and the infrastructure construction to be finished in 2008. Although from the on-site observation from March to May 2008, this schedule was not met as there were still reconstruction targets to be completed and the beneficiaries were still waiting for the handover of their housing units. The total recovery timeframe was estimated to be at least 5 – 6 years. The end of 2009 was the official end of the recovery (as the mandate of BRR, the government coordination department of reconstruction in Aceh, ended then).

Generally speaking, the quality of the reconstruction works was on or above the average level of expected quality during normal time construction in the area. However, there were occasions when the quality of the reconstruction houses was below the expectation of the beneficiaries and they rejected the handover. And from the experience the author had with the reconstruction projects in Aceh, the quality of some reconstruction houses was not satisfactory and required seismic reinforcement or even demolition and rebuilding. During the second fieldtrip in Banda Aceh from March to May in 2008, the author was involved in the structural testing of some 1061 reconstruction houses, where about a quarter of the houses (24.1%) were still under 40% completion rate on March 27th 2008 and almost half of the houses lacked enough earthquake resistant properties (either through diagonal bracing or shear wall) and needed to be retrofitted in some way.

8.1.4 Yangtze River Floods 1998

The Chinese Yangtze River Floods in summer 1998 caused over US$30 billion (NZ$ 58.5 billion then) in estimated damage according to the official report (Ministry of Water Resources of the PRC, 2000). As a result, the Chinese Central Government committed US$1.2 billion a year over the five years period from 1998 to 2003 to flood control and prevention measures in the Yangtze River Basin. From 1998 to the period before the flood season in 1999, a total investment of US$5.81 billion was channelled to the water conservancy projects in the region.

The quality of the reconstruction works after the 98 Floods is believed to be beyond the normal standard. As tested in the flooding season of 1999, which experienced the highest water level in Yangtze River since 1954, the quality of reconstruction works were proved to be effective as the emergencies occurred along Yangtze River dykes were reduced by some 82% in 1999. The initial
response phase lasted until the winter season was over, some 4-5 months after the event. The reconstruction of major reinforcement and protection to the dams and dykes and the reconstruction of permanent houses for the beneficiaries started at the same time. The Reconstruction Phase for the 98 Yangtze River Floods was estimated to be 4-5 years.

8.1.5 Wenchuan Earthquake 2008

According to the Reconstruction Master Plan (State Council of the PRC, 2008b), the total cost of the reconstruction and restoration of Wenchuan Earthquake was estimated to reach 146 billion US dollars (NZ$185.42 billion). The composition of the funding targets and contributing sources were discussed in the relevant case study chapter (section 7.3.3).

The quality of reconstruction works after Wenchuan Earthquake is expected to be high and strict quality control methods are reportedly applied to the newly-accomplished houses, some with enhanced earthquake resistant properties, such as the use of lead-rubber bearing for base isolation for critical infrastructure (e.g. hospitals). This is also supported by the experience of the author during his fieldtrip in the disaster area 6 months after the earthquake in Dec 2008.

The official transfer from initial response to the reconstruction was symbolised with the issuing of the detailed Post-Wenchuan Earthquake Restoration and Reconstruction Master Plan on Sep 19 2008. The reaction of Chinese government to Wenchuan Earthquake was swift and effective. Earlier than the Master Plan, an ordinance regulating recovery and reconstruction activities was issued less than a month after the event and later became the corner stone regulation for the legal framework managing the overall Wenchuan Earthquake recovery.

The timeframe for reconstruction was officially estimated to be 3 years by the State Council, but local provincial and municipal authorities were aiming to finish the reconstruction targets within 2 years. For example, by the end of year 2009, all the housing units’ reconstruction in the rural areas of Chengdu city, the capital city of worst-hit Sichuan Province, were finished. By the second anniversary at May 2010, all the urban reconstruction was finished in Chengdu.
The time/cost/quality aspects for the overall disaster recovery in each of the case studies are summarised in Table 42:

<table>
<thead>
<tr>
<th>Case studies</th>
<th>New Zealand</th>
<th>Indonesian</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>04 Manawatu</td>
<td>05 Matata</td>
<td>04 Banda Aceh</td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response</td>
<td>50 days</td>
<td>28 days → 7 months</td>
<td>4 months</td>
</tr>
<tr>
<td>Reconstruction</td>
<td>2.5 yrs</td>
<td>2 yrs</td>
<td>6 yrs</td>
</tr>
<tr>
<td>Cost (NZD millions)</td>
<td>280 m</td>
<td>15 m</td>
<td>8200 m</td>
</tr>
<tr>
<td>Quality</td>
<td>average</td>
<td>average-high</td>
<td>low-average</td>
</tr>
</tbody>
</table>

Table 42: overall time/cost/quality of the post-disaster reconstruction/recovery works

It should be noted that the reconstruction time in the list represents the Reconstruction Phase I in the recovery activities model introduced in chapter 3, while the cost includes not only the main component of reconstruction cost but also the damage to other sectors as a whole. If considering the casualties of the disasters as another factor, it is fortunate that no lives were lost in both New Zealand floods; 170,000 were killed in the 04 Banda Aceh as a consequence to the Boxing Day Tsunami; The official death toll of 1998 Yangtze River Floods is 4150; Ten years later in the 2008 Wenchuan Earthquake, 88,000 lives perished. The scales and the casualty rates of the disasters clearly affect the recovery and reconstruction.

It is interesting to note that the 2005 Matata Flood has a two stage response of 28 days to 7 months. This indicates the small scale of the disaster compared to others and its damage cost is also the lowest (15 million NZD). The initial response to the disaster was swift but the follow-up decision on the reconstruction plan was slow. A typical feature of the traditional procurement system, where the design and construction phases are separated, slowed the reconstruction process. As a result of separated procurement system, the reconstruction output is of high-quality.

Comparing the cost and time factors from Table 42, it is understandable that the cost of the damage, together with the casualty figures, represent the severity of the disaster impact examined. The more it
costs to reconstruct and recover, the more severe the disaster impact is, the more time needed to recover. For instance, comparing two New Zealand cases, the Manawatu reconstruction cost more thus lasted longer. However, this relationship seems not necessarily linear when the cost of the disaster increases as demonstrated by the three international cases in Table 42. With the increase of the disaster recovery cost, the reconstruction time sometimes decreases from expected. This could be partially explained for the following two reasons. Firstly, all of the international cases are more severe and larger in the size and impact as compared to the New Zealand ones. More factors are involved when considering the influence over the reconstruction time and associated cost. Some examples of those factors are the culture and social-economic structure of local society, the control mode of recovery (e.g. top-town, bottom-up, or balanced), the type and scale of the disaster, the international aid received and how aid is managed and coordinated. All of those factors complicate the original simple linear relationship between time and cost factors. Secondly, one may argue that as the severity and cost of the disaster increase, the more resources and funding will be available and devoted to the recovery and the recovery itself will become paramount in the national priority for future development. All of above will lead to a more rapid recovery. This is reflected in the comparison between two Chinese cases.

The quality factors included in Table 42 were not measured in a quantitative way, but rather expressed in qualitative descriptions of low, average and high. These rankings were given based on relevant literature reviews of documentation, archival records, interviews with participants of reconstruction process, and the direct observation undertaken during fieldtrips to disaster areas by the author. These observations collectively provide a general impression and a basis for comparison of the quality of reconstruction works in each case. One might naturally expect that more money and longer time devoted to reconstruction would generate higher quality outputs. However, it is not necessarily the case as shown in the comparison table above. Depending on the factors mentioned previously, such as the scale of the disaster, the control mode of the recovery, and the administration and coordination structure of the procurement. It can be seen, for example, the Banda Aceh reconstruction cost more money and lasted much longer than in both New Zealand cases but did not necessarily generated higher quality outputs. This is largely due to different scales of the disasters but also other factors, in this case, the management and coordination of international aid to the reconstruction. Comparing the three international cases together, one sees that from Banda Aceh, Yangtze River, to Wenchuan, it costs more money, uses lesser time, and produces better quality outputs. This might be limited to predict a trend of international disaster reconstruction, but it clearly demonstrates the complexity of influencing factors over the time/ cost/ quality features for large-scale post-disaster reconstructions.
The tradeoffs between time/ cost/ quality are different and more difficult to predict post-disaster as compared to normal time construction.

### 8.2 Contractual relationships and procurement path

After examining the overall contractual management context of time/cost/quality, it is necessary to be more specific with reconstruction projects in respect of their contractual relationships and procurement paths chosen in each case study. This section will summarise and compare the key features relating to the procurement systems, contractual models and standard contracts used in reconstruction projects across the five disaster cases and use the result as a basis for further discussion.

Murdoch and Hughes (2008) argue that the simple labels of contractual models such as PFI, partnering, D&B etc. communicate little about the way that a project is structured and these methods are not mutually exclusive. Instead they focus on 6 procurement variables and believe that by grouping those variables, it is be possible to describe any construction procurement method. These variables are listed in section 2.3.2.3. Here they are included as Table 43 for the convenience of the discussion within this section.

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of funding</td>
<td>Owner-financed, public sector-financed, developer-financed, PFI, PPP</td>
</tr>
<tr>
<td>Selection method</td>
<td>Negotiation, partnering, frameworks, selective competition, open competition</td>
</tr>
<tr>
<td>Price basis</td>
<td>Work and materials as defined by bills of quantities, cost reimbursable, whole building, a fully-maintained facility, performance</td>
</tr>
<tr>
<td>Responsibility for design</td>
<td>Architect, engineer, contractor, in-house design teams, supplier</td>
</tr>
<tr>
<td>Responsibility for management</td>
<td>Client, lead designer, principal contractor, joint venture, construction manager</td>
</tr>
<tr>
<td>Amount of sub-contracting</td>
<td>0-100%</td>
</tr>
</tbody>
</table>

**Table 43: Conceptual definitions in procurement choice (Murdoch and Hughes 2008)**
8.2.1 Manawatu 2004

To summarize the contractual path used in Manawatu Floods reconstruction, three major factors have to be agreed upon: Procurement Systems, Contractual Models and Standard Contracts. As discussed previously in the case study chapter, most of the simple and straightforward reconstruction works were carried out using traditional separated procurement system. Some of the road reconstruction works were procured under the Transit NZ’s (now NZTA) Hybrid or PSMC models. These could be categorised as within the integrated procurement systems. The associated contractual models used most frequently was the traditional lump-sum one. This led to the use of the standard contracts of NZS3910 in most cases and Transit NZ’s own specific contracts with some road reconstruction works.

In a typical roading reconstruction work setting after Manawatu Floods, the clients would be regional and district councils and the Transit NZ. The physical work contractors were hired directly by these clients. The source of funding was public sector-financed. The method of selection is usually a matter of choice or preference, but here as in public sector, there are regulations about how suppliers and contractors can be selected. However, the long-term relationship between those contractors and the client in this case exists before the disaster, and in emergency provisions in Procurement Guidance for Public Entities (section 3.2.1) the open tendering process could be dispensed if there is a need to react quickly to genuinely unforeseen events. Generally, the methods used in Manawatu reconstruction case were negotiation and selective-tendering. The price basis was by Bill of Quantities. In the immediate debris clean up works, cost reimbursable methods were used. The architects and engineers designed the work and the client and its consultant managed the actual reconstruction. Most of the project scope in Manawatu was straightforward and could be accomplished by the contractor without further need to subcontract.

To summarise, the procurement path and determining variables of a typical reconstruction project following the Manawatu Floods are:
### Manawatu Reconstruction Procurement Path and Determining Variables

<table>
<thead>
<tr>
<th>Procurement System</th>
<th>Contractual Model</th>
<th>Standard Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated</td>
<td>Traditional lump-sum</td>
<td>NZS3910/ Transit self-drafted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Responsibility for design</th>
<th>Responsibility for management</th>
<th>Amount of sub-contracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>public-sector financed</td>
<td>Architects, Engineers</td>
<td>Client; lead designer</td>
<td>0; limited</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection method</th>
<th>Price basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiation; selective competition</td>
<td>Bills of Quantities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bills of Quantities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Procurement System</th>
<th>Contractual Model</th>
<th>Standard Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated</td>
<td>Traditional lump-sum</td>
<td>NZS3910/ Transit self-drafted</td>
</tr>
</tbody>
</table>

Table 44: Typical Manawatu Reconstruction projects’ procurement path and determining variables

### 8.2.2 Matata 2005

Matata followed a similar reconstruction process to Manawatu. The procurement path and variables in 05 Matata reconstructions are as follows (Table 45):

### Matata Reconstruction Procurement Path and Determining Variables

<table>
<thead>
<tr>
<th>Procurement System</th>
<th>Contractual Model</th>
<th>Standard Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separated</td>
<td>Traditional lump-sum</td>
<td>NZS3910/ Transit self-drafted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>Responsibility for design</th>
<th>Responsibility for management</th>
<th>Amount of sub-contracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>public-sector financed</td>
<td>Architects, Engineers</td>
<td>Client; lead designer</td>
<td>0; limited</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection method</th>
<th>Price basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negotiation; selective competition</td>
<td>Bills of Quantities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Price basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bills of Quantities</td>
</tr>
</tbody>
</table>

Table 45: Typical Matata Reconstruction projects’ procurement path and determining variables

Matata had the same arrangements as the Manawatu case study as both disasters were of a small scale and the consequent reconstruction works were carried out within the existing contractual framework. The use of established relationships was evidenced when procuring reconstruction works. This had the advantage of the parties knowing each other and associated familiarity with the contract types. There was little difference between contractual arrangements of post-disaster reconstruction and normal time construction in both New Zealand cases. This may be appropriate given the sizes of the disasters as relatively small and high-quality output and industry familiarity to the system were desirable features of the reconstruction.
8.2.3 Banda Aceh 2004

As discussed before in the Aceh reconstruction case study, a typical reconstruction scenario was where one NGO branch acted as both the engineer and the contractor and realized its material supply through local and international suppliers and sub-contractors. Four groups/parities were identified: the client (VDC represents the beneficiaries); the authority (BRR in Aceh case); the engineer/designer (usually a NGO); and the contractor (local labours managed by NGO or professional construction companies). Combining the roles of both Engineer/Designer and Contractor together for the NGO, it clearly resembles the role of a management contractor or a D&B contractor in integrated or management-orientated procurement systems. The associated contractual models are summarised in Table 46.

<table>
<thead>
<tr>
<th>Banda Aceh Reconstruction Procurement Path and Determining Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Procurement System</strong></td>
</tr>
<tr>
<td>Integrated/ Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Source of funding</strong></th>
<th>public-sector financed; NGO donation</th>
<th><strong>Responsibility for design</strong></th>
<th>Contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection method</strong></td>
<td>Negotiation; selective competition; open competition</td>
<td><strong>Responsibility for management</strong></td>
<td>Management Contractor</td>
</tr>
<tr>
<td><strong>Price basis</strong></td>
<td>Bills of Quantities; whole building; cost reimbursement</td>
<td><strong>Amount of sub-contracting</strong></td>
<td>high level; 100%</td>
</tr>
</tbody>
</table>

Table 46: Typical Banda Aceh Reconstruction projects' procurement path and determining variables

The specific reconstruction contracts the author encountered during the fieldtrips were those specially drafted ones to be used within the NGO’s administrative framework. However, the standard forms of contracts from, for example, FIDIC, JCT, or NEC families could be utilised to associate with the integrated or management orientated procurement systems. Following the selection processes of standard contracts families, one can conclude that the following standard contracts are suitable to be used in the Aceh reconstruction setting: 1) FIDIC family: Plant and Design-Build (Yellow Book), EPC
Turnkey Projects (Silver Book) for integrated procurement system; 2) NEC family: Integrated Model Set and Management Model Set (see appendix B for details); and 3) JCT family: Major Project Construction Contract (MP) and Design and Build Contract (DB) for integrated procurement system and Management Building Contract (MC), Construction Management Appointment (CM/A), Construction Management Trade Contract (CM/TC) for management-orientated procurement system.

8.2.4 Yangtze River Floods 1998

From the relevant analysis and discussion in chapter 7.2.2.2, the procurement path and variables of 1998 Yangtze River Floods are shown in Table 47:

<table>
<thead>
<tr>
<th>Yangtze River Reconstruction Procurement Path and Determining Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Procurement System</strong></td>
</tr>
<tr>
<td>Separated;</td>
</tr>
<tr>
<td>Integrated/ Management (key reconstruction projects)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of funding</th>
<th>public-sector financed</th>
<th>Responsibility for design</th>
<th>Architects, Clients; Contractors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Selection method</strong></td>
<td>Negotiation; selective competition; open competition</td>
<td>Responsibility for management</td>
<td>Client; Management Contractor</td>
</tr>
<tr>
<td><strong>Price basis</strong></td>
<td>Bills of Quantities; whole building; cost reimbursement</td>
<td>Amount of sub-contracting</td>
<td>as regulated by government procurement guideline, may vary from 0 ~ average level</td>
</tr>
</tbody>
</table>

Table 47: Typical Yangtze River Reconstruction projects' procurement path and determining variables

It can be seen that the typical procurement path in Yangtze River Reconstructions could be separated. However, the competing contractors may be state-owned construction enterprises from the same government sector/department as the project leading authority. This actually makes the procurement system become an integrated or management one. This is also a special feature with Chinese disaster reconstruction cases, where the influence of the government is the strongest in all case examined. It is not unusual to see the same government department initiate the reconstruction project, design it, and
tender the contract to another state-owned contractor from the same department, finance it, manage it and eventually complete the project. In this case, it is actually forming an organisation similar to the joint-venture or alliancing procurement system, which acts as the client, the engineer, and the management contractor. This may partially contribute to the swift response and decision making process in disaster reconstructions experienced in China.

8.2.5 Wenchuan Earthquake 2008

Similarly, in Wenchuan Earthquake reconstruction, Table 48 is prepared:

| Wenchuan Earthquake Reconstruction Procurement Path and Determining Variables |
|-----------------|-----------------|-----------------|
| **Procurement System** | **Contractual Model** | **Standard Contract** |
| Integrated/ Management (key reconstruction projects); Separated | D&B; Management Contracting & Construction Management; Design and Manage Traditional Lump-sum; | self-drafted contracts (could use the standard contracts of FIDIC Yellow or Silver Book; NEC integrated or management contract sets; or JCT DP or DB for integrated and JCT MC or CM for management-orientated procurement system) |

| **Source of funding** | public-sector financed | | **Responsibility for design** | Architects, Clients; Contractors |
|-----------------------|-----------------------| | **Responsibility for management** | Client; Management Contractor |
| **Selection method** | Negotiation; selective competition; open competition | | **Price basis** | Bills of Quantities; whole building; cost reimbursement |
| **Amount of sub-contracting** | as regulated by government procurement guideline, may vary from 0 ~ average level |

Table 48: Typical Wenchuan Earthquake Reconstruction projects’ procurement path and determining variables

From the Wenchuan post-disaster reconstruction management framework (in section 7.3.2.2), it can be seen that the overall structure was a management contracting model, where the reconstruction headquarters at both municipal and village/town levels were the client, the technical consulting team from the Counterpart Provinces Supporting Program was the consultant/designer, the actual project construction management departments at the central acted as the management contractors subcontracting with the suppliers and other physical work contractors. However, when considering a
specific reconstruction project, one may realize that it could be carried out in a traditional separated procurement system as the project construction management department could contract with different design companies, construction companies, and material suppliers. It is believed that by doing so, the previously-discussed benefits associated with the management procurement system, such as the shortened time, single point of contact and responsibility (here the project management department) could be obtained. At the same time, the actual projects with divided smaller-size work packages were sub-contracted and procured in a traditional separated nature, with industry familiarity and high quality works.

**8.2.6 Procurement Path Summary**

Table 49 summarizes the contractual paths of a typical reconstruction project in all the case studies. The variables were determined based on the observation, experience and analysis of materials gathered during each of the case studies. The procurement path identified in each case as shown in the following table is believed by the author, and also supported by the interviewees, to be “typical” as it represents a majority of the procurement practice in these reconstruction projects post-disaster. However, it is understandable that there are other specific reconstruction projects share little or no similarity with these procurement paths identified in each case.
<table>
<thead>
<tr>
<th></th>
<th>Procurement System</th>
<th>Contractual Model</th>
<th>Standard Contract</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 Manawatu</td>
<td>Separated</td>
<td>Traditional lump-sum</td>
<td>NZS3910/Transit self-drafted</td>
</tr>
<tr>
<td>05 Matata</td>
<td>Separated</td>
<td>Traditional lump-sum</td>
<td>NZS3910/Transit self-drafted</td>
</tr>
<tr>
<td>04 Banda Aceh</td>
<td>Integrated/Management</td>
<td>D&amp;B; Management Contracting &amp; Construction Management; Design and Manage</td>
<td>NGO self-drafted contracts (could use the standard contracts from FIDIC, NEC, JCT families)</td>
</tr>
<tr>
<td>98 Yangtze River</td>
<td>Separated; Integrated/Management (key reconstruction projects)</td>
<td>Traditional Lump-sum; D&amp;B; Management Contracting &amp; Construction Management; Design and Manage</td>
<td>self-drafted contracts (could use the standard contracts from FIDIC, NEC, JCT families)</td>
</tr>
<tr>
<td>08 Wenchuan</td>
<td>Integrated/Management (key reconstruction projects); Separated</td>
<td>D&amp;B; Management Contracting &amp; Construction Management; Design and Manage</td>
<td>self-drafted contracts (could use the standard contracts from FIDIC, NEC, JCT families)</td>
</tr>
</tbody>
</table>

Table 49: Procurement path of a typical reconstruction project in each case study

It can be seen from the above table, except for two New Zealand cases, all the three international cases represent a trend of utilizing integrated or management-orientated procurement systems and relevant contractual models in post-disaster reconstructions. It should be noted that the traditional separated procurement system still played an important part in reconstruction, mostly at the specific reconstruction project level. Most of the standard contracts that were used in the reconstruction are self-drafted or a local revised versions of popular standard forms. Large construction companies or government organisations tend to produce their own standard contracts. This lack of popularity with the standard contracts may be partially due to the lack of specially-prepared sets in the popular standard contract families.

Similarly, the 6 procurement variables in each case are also summarised in Table 50.
<table>
<thead>
<tr>
<th>Case Study</th>
<th>Source of funding</th>
<th>Selection method</th>
<th>Price basis</th>
<th>Responsibility for design</th>
<th>Responsibility for management</th>
<th>Amount of subcontracting</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 Manawatu</td>
<td>public-sector financed</td>
<td>Negotiation; selective competition</td>
<td>Bills of Quantities</td>
<td>Architects, Engineers</td>
<td>Client; lead designer</td>
<td>0; limited</td>
</tr>
<tr>
<td>05 Matata</td>
<td>public-sector financed</td>
<td>Negotiation; selective competition</td>
<td>Bills of Quantities</td>
<td>Contractor</td>
<td>Management Contractor</td>
<td>high level; 100%</td>
</tr>
<tr>
<td>04 Banda Aceh</td>
<td>public-sector financed; NGO donations</td>
<td>Negotiation; selective competition; open competition</td>
<td>Bills of Quantities; whole building; cost reimbursement</td>
<td>Contractors</td>
<td>Client; Management Contractor</td>
<td>as regulated by government procurement guideline, may vary from 0 ~ average level</td>
</tr>
<tr>
<td>98 Yangtze River</td>
<td>public-sector financed</td>
<td>Negotiation; selective competition</td>
<td>Bills of Quantities; whole building; cost reimbursement</td>
<td>Architects, Clients; Contractors</td>
<td>Client; Management Contractor</td>
<td></td>
</tr>
<tr>
<td>08 Wenchuan</td>
<td>public-sector financed</td>
<td>Negotiation</td>
<td>Bills of Quantities</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 50: Procurement variables associated with a typical reconstruction project in each case study

As can be seen from Table 50, the client in the reconstruction phase usually would be the government agencies in the affected area, and here the typical reconstruction considered is usually the public facilities. Thus the source of funding would be from public sector. Since there is a limited timeframe for contractor selection in an emergency, the most popular selection method would be the selective competition or negotiation based on pre-exist relationships. Bill of Quantities method is still the dominant price basis for reconstruction procurement while the cost reimbursement and whole building methods would be used in integrated and management systems. From the design and management responsibility columns, it can be seen that because of the popular setting of NGO as management contractor in Banda Aceh reconstruction, the contractor took the responsibilities in both roles as in a management procurement system. The amount of sub-contracting depends upon the complexity of the reconstruction projects and relevant government regulations. Both New Zealand cases have the lowest subcontracting rate while the Banda Aceh reconstruction has the highest subcontracting level.
8.3 Procurement guidelines and regulations

8.3.1 Procurement guidelines and regulations in literature review

Since the source of funding for most of the reconstruction works is from the public sector, the government guidelines and regulations are important when considering the overall reconstruction procurement environment. Procurement guidelines and regulations are reviewed in the disaster literature review chapter and in each case study. This section is not intended to repeat the analysis and discussion made previously but to summarise and conclude on the characteristics of procurement guidelines and regulations for post-disaster reconstruction.

In the disaster literature review section 3.2.1, the guidelines issued by various government bodies in relating to the normal time procurement were summarised. The Auditor-General Office’s “Procurement Guidance for public entities” was specially mentioned for the basic over-riding principles stated in it for all public-sector procurements, which are “accountability, openness, value for money, lawfulness, fairness and integrity”. The “Emergency Procurement” section in the Guidance states that it may not be possible to satisfy the principle of open and effective competition throughout the procurement process in an emergency. Thus a public entity may dispense with parts of the procurement process if it needs to react quickly to genuinely unforeseen events. However, it further requires appropriate guidance and procedure be made in relevant government documents on what constitutes an emergency and lines and levels of authority and control.

The OGC Procurement Guidelines is an example of the kind of procedure required for public-sector procurement in commonwealth nations. The complicated process with checkpoints such as strategic assessment, business justification, etc. was considered not suitable to be used in a post-disaster situation. Procurement Methodology Guidelines for Construction used in NSW, Australia was introduced in the literature and subsequently analysed for its applicability to the post-disaster reconstruction situation. The component of each contractual model forming the overall procurement framework of the NSW guideline was compared to a list of desirable features of the procurement framework for reconstruction work post-disaster. For the Procurement Delivery Systems identified in the NSW Government Guidelines, the Managing Contractor Systems would be most suitable for the disaster reconstruction type of projects. Alliance Contract System could be suitable for reconstruction projects that are large and complex where more conventional procurement and contract systems would not be able to achieve the outcomes required. There are attitudes, capacity, expertise and corporate
cultures needed for an alliance which requires a sophisticated construction market. Privately Financed Project (PFP) Delivery Systems could also be adopted post-disaster for the infrastructure projects. However more caution is needed in procuring PFP projects post-disaster, because it requires more effort, expert advice, management and support for the client (government agency) than other systems.

8.3.2 Procurement guidelines and regulations in case studies

Most of the reconstruction works carried out in both New Zealand cases was managed under the existing framework of normal time regulations and legislations. It was found in Manawatu case that the then newly-passed CDEM Act 2002 was appropriate for dealing with the event and did not hinder authorities at any level in managing the disaster. The emergency work provision (s330) of RMA 1991 was specially discussed in relating to the level of variations allowed during practice. Although did not directly concern the reconstruction procurement process, they provided a management structure under which the procurements post-disaster were carried out. In the Matata case study, future land use planning issues arose, in particular where sub-divisions and housing could be located in the town of Matata. Other regulatory issues in Matata recovery discussed include: the community consultation process in relating to the Local Government Act 2002; identification of Hazards required in CDEM Act 2002; existing land use rights in section 10 of RMA; and the limited control ability of Council’s through District Plan to the affected area.

The guidelines and regulations reviewed in the Banda Aceh reconstruction case were those concerned with the timber procurement process as timber procurement was one of the major obstacles faced during the procurement process. These guidelines emphasized the need, and facilitated the procurement of construction timber from legal and sustainable sources.

As discussed previously, the influence of central government over the reconstruction process in Chinese case is the strongest one among all disasters analysed. Thus the guidelines and regulations in China played an important role in the reconstruction management and affected the way in which the reconstruction works and associated procurement were carried out. In the Yangtze River Flood reconstruction, the corner stone guideline issued by the Chinese State Council was “The Recommendations”. It stipulated the tendering methods to carry out reconstruction works and emphasized the importance of utilizing local-available materials and modern technology in rebuilding.
The other important piece of legislation passed after the 98 Yangtze River Floods was the Tendering Act 1999, which could be seen as an effort made by the authority to regulate the flood reconstruction procurement and in general the tendering practice in the overall construction market. The Tendering Act specifies certain types of engineering projects that compulsorily required to go through the tendering process, different types of tendering, functions and liabilities of supervising government departments, qualification requirements of the tendering agencies, and prerequisites for any organisation to initiate a tender process, duties and responsibilities on both parties and detailed specifications on tendering procedure.

The 2008 Wenchuan Earthquake reconstruction sees the most detailed government regulations and guidelines on almost every aspects of the overall recovery effort. Several pieces of regulations and legislations passed especially for the Wenchuan Earthquake reconstruction were introduced in the case study chapter. Several worth mentioning are “the Reconstruction Ordinance 8 June” – a strategic level guideline issued less than a month after the disaster. In this regulation, the funding sources, supporting policies; legal liabilities of the owner, the designer, and the contractor for reconstruction works were defined; The Counterpart Provinces Supporting Program; the Master Plan; and specific local government regulations issued during the reconstruction process to standardize the required competitive tendering process in detail.

8.4 Chapter Summary and Discussion

The time/cost/quality aspects, procurement paths and determining procurement variables associated with reconstruction process in each case study have been examined and analysed. An overall summary of the cases is presented in Table 51.
<table>
<thead>
<tr>
<th>Case studies</th>
<th>New Zealand</th>
<th>Indonesian</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>04 Manawatu</td>
<td>05 Matata</td>
<td>04 Banda Aceh</td>
<td>98 Yangtze River</td>
</tr>
<tr>
<td>Time</td>
<td>Time</td>
<td>Time</td>
<td>Time</td>
</tr>
<tr>
<td>Response</td>
<td>50 days</td>
<td>28 days → 7 months</td>
<td>4 months</td>
</tr>
<tr>
<td>Reconstruction</td>
<td>2.5 yrs</td>
<td>2 yrs</td>
<td>6 yrs</td>
</tr>
<tr>
<td>Cost (NZD millions)</td>
<td>280 m</td>
<td>15 m</td>
<td>8200 m</td>
</tr>
<tr>
<td>Quality</td>
<td>average</td>
<td>average - high</td>
<td>low-average</td>
</tr>
<tr>
<td>Procurement System</td>
<td>Separated</td>
<td>Separated</td>
<td>Integrated/Management</td>
</tr>
<tr>
<td>Contractual Model</td>
<td>Traditional lump-sum</td>
<td>Traditional lump-sum</td>
<td>D&amp;B; MC, CM, D+M</td>
</tr>
<tr>
<td>Source of funding</td>
<td>public-sector financed</td>
<td>NGO self-drafted contracts; public-sector financed</td>
<td>public-sector financed</td>
</tr>
<tr>
<td>Selection method</td>
<td>Negotiation; selective competition</td>
<td>Negotiation; selective competition; open competition</td>
<td></td>
</tr>
<tr>
<td>Price basis</td>
<td>Bills of Quantities</td>
<td>Bills of Quantities; whole building; cost reimbursement</td>
<td></td>
</tr>
<tr>
<td>Responsibility for design</td>
<td>Architects, Engineers</td>
<td>Contractor</td>
<td>Architects, Clients; Contractors</td>
</tr>
<tr>
<td>Responsibility for management</td>
<td>Client; lead designer</td>
<td>Management Contractor</td>
<td>Client; Management Contractor</td>
</tr>
<tr>
<td>Amount of sub-contracting</td>
<td>0; limited</td>
<td>high level; 100%</td>
<td>as regulated by government procurement guideline, may vary from 0 ~ average level</td>
</tr>
</tbody>
</table>

Table 51: Summary of case studies results

It can be seen from the above table, as the impact of the disaster increases, represented by the increased figure of the reconstruction cost, the procurement system chosen changes from the
traditional separated procurement systems to the integrated and management systems simply because
the scale and the nature of the reconstruction following more significant and serious disasters is out of
the management capability demonstrated in a traditional contractual system. In both New Zealand
disaster cases, the impacts were not significant enough to generate a change of procurement methods
for reconstruction as it was basically managed as normal time construction, although a sense of
collaborative relationships between the contracting parties was observed during reconstruction.

Given the scale of the damage experienced in two Chinese disasters examined, the reconstruction
following them were quick. The reconstruction outputs were of high quality. The use of integrated
relationship-based contractual arrangements in both cases was clear. The relationship and collaborative
environments exist pre-disaster between the client department, the state-owned designer and contractor
organisations usually within the same industry sector was also important contributing to the success of
the overall procurement management. The effective guidance and coordination effort made by the
authority was the other determining feature of the Chinese experience. It is also believed to be the
difference between Chinese and Indonesian cases. The quality of reconstruction works in Indonesian
reconstruction was lower and the reconstruction time was longer than in the Chinese cases. The
procurement systems used in both countries were integrated and management types but the difference
was that Indonesian reconstruction was in a general sense driven by various international NGOs on an
ad-hoc basis but the reconstruction in China was clearly led by government agencies on different
levels. This may be partially explained by culture difference, if using the GLOBE factors (see section
2.1.7), different attitudes toward the power distance, institutional collectivism, and uncertainty
avoidance between Confucian Asian and Southern Asian countries (see e.g. Javidan et al., 2005
introduction on GLOBE project). International assistance also played an important part in Chinese
reconstruction but they were coordinated into the scope of the overall planned recovery efforts led by
relevant authorities.

A trend of using self-drafted standard contracts in those reconstruction cases were clearly seen, this
should not be encouraged and it is recommended that the standard contract families should develop its
own set of reconstruction contracts to be used by those public-sector agencies or general
reconstruction organisations, incorporating the features required in this special procurement
environment. By utilizing the standard reconstruction contracts post-disaster, the communication and
coordination effort of disaster management in the affected area should be easier. It is believed that the
coordination effort from the government over the reconstruction process through various guidelines
and practical support play an essential role in determining the overall speed and success of the disaster recovery process.
Chapter 9 Conclusions and Recommendations

The main objective of this PhD research is to review the existing procurement and contractual arrangements and analyse their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster in New Zealand. The main objective is divided into 3 sub-objectives as:

- Objective 1: To review the literature on construction contracts and to examine their usefulness and applicability in a disaster reconstruction situation
- Objective 2: To examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstructions.
- Objective 3: To examine international experience of disaster reconstruction with a focus on the contractual and procurement systems used.

In order to fulfil these objectives, two major methods were used in this research. Firstly, a literature review was carried out to set up the theoretical framework then case studies were conducted to test the theory in reconstruction practice. Detailed principal research questions and associated chapters are illustrated in Figure 18: Research procedure overview.

The literature review was divided into two major parts. The first one was on the procurement path, consists of procurement systems, contractual models and associated standard contracts, their advantages, disadvantages, and project suitability under the normal time construction. The second part of the literature review focussed on the theme of disaster reconstruction. Within this part the following were covered: different reconstruction theories were introduced and compared, under which the reconstruction activities model was established and the research focus on the reconstruction phase was identified; New Zealand and representatives of international government guidelines on procurement under the normal time were examined; the contractual models for post-disaster reconstruction in New Zealand and overseas were reviewed and discussed. The suitability of procurement systems and contractual models to post-disaster reconstruction situations were examined in theory to produce the client’s priorities identification chart (section 3.3.1). The theoretical examination concludes that Design and Build in the Integrated Procurement System and Management Contracting in the Management-orientated Procurement System are the most suitable contractual models to be used in a post-disaster reconstruction scenario.
The case studies part of the thesis focused on the reconstruction process following five natural disasters in New Zealand and abroad. To be more specific, the case studies concentrated on the following aspects of the reconstruction: procurement and contractual arrangements; overall time, cost, quality of the reconstruction; and relevant government regulations and guidelines, especially those related to the reconstruction procurement practice. The analysis and discussion were made in each case study chapter and the final results were summarized and compared in light with the literature review results.

The principal research objectives and associated questions are summarised and answered below with relevant thesis sections.

<table>
<thead>
<tr>
<th>Objective 1: To review the literature on construction contracts and to examine their usefulness and applicability in a disaster reconstruction situation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research questions</strong></td>
</tr>
<tr>
<td>a. What are the common construction contracts used in New Zealand industry?</td>
</tr>
<tr>
<td>b. Are they still useful in the aftermath of a natural disaster?</td>
</tr>
<tr>
<td>c. If not, what are the main impediments and how could they be improved</td>
</tr>
</tbody>
</table>

*Table 52: Objective 1 research questions and relevant thesis sections*

The common construction contracts used in New Zealand industry were introduced and summarised in section 2.3 of this thesis. They include the most commonly used NZS3910:2003 and other local standard forms such as NZS3915:2000, MBF standard contracts, and NZIA standard contracts. Besides these New Zealand ones, some international standard contracts, such as NEC and FIDIC suites of standard contracts, are used increasingly in New Zealand for more innovative forms of procurement. As shown in the New Zealand case studies, the commonly-used construction contracts are still useful for disaster reconstruction. However, this is because the sizes of the disasters examined were not significant enough to generate real changes to the project delivery environment. The author believes there are potential impediments for commonly-used New Zealand standard contracts to cater for the reconstruction needs following a large scale natural disaster in New Zealand. The major construction contracts used in New Zealand are under the separated procurement system, in which the design and construction functions are in a sequential manner. The opportunity to incorporate the buildability considerations into design is lost and the overlap between design and construction is not facilitated by
using these contracts post-disaster. The limited timeframe and already-stretched financial resources post-disaster are another concern in using these standard contracts for rebuilding. To summarise, the main impediments to use currently-available construction contracts in New Zealand for reconstruction works are time, cost and communication factors. The main advantages are familiarity with the system and receiving a quality product. The improvement on the situation could be made by using other more suitable international contracts for significant reconstruction works, which facilitate the integrated and management-orientated procurement systems to make full use of existing good relationship between contracting parties. However, the implementation of international standard contracts post-disaster should be accompanied by higher industry familiarity level and overall planning pre-event.

### Objective 2: To examine current procurement systems, contractual models, regulations on procurement and their relevance to disaster reconstruction

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Relevant thesis sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. What are the procurement systems and contractual models that are used in the construction industry?</td>
<td>s2.1; s2.2; s2.4</td>
</tr>
<tr>
<td>b. What are the existing government regulations on procurement?</td>
<td>s3.2; s5.3.2; s5.6.2; s7.2.2.3; s7.3.2.3; s8.3</td>
</tr>
<tr>
<td>c. The relevance and usefulness of procurement systems, contractual models, and procurement regulations in a disaster reconstruction situation?</td>
<td>s3.2; s3.3; s3.4; s5.8; s6.3; s7.2.2.2; s7.3.2.2; s8.2</td>
</tr>
</tbody>
</table>

**Table 53: Objective 2 research questions and relevant thesis sections**

The procurement systems and contractual models that are used in the construction industry were covered in details in section 2.1 and 2.2. They were then summarised and linked with each other to form different procurement paths in section 2.4. A table summarising government procurement guidelines in New Zealand was provided and discussed in section 3.2.1. International examples of government regulations on procurement were introduced in section 3.2.2, including OGC procurement guidelines in UK, NSW procurement guidelines in Australia, Government Procurement Law in China, and Procurement Guidelines issued by Asian Development Bank and The World Bank. The relevant provisions to post-disaster reconstruction within these guidelines were drawn out and discussed. Greater flexibility is given to the procurement of goods and works under disaster and emergency assistance circumstance. These guidelines provide a legal basis for managing public-sector procurement in a disaster reconstruction situation. However, more specific guidelines, usually issued after disasters, are required to further regulate the reconstruction practice as observed in Chinese case studies. Detailed discussion on procurement guidelines and regulations post-disaster were made in
section 8.3. The relevance and usefulness of procurement systems and associated contractual models for reconstruction were analysed in section 3.3 and 3.4 in literature review and further examined in relevant case studies sections as listed in Table 53. Summarising the information, one can see that it is crucial to choose the right forms of procurement systems and contractual models and manage them with the support of overall government regulations to ensure a successful delivery of reconstruction projects.

Objective 3: To examine international experience of disaster reconstruction with a focus on the procurement and contractual systems used

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Relevant thesis sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. What are the recent developments in forms of the major international construction contracts?</td>
<td>s2.3.2; s2.3.3</td>
</tr>
<tr>
<td>b. What are the procurement systems that have been used in reconstruction in other vulnerable zones in the world?</td>
<td>s6.3; s7.2.2; s7.3.2; s8.2</td>
</tr>
<tr>
<td>c. Are these international experiences useful to New Zealand, if yes, how can they be/ have been modified to suit New Zealand conditions?</td>
<td>s8.1.6; s8.2.6; s8.4</td>
</tr>
</tbody>
</table>

Table 54: Objective 3 research questions and relevant thesis sections

The research found that, following a disaster event, the procurement framework for reconstruction projects needs to have the following features:
1. allows the overlap between the design and construction thus a early completion of the reconstruction project would be possible
2. prefers the single point responsibility as most of the implementing agencies (e.g. NGOs) involved in disaster reconstruction would not have relevant disaster reconstruction management experiences, the D&B or Construction Management models are favoured
3. allows for effective communication links between the parties
4. allows for the use of the existing relationships between the parties involved
5. allows the involvement of the affected community into the decision making process to facilitate a community-driven reconstruction effort
6. ensures both social and economic accountability, not only to the implementing agency who award the contract and provide the funding, but also to the affected community or beneficiaries
7. provides effective mechanism for quality assurance and monitoring during the project duration and after for sustainable maintenance with future hazard mitigation options considered
8. ensures the contract arrangement is “win-win”, i.e. that is the best possible deal both for the client and the contractor
9. ensures local industry familiarity with the framework
10. encourages the use of local material, labour and plant
11. facilitates the reconstruction works to be carried under limited timeframe and relatively low cost

It is identified through literature review, confirmed by theoretical examinations, and supported by case studies that relationship-based contractual arrangements are more suitable for post-disaster reconstructions. To be more specific, it is believed that the following procurement paths are favoured for reconstruction projects:
Table 55: preferred procurement paths for disaster reconstructions

Depending on the procurement systems and contractual models chosen, specific standard contract families are preferred. Detailed selection of which contract(s) to use within each standard family was covered in literature review. However, comparing across FIDIC, NEC, and JCT, the client for post-disaster reconstruction internationally would more likely choose FIDIC set of standard contracts as it is more widely used and regarded as an international standard, while NEC and JCT are more UK based. However, it is also worth noting that there is an increase use of NEC3 contracts in New Zealand by local authorities, utility companies and private sector companies to facilitate early contractor involvement and some of the more innovative forms of procurement, including pain/gain share arrangements between parties using NEC ECC options C and D. The TSC contract in NEC3 is also being used in New Zealand for facilities management contracts. The features facilitated by NEC3 are desirable for a post-disaster reconstruction situation. With the increase of industry familiarity over time, the NEC3, or revised one based on NEC3, would be an option for the New Zealand disaster reconstruction contractual arrangement. NEC3 is also compatible to the New Zealand legislation. The JCT is mainly used in the UK construction market and it is not commonly used in complex engineering projects. As discussed earlier in section 2.3.3, the approach to delay under the JCT 2005 is retrospective which contrasts with the proactive NEC3 approach of addressing delays as soon as they arise, which may not be favoured in a post-disaster reconstruction context. To summarise, FIDIC would be suitable to use as a basis for international reconstruction projects. NEC3 could be used post-disaster if industry familiarity level is high enough to facilitate a smooth delivery by all reconstruction stakeholders. JCT could be an option for UK-based reconstructions, but attention needs be drawn to possible amendments over its extension of time clauses and the general suitability of other aspects under the reconstruction situation.
Besides the integrated and management-orientated procurement systems demonstrated above, it should also be noted that the collaborative procurement systems, such as partnering and alliancing could be suitable for reconstruction projects that are large and complex where more conventional procurement and contractual systems would not be able to achieve the outcomes required. There also needs to be attitude, capacity, expertise and a corporate culture for collaborative procurement systems. On the other hand, depending on the scale and impact of the disaster, one may argue that even the traditional separated procurement systems could also deliver satisfactory outcomes when the impacts are limited and no real differences presented between reconstruction projects and normal time construction projects.

As discussed earlier in the time/cost/quality section, there are other factors to be considered in determining those tradeoffs for post-disaster reconstruction projects as compared to normal time constructions. This is also true for determining the procurement and contractual arrangements for post-disaster reconstructions. Besides the common factors, such as those listed in Table 19, timing, variations, complexity, quality, price certainty, responsibility, professional involvement, and risk avoidance, there are other factors to be considered when determining the desirable procurement and contractual arrangements post-disaster. These include considerations on the scale of the disaster, the type of the disaster, and the control mode of reconstruction.

The scale of the disaster is important as it determines whether it is necessary to manage the reconstruction projects in a different way. Such as in the case of Matata reconstruction, where the scale of the damage is not significant as compared to international cases, the need for industry familiarity was paramount in determining the overall separated procurement system for reconstruction in this case. The associated benefits with more appropriate integrated or management-orientated procurement systems post-disaster were not significant or convincing enough to drive the changes in the local construction industry. It is believed that reconstruction following large scale disasters would be more suitable to be procured in relationship-based integrated procurement systems.

The type of the disaster also influences the procurement choices of reconstruction. As can be seen from the summary Table 50, the reconstructions after flooding disasters, such as Manawatu, Matata, and Yangtze, are more likely to be delivered by separated procurement systems, while the earthquake ones are followed by integrated or management-orientated procurement arrangements. This may be
explained by the different senses of emergency associated with various types of disasters. The flooding disasters are more slow-approaching events limited along the river drainage regions as compared to earthquakes where usually more severe or intensive damage are made to a larger population in a much shorter period. Since the floods are “slow”, it is more likely the reconstructions after them are to be managed in a traditional way. The reconstructions after earthquakes, especially those significant ones such as in the Banda Aceh and Wenchuan cases, the sense of emergency is more clear and the atmosphere is more suitable for integrated/management procurement systems, under which the cooperation between reconstruction stakeholders is expected.

The control/management mode of disaster reconstruction plays an important part in determining the overall structure of recovery, which further influences other important issues in the reconstruction process, such as procurement and contractual arrangements, international aid and how aid is coordinated, the funding sources, and the community involvement. There has long been an argument about whether top-down or bottom-up disaster recovery is more suitable. This depends on the scale and type of the disaster, and also the cultural aspects and social-economic structure of the affected society. In reality, both approaches exist simultaneously and it is believed in this research that a balanced structure of recovery control/management is more desirable than purely top-down or bottom-up. The question is how this balance could be managed and maintained. The control/management focus changes according to different phases of the recovery (i.e. emergency, restoration, reconstruction) and at different levels of the overall controlling framework. For example, in the Wenchuan case study, the top-down headquarter-commands mode was more appropriate in the initial emergency response, where swift mobilisation of resources, quick decision making, clear coordination, and constant supervision were required. However, the procurement process is different between the initial response and long-term reconstruction phases. The community participation into the reconstruction, sometimes even drove the reconstruction. Community participation should be encouraged to make sure the affected community is in the centre of decision making for their own recovery. This “ownership” will in the long term ensure the sustainable development of disaster-affected areas and resolve the problems of reconstruction efficiency and transparency. The “Community Contract” introduced in the literature review is one example of encouraging community participation through contractual arrangements. It is believed that a successful disaster reconstruction process should be coordinated, supervised and supported by relevant authorities but led by local communities and local reconstruction agencies. The international aid agencies in the form of NGO’s acting as management contractors are crucial but reconstruction effort should be coordinated into the overall planning and be combined with
local experiences and resources, and be managed by local authorities representing the best interests of affected communities.

The recommendations from this research for the reconstruction process for a large scale New Zealand disaster with the relevant thesis sections are summarized below:

<table>
<thead>
<tr>
<th>Recommendations:</th>
<th>Relevant sections in this thesis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use existing relationships (based on trust) to get the reconstruction process done to ensure a good collaboration; Select the appropriate procurement systems, such as the integrated or management-orientated procurement systems to make full use of the existing good relationship between contracting parties with competitiveness and transparency maintained</td>
<td>s2.1.7; s2.2.7; s2.4; s8.2.6 …</td>
</tr>
<tr>
<td>2. The early involvement of the reconstruction agencies, including their design and planning team, into the initial response phase is necessary.</td>
<td>s2.1.3; s2.1.4 …</td>
</tr>
<tr>
<td>3. Pre-disaster identification and registration of suitable contractors and suppliers for reconstruction</td>
<td>s2.1.3; s2.2; s2.1.4;</td>
</tr>
<tr>
<td>4. The importance of pre-existing inter-agency linkages should be reinforced in the form of a pre-event memorandum of understanding or a formal contract, and should also be emphasized in CDEM operational planning and training.</td>
<td>s3.2.1; s5.4; s5.7</td>
</tr>
<tr>
<td>5. Use the set of criteria in this research (section 3.3.1) for the public-sector clients to identify their procurement priorities and preferred contractual models in a reconstruction situation pre-disaster through training programs and exercises</td>
<td>s3.3.1</td>
</tr>
<tr>
<td>6. When describe a certain procurement system or contractual model in government documents such as procurement guidelines etc., the 6 procurement variables should also be included as in chapter 8 of this thesis as a part of the description.</td>
<td>s2.3.2.3; s8.2</td>
</tr>
<tr>
<td>7. Encourage the use of “Community Contract” (section 3.3.2.3) or similar arrangements for post-disaster reconstruction projects that are labour-intensive and technically-straightforward</td>
<td>s3.3.2.3</td>
</tr>
</tbody>
</table>
8. Relevant government agencies should work together now to produce a practical guidance note on post-disaster public-sector procurement, which clearly defines what constitutes a disaster reconstruction, the range of projects to be tendered, in which way they should be tendered, communication links and lines of authority and control.

9. Emphasize the need to standard contract drafting committees of a specially-drafted set of standard contracts for the use for post-disaster reconstruction consider incorporating the desirable features outlined in this research.

10. Swift decision on funding sources and approvals should be made to accelerate the reconstruction process and this arrangement could be formalized through CDEM regulations and be fully understood by the recovery agencies pre-event. This also requires a disaster scenario model determining different level of impacts and a priority list of vulnerable areas to be developed and agreed pre-event for fast assessment post-disaster.

11. The source of the funding for public facilities should be determined before any of the disasters, it is preferred that a single authority would take full responsibility in funding the reconstruction to avoid unnecessary confusion in an emergency response situation (i.e. avoid the central govt vs. regional council scenario). The Central Government should take a proactive role and cooperate closely and quickly supporting District Councils’ initiatives.

12. Specific arrangements should be made between adjacent territorial authorities to ensure a single authority over adjoining areas of likely single event emergencies.

13. A national guide on the practical application of the emergency works provisions of the Resource Management Act (RMA) should be produced.

14. Both the District Council and Regional Council will need to review policies in respect to regulatory and non-regulatory matters, in terms of identifying the cause of the disaster, and mitigation of it, along with future management processes, linked with the broader disaster risk management and sustainable development frameworks (such as the “Shanghai Principles” introduced in section 3.1.1.2).
15. Consistence of communication in all levels - this is especially crucial in the initial response phase. It means a central point for communication, an appropriate computer-based information system to integrate information flow between local, CDEM Group and national levels of emergency management and associated agencies, a single consolidated mapping system, the same format for all situation reports etc., should be agreed upon and implemented pre-event through exercises.

Based on the findings of the research, some recommendations are made for the direction of future research into post-disaster reconstruction procurement and contractual arrangements as follows:

- **Sources of funding for reconstruction**: As demonstrated previously in case studies, the certainty of funding sources for reconstruction would save valuable time in emergency phase and ensure an early commencement of reconstruction and overall recovery. However, in the current cases, funding sources are not clear. Various stakeholders contribute to the reconstruction effort financially, such as the government agencies (both central and local), the insurance industry, the community through donations, the individuals, etc. According to different types of reconstruction (public or private), the makeup of the funding sources may vary. This needs to be studied carefully to provide a basis for smooth implementation post-disaster. The author feels that there are gaps between perceptions from different stakeholders and also between plans and reconstruction reality. The theoretical framework needs to be further verified in local reconstruction case studies. To summarize, the research should be about who pays for reconstruction, the mechanism of payment and the contractual issues involved in payment for reconstruction.

- **Early involvement of reconstruction contractors**: As emphasized in recommendation 2 and 3, early involvement of potential contractors and suppliers pre-event or during the emergency response phase into reconstruction planning would be beneficial. However, the incentives and the administrative structure in which this could be facilitated are not clear. The research may involve the decision making process of different stakeholders for planning and reacting to disasters, suggest formats for pre-registration of contractors, and set rates for post-disaster works.
• **Detailed use of standard contracts for reconstruction:** This research focuses more on the overall procurement systems and contractual models rather than the detailed clauses of standard contracts for reconstruction. There is a need for further research on the use of different standard contacts in disaster reconstructions, or how those self-drafted contracts for rebuilding have been set up, what are the differences between those to the standard sets of contract documents and the reasons behind these differences. Those could be based on the desirable features of reconstruction procurement systems identified in this research.

• **Measurement of successful implementation of reconstruction procurement:** This may firstly involve the identification of Key Performance Indicators (KPIs) for a successful procurement during normal time construction through literature review. Further research is required to determine the relevance of those KPIs for post-disaster reconstruction procurements, develop specific sets for reconstruction purpose, and test them in real case studies, etc. The KPIs identified may include both tangible and intangible indicators, which may cover considerations in engineering, social, economic, and psychological aspects of disaster reconstruction.

• **Detailed relationship of other factors influencing reconstruction procurement:** As discussed earlier, other factors influencing reconstruction procurement include: the size and type of the disaster, the control/management mode of reconstruction, the cultural aspects and social-economic settings of the affected society. Further research is required to determine the exact relationship between those factors and the different procurement systems adopted post-disaster.

In summary, this research has explored theoretically and practically, the procurement and contractual arrangements for post-disaster reconstruction and has found that integrated and management-orientated procurement systems are more appropriate for post-disaster reconstruction use. Associated contractual models and possible standard contracts, together with a list of desirable features for the reconstruction procurement path, were identified. The recommendations are primarily made for New Zealand, although the recommendations could be universally applied. This thesis has also identified the potential direction of future research into reconstruction procurement with some considerations for facilitating future research. If reconstruction is managed in a systematic and coordinated manner, then affected communities will not be left facing a secondary disaster of homelessness, lack of facilities and poorly reconstructed infrastructure.
List of References


ADB (2010) Procurement Guidelines. IN ASIAN DEVELOPMENT BANK (Ed.).


BRR (2006c) Trucking and Illegal Payments in Aceh Investigation.


CHIA, E. S. (2007) Engineering disaster relief. 3 ed. 445 Hoes Lane / P.O. Box 1331, Piscataway, NJ 08855-1331, United States, Institute of Electrical and Electronics Engineers Inc.


COSMOS CORPORATION (1983) *Case studies and organisational innovation: strengthening the connection*, Bethesda, MD.


FIDIC (2010a) FIDIC standard conditions of contract introduction. FIDIC website.

FIDIC (2010b) International Federation of Consulting Engineers - Regions.


JCT (2008) Practice Note - Deciding on the appropriate JCT contract. JCT Website.


LI, B., HU, X. & XIE, B. (2009) Transportation network reconstruction for natural disasters in the emergency phase based on connectivity reliability. Chengdu, China, American Society of Civil Engineers.


NARASIMHAN, V. L. (2008) A risk management toolkit for integrated engineering asset maintenance. 2 ed. PO Box 588, (2 Ernest Place), Crows Nest, NSW 1585, Australia, Engineers Media.


NEC (2010a) NEC3 - International use of NEC contracts.

NEC (2010b) NEC - International - New Zealand.


PROJECT AID (2010) Bringing effective project management to humanitarian and community projects - PMI's Post Disaster Rebuild Methodology.


SICHUAN DISASTER RECONSTRUCTION NEWS ONLINE (2010a) The reconstruction of rural housing units in Mianyang is entering the final critical stage. In YANG, F. (Ed.). Chengdu, Sichuan Provincial Government Online.


THE WORLD BANK (2010) Guidelines Procurement under IBRD Loans and IDA Credits. IN THE WORLD BANK (Ed.).


TRANSIT NEW ZEALAND (2005) *Long Term Procurement Plan (June 2005)*.


Further readings for Banda Aceh Case Study:
(documents collected during the fieldtrips that are related but not directly referenced in the drafting of the Banda Aceh Case Study chapter)

BRR. "RESETTLEMENT ASSISTANCE OPTIONS, BRR Policy Guidelines for the Provision of Resettlement Assistance to Victims of the NAD/Nias Tsunami and Earthquakes."
BRR. (2005). "BRR 6 months Information Sheet."
BRR. (July, 2006). "Timber procurement and transportation guidelines (draft)."
BRR. (June 2006). "Decrees for Housing and Human Settlement 060606 amended ".
BRR. (June 2006). "Village Planning Guidelines."
BRR. (Sep, 2005). "BRR INFRASTRUCTURE GUIDELINES #1, Extended Guidelines for Infrastructure Redevelopment in Tsunami Affected Areas, ISSUED DRAFT #1."
BRR. (Sep, 2005). "BRR news update."
BRR. (Sep, 2005). "Infrastructure Implementation in Tsunami and Earthquake Affected Areas, Schematic A-F."
NGO C. (June 2006 ). "LETTER OF AGREEMENT - NGO C AUSTRALIA VOLUNTEER PERSONNEL."
NGO C. (May, 2005). "PROJECT REPORT TO BRR."
MINISTRY OF PUBLIC WORKS INDONESIA. "Building Code - Province of Nangroe Aceh Darussalam."
UN. "UNITED NATIONS GENERAL CONDITIONS FOR CONTRACTS FOR PURCHASE OF GOODS."
UN. "UNITED NATIONS SPECIAL CONDITIONS FOR CONSTRUCTION WORKS."
UN. (March, 2006). "PS REVISED VERSION OF INVITATION TO BID TERMS AND CONDITIONS 13 March 2006."


UN-Habitat. (Sep, 2005). "Meeting Minutes. - why the timber taskforce discontinued before, what are the outstanding issues, what is needed to restart a timber task force."


UNORC. (May, 2006). "HUMANITARIAN AND RECOVERY UPDATE – ACEH & NIAS."


Appendices:
Appendix A: Guide to selecting the appropriate JCT main contract
Part 2 NEC3 Procurement and Contract Strategies

Sustainable procurement for construction or engineering relies upon making value for money decisions over the life of the asset and not solely on capital costs. A value for money solution to meet user requirements relies upon the optimum combination of whole-life costs and quality.

Any procurement strategy should identify the best way of achieving the project objectives, taking into account the likes of key objectives, constraints, funding, risk and asset ownership. It is the optimum balance of these factors that one strives for.

The procurement route is the means of achieving the procurement strategy. This will include the contract strategy that best meets the client’s needs.

The contract strategy will determine the level of integration of design, construction and maintenance for a project. This should support the main project objectives in terms of the likes of risk allocation, incentivisation and delivery.

There are many procurement routes available including traditional, design and build, prime contracting, management contracts and private finance initiative/public-private partnership (PFI/PPP). The NEC is designed to be flexible enough to work in most currently available procurement routes.

Traditional approaches

The traditional approach with many projects in the construction industry is to have design as a separate function from construction.

Figure 1 shows a simple relationship between a Client and a Consultant or Contractor for pre-construction or construction related services. The Client could be one of public or private standing and the Consultant or Contractor can in turn subcontract services to suit. The contract could be for the likes of design, project management, cost consultancy, environmental, audit, facilitation, management consultancy or architectural services. The NEC contracts that could be used are the PSC or TSC and this approach can be used on a one-off project or a series of projects.

![Figure 1. Single appointment for non-construction works.](image)

Figure 2 shows another simple contractual relationship this time for construction works to be carried out for a Client by a Contractor. Again, the Client could be one of public or private standing and the Contractor can in turn subcontract works to suit. The contract could be for constructing any construction or engineering works. The NEC...
Part 2 NEC3 Procurement and Contract Strategies

contracts that should be used are the ECC, ECSC or TSC and this approach can be used on a one-off project or a series of projects.

![Diagram](image)

Figure 2. Single appointment for construction works.

The classic traditional contract is a consultant designing works on behalf of a Client who engages a Contractor to construct them, as shown in Figure 3. Under ECC, ECSC or TSC, the Contractor is responsible for the quality of his workmanship but the Client has the safeguard by engaging a Supervisor whose role is to check that the materials and workmanship meet the contracted quality levels.

![Diagram](image)

Figure 3. Multiple appointment of suppliers.

More realistically, there will be many organisations involved in even a simple project and Figure 4 below demonstrates the cascading NEC contracts in such a relationship.

![Diagram](image)

Figure 4. Cascading NEC contracts in project organogram.
Design and build

There are a number of variants of design and build contracting, including just design and build (JDB), design build operate (DBO) and design, build, operate and maintain (DBOM).

In D&B a single Contractor acts as the sole point of responsibility to a Client for the design, management and delivery of a project, on time, within budget and usually in accordance with a performance specification. Figure 5 shows a typical D&B project organisation for a single project. If a Client requires Contractor self-certification of the quality of the works, then the Supervisor instead becomes a function of the Contractor.

![Diagram of D&B project organisation]

**Figure 5. Typical D&B project organisation.**

In DBO the Contractor operates the asset over a compliance period primarily to prove the contracted assumptions. The contract strategy for this can be one of two approaches, with the choice largely being down to length of the operating period. If a relatively short operating period is required then the D&B element of the project could be encompassed as a section of the whole of the works within the ECC with the operating period of, say, one year being a second section. Payments for the design, construction and operation would follow the chosen ECC payment option.

If the operating period was a considerable length of time then it may be preferable to enter into two contracts, ideally at the same time, one to D&B under ECC and the other to operate under TSC. Figure 5 is still representative of the D&B element of the works with Figure 6 indicating the TSC contractual relationships. The assumption here is that no further design is required in this period, though of course this could be provided on a subcontracting basis if required.

DBOM is where the asset is also operated and maintained by the Contractor for (usually) an extended period of time of 5, 10, 15 years or more. In this scenario, it is more likely that the two contract approach, with TSC in place to maintain the asset in a certain state, would be the preferred route.
Prime contracting

Prime contracting is conceptually very similar to D&B and is where a single Contractor again acts as the sole point of responsibility to a Client for the management and delivery of a construction project, on time, within budget (this time defined over the lifetime of a project) and in accordance with (usually) a performance specification. Often Clients will use this model where they require the Contractor to demonstrate, during the initial operating period, that the operating cost and performance parameters can be met in accordance with a pre-agreed cost model.

The contractual relationships for prime contracting are as those for D&B, DBC or DBCOM, as applicable. A distinguishing feature of prime contracting in the United Kingdom from D&B is that often the design requirements are to deliver the performance requirement for which the asset was intended, whereas the level of reasonable skill and care is often the chosen norm under the D&B variants. The level of design responsibility can be chosen easily whichever NEC contract is used, however, the risk profile of these are in reality quite different.

Management contracts

Management type contracts include management contracting and construction management, both are catered for in NEC. In reality a management contract structure is similar to a traditional contract, where the main Contractor subcontracts works out. He can carry out as much design and/or construction of the works as he desires, but this should be listed in Contract Data part two as a lump sum total. This stated total, together with the package Contractor’s costs, are added together and the management Contractor’s Fee is applied to this amount. This total is the Price that the Client pays. Figure 7 illustrates this management contracting relationship.
Figure 7. Typical management contracting relationship.

Construction management can be organised under NEC as demonstrated in Figure 8. Here, the Construction Manager joins the professional team alongside the Project Manager, Supervisor and a Designer. Direct contracts are entered into between the Client and specialist trade contractors, who in turn may subcontract works.

Figure 8. Typical construction management relationship.
PFI/PPP

This procurement route is typically where the public sector Client buys services with defined outputs from the private sector on a long-term basis, typically for 25 years. This will involve maintaining or constructing and maintaining the asset, and the supplier is incentivised in this model to have the highest regard to whole-life costing as they have the risk of operation and maintenance for a substantial period of time.

NEC can be used for all works and services within the supply chain but not for the head contract itself. Traditionally the head contract is a bespoke agreement designed to reflect the specific project. Figure 9 shows how the NEC could be used to design and construct the asset.

Figure 9. Typical PFI/PPP relationship for construction activities.
Figure 10 shows how the NEC could be used to contractually organise the operation and maintenance (O&M) of the asset.

![Diagram](image)

Figure 10. Typical PFI/PPP relationship for O&M activities.

Summary

The extent of types of work and service, and the contractual relations to deliver them, are diverse, but NEC has sufficient flexibility to provide Clients and their suppliers with successful outcomes. Although the use of the entire NEC family is in no way a mandatory requirement, having suppliers engaged on similar and consistent terms, which promote partnering, team working, the principles of lean thinking, a focus on time, cost and quality with a process for dispute avoidance and efficient dispute resolution should disputes arise, will increase the likelihood of a mutually satisfactory project for all concerned. NEC terms are a radical departure from traditional drafting approaches and are drafted on a relational contracting basis that embodies efficient management processes.
Appendix C: Interview questions and schedules

C.1 New Zealand Case Studies interview questions and schedules

Questionnaire 1

A. Contractual arrangements
1. What types of contract and payment mechanisms were used for reconstruction (Design & Built, A+B contract, negotiated or other approaches)?
2. How was the contract process going? (time of advertising, bid opening, award and approval of contracts)
3. What was expected of the contractor(s) during the reconstruction?
4. Which parties were working together? And how was the collaboration?

Main question: What are the differences between contractual arrangements in disaster reconstruction in comparison with the normal situation?

B. Building, environmental regulations and legislation
1. Which regulatory processes facilitate the reconstruction? and how?
2. Were there any problems with the existing legislation and regulations during the reconstruction after the disaster? If yes: What were the problems? (how were they resolved?)
3. What were the wishes and demands of the citizens involved? (Did the demands and wishes hinder the progress of reconstruction?)
4. Have the workloads and resources availability been a problem? (Where did the workloads and resources come from?)

Main question: What are the differences between the post-disaster building process and the normal building process (with focus on legislation and regulations)?

C. Funding
1. How was disaster reconstruction funded?
   • according to different types of work, public & private
   • natural disaster relief expenditure is addressed in any relevant law?
   • how did the amount of subsidy been decided?
2. Which authority was the main funding authority?
3. Were there any other authorities financially assisted the reconstruction? If yes, how (through what payment mechanisms)?
4. Was everything funded? How about the roads? What was the amount of the funding?
5. Was everything insured? If no: How much was the shortfall between insurance cover and the cost of recovery from the disaster? If too significant, how could it be available?
6. Did the community already have/ or aware they have a Mitigation/Recovery plan about reconstruction funding?

Main question: What is the difference between funding in post disaster situations, and funding in the normal construction situation?

D. Quality
1. Was the reconstruction process efficient? (Capacity shortages/shortfalls?)
2. Was there a Quality Assurance plan available for reconstruction? To what level should the reconstruction be carried out? (upgrading of facilities to a level greater than existed

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30 Standard format, used in all case studies, the translated version is used in Chinese cases
before the disaster or to restore to previous levels, or only for temporary purposes then move out of potential hazard area?)

3. Was the rebuilding of roads and houses also an opportune time to prepare for a next disaster? If yes, how?

Main question: What is the difference between the quality of the reconstruction and the normal building process?

E. Time

1. What defines switch from response to recovery?
   • how long does it take approximately?
   • is there any physical or policy milestone?
   • how the procurement approach changes according to the switch?

2. How was the reconstruction process made as quick as possible? (waive laws or procedures? Fast action in advertising, bid opening, award and approval of contracts? Other ways?)

3. What were the priorities in recovery/reconstruction process? how were this pattern defined?

Main question: What is the difference between the time of reconstruction and construction in normal situations?

F. GENERAL CONCLUSION

1. Was there any specific person be appointed as Recovery Coordinator during the flood? What were the agencies/parties involved to be coordinated in the recovery? how was the process?

2. How do time/cost/quality drivers differ on reconstruction projects and to which degree the balance maintain?

3. How is construction companies mobilised to do the reconstruction work?

New Zealand Case Studies Interview and meeting Schedule

<table>
<thead>
<tr>
<th>Interviewee(s)</th>
<th>Time/ Date</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery Facilitator - Matata Rehabilitation MCDEM</td>
<td>1430-1600</td>
<td>Questionnaire 1</td>
</tr>
<tr>
<td></td>
<td>1 June 2007</td>
<td></td>
</tr>
<tr>
<td>Transit NZ Regional Manager &amp; MWH Consultant (involved in the Manawatu Flood reconstruction in Wanganui Region)</td>
<td>1400 – 1600</td>
<td>Questionnaire 1</td>
</tr>
<tr>
<td></td>
<td>1 Nov 2005&lt;sup&gt;31&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<sup>31</sup> This interview was carried out by a colleague researcher (Jetske Van der Zon) from Resilient Organisations Group using the questionnaire as a pilot study at an early stage of this research
## C.2 Indonesian Case studies interview questions and schedules

### C.2.1 July 2006 Banda Aceh fieldtrip

#### 2006 Banda Aceh Interviews schedule

<table>
<thead>
<tr>
<th>Interviewee(s)</th>
<th>Time/ Date</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procurement Manager NGO C</td>
<td>1415-1540, 8 July 2006</td>
<td>Questionnaire 2 (included below)</td>
</tr>
<tr>
<td>BRR(^{32}) Timber Helpdesk officer</td>
<td>0930-1000, 10 July 2006</td>
<td>Open discussion on timber procurement and supply chain transportation</td>
</tr>
<tr>
<td>NGO C’ Project Manager in Banda Aceh</td>
<td>1400-1530 (recorded), 12 July 2006</td>
<td>Questionnaire 2</td>
</tr>
<tr>
<td>British Red Cross Indonesia Forestry Support Services Ltd. New Zealand Procurement Manager NGO C</td>
<td>0830-1145, 17 July 2006</td>
<td>British Red Cross generally introduced and discussed with us the proposed procedure of importing timber from New Zealand for reconstruction work in Banda Aceh</td>
</tr>
<tr>
<td>Procurement Manager NGO C</td>
<td>1000-1030, 24 July 2006</td>
<td>Questionnaire 3 (included below)</td>
</tr>
<tr>
<td>Program Manager of NGO C’ housing project</td>
<td>1337-1457 (recorded), 24 July 2006</td>
<td>Questionnaire 4 (included below)</td>
</tr>
<tr>
<td>NGO C’s Shelter Team Manager</td>
<td>0930-0955 (recorded), 26 July 2006</td>
<td>No1,7,8,10,13 of Questionnaire 3 and No2,8,9 of Questionnaire 4</td>
</tr>
</tbody>
</table>

\(^{32}\) Aceh and Nias Rehabilitation and Reconstruction Agency (Badan Rehabilitasi dan Rekonstruksi), representative and coordinating body of Government of Indonesia in tsunami reconstruction process
<table>
<thead>
<tr>
<th>Meeting Description</th>
<th>Date/Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Introduction workshop of BRR Housing and Human Settlement Policy (1st day presentation)</strong></td>
<td>6th July 2006 in a seminar room on the top floor of a local hospital, attended by all the country representatives of NGO C during their 2-days workshop in Banda Aceh</td>
</tr>
<tr>
<td><strong>Flowchart of Timber procurement and transportation guideline introduction meeting (recorded)</strong></td>
<td>11th July 2006 in UNORC(^{33}) meeting room, attended by BRR officers, senior advisors to BRR timber policy, UNHCR(^{34}) and other NGO representatives</td>
</tr>
<tr>
<td><strong>Construction weekly meeting No1</strong></td>
<td>11th July 2006 in NGO C’s head office, attended by construction team, project managers, shelter team leader and overall program coordinator</td>
</tr>
<tr>
<td><strong>Construction weekly meeting No2</strong></td>
<td>18th July 2006 in NGO C’s head office, discussed the options for timber procurement and several problems encountered by construction team on the site</td>
</tr>
<tr>
<td><strong>Timber decision meeting in NGO C</strong></td>
<td>18th July 2006 in Procurement office, attended by program coordinator, procurement manager, shelter team manager, further discussed the options mentioned before on weekly meeting for timber supply</td>
</tr>
<tr>
<td><strong>Construction weekly meeting No3</strong></td>
<td>25th July 2006 in head office, attended by construction team, project managers, shelter team manager and program coordinator, discussed the problems arisen with the introduction of new BRR houses to NGO C’s target.</td>
</tr>
<tr>
<td><strong>Timber decision meeting No2</strong></td>
<td>25th July 2006 in procurement office, attended by program manager, program coordinator, procurement manager, a local timber supplier from Kalimantan</td>
</tr>
<tr>
<td><strong>Timber on-site test</strong></td>
<td>26th July 2006 in Kalimantan timber merchant’s warehouse in Aceh, attended by NGO C’s architecture consultant, procurement manager and timber supplier</td>
</tr>
</tbody>
</table>

\(^{33}\) United Nations Office of the Recovery Coordinator  
\(^{34}\) United Nations High Commission of Refugees
Besides the standard questionnaire 1, other versions used are:

**Questionnaire 2**

_revised on 8 July 2006_

1. What role do you think that NGO C is taking in the reconstruction process between involved parties such as Community Board and BRR? Contractor, engineer, client, or funding authority?
2. Except NGO C and other NGO’s, are there any local or international contractors (construction companies) involved in the reconstruction phase? What is their market share?
3. Building legislation and funding policy: is BRR’s Housing and Human Settlement Policy coming from BRR solely? Is that all the organisations including NGO’s involved in reconstruction process are under this policy?
4. What are the wishes and demands of the citizens involved according to your experiences? Are they hinder the progress? How and who decided the eligibility and priority of the reconstruction? How did NGO C and other NGO’s choose their reconstruction targets at first place?
5. In general prospective, how is reconstruction funded? (according to different types of works: public roads, facilities, private houses)
6. Has natural disaster relief expenditure been addressed in any relevant law or mitigation plan? How did the amount of subsidy been decided?
7. Quality: is there a QA plan available? To what level is the reconstruction aiming at? Is rebuilding also an opportunity to better prepare for next disaster?
8. Time/ schedule: What defines switch from response to recovery? How long did it take? Is there any physical or policy milestone?
Questionnaire 3 (20/7/06)

1. **What are the overall organizational matrix/structure of NGO C INDONESIA?**
2. What value does procurement/ design/ site construction/ site socialisation provide in achieving NGO C’s strategy or mission?
3. What value do vendors, BRR, other NGO’s, the UN system provide?
4. Who or what are the roles of **design question proposers and solution providers**? Some of those in the chain are both proposers and providers. How are these separate roles viewed and **how does one go from a proposer to a provider**? Are there any patterns to these roles?
5. What are the **design values and strategies for each of the different sections in NGO C**? How are the goals of the procurement/ design/ site construction/ site socialisation the same or different from one another? What happens with the differences? How are they handled (if at all)? How do the similarities come about? Are they by design or by accident?
6. What are the standard conditions of contracts and standard forms?
7. **How does information get around the organization**? How is the email system used and to what extent? When and why are meetings called? Who attends and are they useful? A list of all the usual meetings that occur between and in the sections of procurement/ design/ site construction and site socialisation.
8. What is the flow of information between the sections? How issues are resolved, what direction is the information and what level of feed back is occurring?
9. Are there any different NGO C mission statements exist in its different sections?
10. **What are the design values and strategies for each of the different sections in NGO C?** How are the goals of the procurement/ design/ site construction/ site socialisation the same or different from one another? What happens with the differences? How are they handled (if at all)? How do the similarities come about? Are they by design or by accident?
11. **What are the gaps and overlaps between the different sections in NGO C?** What examples are there of supplier/vendor involvement to reduce design overlap ie. type of wood, timing of supply? Water tank event.
12. **How complex are the designs and how are they being received by procurement and by the site? To what extent has the design resulted from community consultation and to what extent could it respond more effectively?**
13. **What are the standard conditions of contracts and standard forms?**
14. **How will NGO C address bribes and under the table payments? How are issues of sustainability (that appears to be seen as both a risk and increasingly as a liability) dealt with both inside NGO C and outside NGO C (for example BRR)?**
15. What are the gaps and overlaps between the different sections in NGO C? What examples are there of supplier/vendor involvement to reduce design overlap ie. type of wood, timing of supply? Water tank event.
16. Are there examples of **synergy** where the whole is greater than the sum of the individual parts? Are there examples of **supply networks** (as opposed to supply chains)? Are there examples of both and what is the pattern of their development? (A supply network has the added component of familiarity between NGO C and it vendors. It suggests that certain vendors are being able to develop an understanding of what NGO C’s issues are and are responding to resolve (or already have resolved) what maybe issues between the two organisations. A supply chain on the other hand just supply with no feedback. (An example of a network would be the rubber timber situation in question 1 and possibly Ralph Douglas from British Red Cross as a second example. These suggest some maturity of this area of procurement.)

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1. What is the overall organizational matrix/structure of CII?
2. What are the main obstacles that you are facing now in the reconstruction process?
3. Who or what are the roles of design questions proposers and solution providers? Some of those in the chain are both proposers and providers. How are these separate roles viewed and how does one go from a proposer to a provider? Are there any patterns to these changes?
4. What is the flow of information between the sections? How does information get around the organization? How is the email system used and to what extent? When and why are the meetings called? Who attends and are they useful? What direction is the information and what level of feedback is occurring? Do you have the minutes of previous meetings?
5. According to your experiences, what are the gaps and overlaps between the different sections in NGO C?

6. Site socialization/community consultation: what are the wishes and demands of the citizen involved according to your experiences? Do they hinder the progress? Who decide what kind of priority for the reconstruction? How did NGO C and other NGOs choose the reconstruction targets at the first place?
7. In general prospective, how is reconstruction funded according to different types of works (public roads, facilities, private houses)?
8. Is natural disaster relief expenditure addressed in any relevant law/mitigation plan? How did the amount of subsidy been decided? Could you break down the cost of a typical 52 million house as an example?
9. Is there a QA plan available for reconstruction? To what level is the reconstruction aiming at?
10. Anything else you want to add to your comments?
### 2008 Banda Aceh Interviews schedule

<table>
<thead>
<tr>
<th>Interviewee(s)</th>
<th>Time/ Date</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reconstruction Coordinator Emergency Architects</td>
<td>1100 - 1500, 22 March 2008</td>
<td>Conversation based on Questionnaire 1</td>
</tr>
<tr>
<td>Finance Coordinator NGO C International Indonesia</td>
<td>1430 – 1520, 24 March 2008</td>
<td>Unstructured interview based on Funding and cost aspect of Questionnaire 1</td>
</tr>
<tr>
<td>Procurement and Supply Chain Manager Canadian Red Cross &amp; Recovery coordinator Canadian Red Cross</td>
<td>1300 – 1500, 21 April 2008</td>
<td>Questionnaire 1</td>
</tr>
<tr>
<td>Head of Office IOM 35 – Banda Aceh</td>
<td>1400 – 1500, 29 April 2008</td>
<td>Unstructured interview based on Questionnaire 1</td>
</tr>
<tr>
<td>Procurement &amp; Supply Chain Manager NGO C Banda Aceh</td>
<td>1410 – 1530, 13 May 2008</td>
<td>Questionnaire 5 revised based on Questionnaire 1 (included below)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction workshop of NGO Housing and Human Settlement Policy</td>
<td>18 March 2008, DAY 1</td>
<td>Orientation organized by NGO C’s Housing Program leader and general functional managers</td>
</tr>
<tr>
<td>Reconstruction Program Progress</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-site briefing of housing reconstruction progress (in Jantho)</td>
<td>19 March 2008</td>
<td>Attended by Reconstruction Engineering Supervisor, Infrastructure Reconstruction Manager, Prof. Regan Potangaroa, and local engineers on site</td>
</tr>
<tr>
<td>Site visit to reconstruction projects managed by NGO Emergency Architect in Sigli (4 hours’ drive from Banda Aceh, east coast of Sumatra)</td>
<td>22 March 2008</td>
<td>Attended by Banda Aceh Recovery Program Leader, Engineering Supervisor, Engineers and Architects from NGO ‘Emergency Architects’.</td>
</tr>
<tr>
<td>Briefing meeting with Administration and Financial Management of Aceh Reconstruction Program</td>
<td>24 March 2008</td>
<td>Attended by General Manager, and Head of Financial Department</td>
</tr>
<tr>
<td>meeting with relevant officials from BRR about construction material prices, overall procurement regulations, and village planning guidelines</td>
<td>25 March 2008</td>
<td>Attended by Ricky Sugiatro, Office of the Director, BRR; Col. Raymood Benson, Technical Advisor to BRR; and Dr. Erwin Fahmi, Director of internal affairs, BRR.</td>
</tr>
<tr>
<td>Database management meeting</td>
<td>26 March 2008</td>
<td>Attended by NGO C’s Database Manager</td>
</tr>
<tr>
<td>Construction team meeting</td>
<td>30 March 2008</td>
<td>Attended by NGO C’s Construction Sector Coordinator, and Infrastructure Construction Manager.</td>
</tr>
<tr>
<td>On-site construction meeting</td>
<td>31 March 2008</td>
<td>With local engineers, construction team, and NGO C’s Construction Manager</td>
</tr>
<tr>
<td>Meeting with recovery coordinator from Canadian Red Cross</td>
<td>17 April 2008</td>
<td>Introduction of recovery works carried out by Canadian Red Cross in Banda Aceh and discuss the possibility of conducting interviews with them</td>
</tr>
<tr>
<td>On-site construction meeting</td>
<td>18 April 2008</td>
<td>Attended by local engineers, Construction Sector Coordinator, and Infrastructure Construction Manager.</td>
</tr>
<tr>
<td>Office construction team meeting</td>
<td>28 April 2008</td>
<td>Attended by Construction managers and local staff</td>
</tr>
<tr>
<td>IOM presentation and training</td>
<td>29 April 2008</td>
<td>The author giving presentation on the use of structural testing equipments followed by on-site demonstration for the training of local IOM construction team</td>
</tr>
<tr>
<td>Banda Aceh reconstruction program database team meeting</td>
<td>30 April 2008</td>
<td>Attended by NGO C’s database team, and Construction Sector Coordinator</td>
</tr>
</tbody>
</table>
Questionnaire 5 (08 Aceh Fieldtrip)

A. Contractual arrangements

1. What types of contracts and payment mechanisms were used for reconstruction projects (Traditional, Design & Built, BOOT for infrastructure projects, negotiated or other approaches)?
2. Take a typical reconstruction project from your organisation and try to determine the following factors in the list (some examples are given):

<table>
<thead>
<tr>
<th>Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source of funding</td>
<td>Owner-financed, public sector-financed, developer-financed, PFI, PPP</td>
</tr>
<tr>
<td>Selection method</td>
<td>Negotiation, partnering, frameworks, selective competition, open competition</td>
</tr>
<tr>
<td>Price basis</td>
<td>Work and materials as defined by bills of quantities, cost reimbursable, whole building, a fully-maintained facility, performance</td>
</tr>
<tr>
<td>Responsibility for design</td>
<td>Architect, engineer, contractor, in-house design teams, supplier</td>
</tr>
<tr>
<td>Responsibility for management</td>
<td>Client, lead designer, principal contractor, joint venture, construction manager</td>
</tr>
<tr>
<td>Amount of sub-contracting</td>
<td>0-100%</td>
</tr>
</tbody>
</table>

3. How was the contract process going? (time of advertising, bid opening, award and approval of contracts)
4. What was expected of the contractor(s) during the reconstruction?
5. Which parties were working together? And how was the collaboration?

Main question: What are the differences between contractual arrangements in disaster reconstruction in comparison with the normal situation?

B. Building, environmental regulations and legislation

1. Which regulatory processes facilitate the reconstruction? and how?
2. Were there any problems with the existing legislation and regulations during the reconstruction after the disaster? If yes: What were the problems? (how were they resolved?)
3. What were the wishes and demands of the citizens involved? (Did the demands and wishes hinder the progress of reconstruction?)
4. Have the workloads and resources availability been a problem? (Where did the workloads and resources come from?)

Main question: What are the differences between the post-disaster building process and the normal building process (with focus on legislation and regulations)?

C. Funding

1. How was disaster reconstruction funded?
   - according to different types of work, public & private
   - natural disaster relief expenditure is addressed in any relevant law?
   - how did the amount of subsidy been decided?
2. Which authority was the main funding authority?
3. Were there any other authorities financially assisted the reconstruction? If yes, how (through what payment mechanisms)?
4. Was everything funded? How about the roads? What was the amount of the funding?
5. Was everything insured? If no: How much was the shortfall between insurance cover and the cost of recovery from the disaster? If too significant, how could it be available?
6. Did the community already have/ or aware they have a Mitigation/Recovery plan about reconstruction funding?
Main question: What is the difference between funding in post disaster situations, and funding in the normal construction situation?

D. Time

1. What defines switch from response to recovery?
   • how long does it take approximately?
   • is there any physical or policy milestone?
   • how the procurement approach changes according to the switch?
2. How was the reconstruction process made as quick as possible? (waive laws or procedures? Fast action in advertising, bid opening, award and approval of contracts? Other ways?)
3. What were the priorities in recovery/reconstruction process? how were this pattern defined?

Main question: What is the difference between the time of reconstruction and construction in normal situations?

E. GENERAL CONCLUSION

1. Was there any specific person or organisation be appointed as Recovery Coordinator? What were the agencies/parties involved to be coordinated in the recovery? how was the process?
2. How do time/cost/quality drivers differ on reconstruction projects and to which degree the balance maintain?
3. How are construction companies mobilised to do the reconstruction work?

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36 could be skipped if time is not enough
C.3 Chinese case studies interview questions and schedules

C.3.1 98’ Yangtze River Floods Reconstruction

Questionnaire 6\(^{37}\) (revised Chinese version based on Questionnaire 1)

关于 98洪水灾后重建的一些问题

一、 合同及招投标安排
1. 灾后重建过程中使用了何种合同和招投标方式？
   例如：合同方面：传统的总价合同，议价合同，全包合同/一揽子合同（设计+施工），
   或者其他的合同类型；招投标方式：选择性招投标，指定施工方然后议标，开放式竞争性招投标或其他
2. 重建项目的建设实施过程是如何进行的？效果如何？（公布招标公告的时间长短，开标，
   宣布中标和签订合同的过程是否令人满意）
3. 在重建过程中，对承包商的要求是什么？更倾向于选择怎样的承包商？
4. 有哪些参与方（项目参建方）在一起来工作？他们的合作情况如何？
5. 在整个重建过程中，你认为你所经历的最困难的事情是什么？
   在整个建设实施过程中的合同和招投标安排方面，你认为最困难的事情是什么？
   在灾害重建中的项目建设实施安排与平常情况下的安排有什么不同之处？

二、 建筑环境法律法规
1. 有无专门的法律法规（办法、规定等）指导和统筹整个重建过程？如有，是哪些？
2. 在 98 洪水之后的重建过程中有没有发觉上述法律法规中存在的问题和不合理处？如果存在，这些问题是什么？又是如何被解决的？
3. 在灾害重建过程中，受灾居民的期望和要求是什么？这些期望和要求是否防碍了重建工作的进行？
4. 重建过程中的人力资源（如合格的施工队伍）和建设用物资是否感觉到匮乏？这些人力和物资资源是如何分配的？（例如：政策法规规定，国家计划调配或者受灾单位自行筹措等等）
   在法律法规方面，灾害重建过程与平常情况下的建设过程有哪些不同之处？

三、 重建资金来源
1. 灾后重建的资金来源是怎样的？
   （1）根据不同类型的建筑：公共设施，商业建筑，私人房产
   （2）有无相关法律规定自然灾害之后的重建资金额度和来源？
   （3）资助金额（补贴额度）是如何确定的？
2. 最主要的重建资金是来自哪个/哪些机构或政府部门？
3. 是否有其他的机构（或组织）通过财政支持重建工作？如果有，他们是采取何种资助方式？如何进行的？
4. 在重建工作中，是否所有被洪水损毁的财产都得到了拨款和经济上的重建援助？例如，

\(^{37}\) Used in both Chinese case studies of 98 Yangtze River Floods and 08 Wenchuan Earthquake reconstructions
受洪水影响的公路？这种拨款的额度是多少？符合怎样的条件才能得到重建拨款？
5. 大概有多大比例的受损物业是通过财产和房屋保险而得到保险公司赔付的？保险的赔付额足够他们的重建所需吗？不足的部分是由业主承担吗？如果太多而无力承担该怎么办？
6. 普通受灾的单位和业主是否清楚重建的资金应该怎样筹措以及相关的法规规定？

四、 质量
1. 重建工作是积极有效的吗？（有无资金短缺，或质量上的不达标导致工期延长）
2. 是否存在可用于重建工作的既有的质量保证计划（体系）？重建工作要达到怎样的质量水平？（是将基础设施修复到比灾前原有状态更好的水平？还是只是修复到其以前的水平？或是只是为了暂时的用途，然后将其移出潜在危险的地区？）
3. 公路、房屋等重建是否是一个机会，能够为防御日后的灾害做好准备？如果是，是如何进行的？
重建工作的质量要求和平常建造过程的质量要求有区别吗？

五、 时间
1. 从对灾害的最初反应到具体重建之间的转折是怎样确定的？
   (1) 大约用了多长时间？
   (2) 有没有法规规定上的转折点（重建开始时间）？
   (3) 招投标模式在转折前后是否有所改变？
2. 重建工作是如何提速的？（例如：法规规定中的特例和照顾，免除一些不太必要的程序等？在招标公告，开标，宣布中标和签订合同等方面删繁就简？或是别的什么方法？）
3. 重建过程中的优先顺序和重点是什么？这种顺序是如何确定/规定的？

六、 小结
1. 是否任命（委任）特定人员作为洪灾重建工作的协调人/总指挥？在整个重建过程中需要协调哪些机构/组织？协调过程是如何进行的？
2. 重建项目的工期、成本、质量这些驱动因素是如何维持平衡的？这三者之间的平衡保持在哪种水平？（例如：是增大成本，牺牲质量来满足工期？或者质量在长远考虑是最重要的等等？根据不同的重建阶段重点有所不同？）
3. 重建过程和平时的工程建设过程有哪些不同处？（政策规定上的，招投标方式上的，资金来源上的，质量要求上的，时间长短上的）
<table>
<thead>
<tr>
<th>Interviewee(s)</th>
<th>Time/ Date</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief of International Cooperation Office &amp; Assistant, Laboratory of Geo-environmental Engineering Nanjing Hydraulic Research Institute</td>
<td>1400 – 1600 8 Sep 2007</td>
<td>Unstructured interview based on Questionnaire 6</td>
</tr>
<tr>
<td>Contacts from CWRC(^{38}) organized by Prof. Xiao Rongqin Department of Mechanical Engineering Wuhan University</td>
<td>July 2006</td>
<td>Postal questionnaire 6, followed up by telephone interviews</td>
</tr>
<tr>
<td>Chief Engineer of Department of Water Resources, PRC &amp; Chief Engineer of CWRC</td>
<td>June 2007</td>
<td>Postal questionnaire 6, followed up by telephone interviews</td>
</tr>
<tr>
<td>Director &amp; Chair Professor of Water Resource Research Center, Chinese Academy of Sciences (CAS) &amp; 2 Professors from Institute of Geographical Sciences and Natural Resources Research, CAS</td>
<td>1000 - 1300 12 Sep 2007</td>
<td>Unstructured interview based on Questionnaire 6</td>
</tr>
</tbody>
</table>

\(^{38}\) CWRC: Changjiang (Yangtze River) Water Resources Commission, the authority overseeing the reconstruction of post-flood reconstruction after 98 event.
# 08 Wenchuan Earthquake Case Study

## Interview and meeting Schedule

<table>
<thead>
<tr>
<th>Interviewee(s)</th>
<th>Time/ Date</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacts from Sichuan provincial government departments organized by Mr. Wu Yi, a retired director of a national pharmaceutical company in Chengdu</td>
<td>Nov 2008</td>
<td>Postal Questionnaire 6 followed up by telephone interviews</td>
</tr>
<tr>
<td>Secretary of the Board The Association of Chinese Evangelical Ministry[^39]</td>
<td>1300 – 1500 Nov 2008</td>
<td>unstructured interview based on questionnaire 6</td>
</tr>
<tr>
<td>Dean, School of Civil Eng. and Architecture &amp; Asso. HoD of Civil Engineering Department &amp; 2 other Professors from Sichuan University</td>
<td>3 Dec 2008</td>
<td>meeting discussion based on questionnaire 6</td>
</tr>
<tr>
<td>Chief Director Deputy Director Construction Bureau of Mianzhu City, Sichuan Province &amp; Engineer at Mianzhu City Construction Quality Supervision Center</td>
<td>1000 - 1700 4 Dec 2008</td>
<td>Questionnaire 6, followed by site visit to the reconstruction projects facilitated with the help from Sichuan University and local Bureau of Construction</td>
</tr>
<tr>
<td>Project Manager of a reconstruction project in Dujiangyan City funded by Chengdu Land Resources Bureau</td>
<td>0930 – 1200 5 Dec 2008</td>
<td>on-site interview based on questionnaire 6</td>
</tr>
</tbody>
</table>

[^39]: A Hong Kong-based NGO involved in the reconstruction works after the 08 Wenchuan Earthquake
关于 98 洪水灾后重建的一些问题作答

98 年大洪水后,党中央,国务院及时确定了“封山植树,退耕还林、退田还湖、平垸行洪、以工代赈、移民建镇、加固干堤、疏浚河道”的灾后重建、根治水患的“32”字方针,其中封山植树、退耕还林、以工代赈由林业等部门承担,其它五项由水利部门为主承担或水利部门参与承担。一、合同安排

1、灾后重建使用了何种合同文本（支付方式）和招标方式？总体来讲,灾后重建建设管理前两年不规范,从 2000 年以后,按国家有关法律《招标法》、《合同法》及有关规章的规定,采取五制的办法进行灾后重建的建设管理工作。在湖北,设计、监理一般没有采取招标形式,由法人或项目单位选择设计、监理单位,施工队伍的选择严格按《招标法》的规定确定,即 200 万以上的建筑工程、50 万以上的设备采购采取公开招标,在此之下的采取邀请招标,少数合同金额少、工程量、设备量小的采取指定方式确定施工单位。招标的具体操作,首先根据工程大小及性质,确定何种资质、什么等级以上的施工企业才有投标资格等条件,委托招标代理机构组织具体的招标工作,施工单位报名后,做出标书,在指定的时间送达,由水利建设主管部门从专家库中抽取的评标专家,与项目单位代表等共同组成评标委员会,在有关部门代表的监督下开展评标工作,最后由项目法人或水利建设主管部门公示后发出中标通知书,中标价一般就是合同价。

2、缔约过程（招投标）进行得怎样？（时间长短、满意度）整个招标过程从招标公告、标书制作、评标、中标公示通知到发中标通知、缔约都是按规定进行。一般来说,通过这种方式选择的施工单位,按照其标书承诺的方式施工,都能够顺利地完成任务。

3、在灾后重建过程中,施工者应具备哪些条件？更倾向于选择怎样的施工单位？

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40 received in the Yangtze River Floods reconstruction case
施工者应具备的条件具体体现在招标公告中对施工企业的要求或应具备的条件上，在这方面国家有关规章作了一些规定，一般情况下，大型工程、一级建筑项目须有相应一级单项或总承包资质，中型或一般项目须具有二级以上资质，少数小型项目要求三级以上资质；其次是对业绩的要求，要有类似工程的业绩；其它如企业信誉、经济实力、施工能力等也是评标中的重要依据。对于倾向性，按规定应该在招标条件满足范围下一视同仁，但应该说招标活动中还存在有一定的倾向性，主要体现在评标环节，公开招标公告中一般没有地域等方面的限制，但在评标环节中，评标专家对本地区知名的施工企业过去业绩、施工能力、信誉等方面比较了解，对本行业、本地区以外企业缺乏了解，可能使评招工作带有一定的倾向性；从实际情况看，本行业、本地区企业在履约的过程中有一定的优势，施工环节熟。人员熟、气候适应，沟通、协调起来更方便，能创造更好施工环境，这些都有利于项目的建设。

4. 哪些部门和单位参与了重建？它们之间的合作运转情况如何？

移民建镇这项工作在湖北是由省发改委牵头负责，水利、城建等部门参加共同完成，其它几项工作都是由水利部门负责完成。在工作中，发改委与水利部门共同审查项目的前期工作，包括设计方案、概算；在实施的过程中，很多部门都参与了工作，主要是监督检查工作，如财政部门负责资金调度及财务检查，监察部门监督招标过程，国家审计署及各省市县审计部门开展经常性、大规模与小规模结合、专项与全面的审计，国家其它从事监督的有关部门开展灾后重建项目经常性检查，水利部门的质量监督单位对建设质量实施全程监控，有力的保证了灾后重建项目的建设。

从建设各方来讲，参加的部门主要有：水利部门成立的法人单位、设计单位、监理单位、招标代理单位、质量监督单位代表政府实施质量监控。

二、建设环境法律法规

1. 有无专门的法律法规指导和统筹整个重建过程？如有是哪些?

灾后重建整个过程是依照国家有关法律法规进行。党中央国务院在1998下发了《关于灾后重建、整治江湖、兴修水利的若干意见》（中发[1998]15号），提出灾后重建的“32”字方针，这一纲领性文件指
导整个灾后重建工作。在具体实施中，国家已有和专门出台了多项法律法律法规指导重建工作的各个方面和各个环节。前期工作，主要是按照国家基本建设程序，层层把关。技术方面，主要是按照规程规范，精心设计；建设方面主要是实行三制即项目法人负责制，工程招标制，项目监理制，每个方面，又作出了专门规定，如招投标，有招标管理办法（建设部门令），后来出台了《招标法》，三制的要求后来逐步发展、增加合同管理制成为“四制”，增加资金管理成为“五制”等等。国家发改委、水利部、建设部、财政部对建设管理、资金管理的作了具体的规定，基本上涵盖了重建的每个方面，每个环节。

2、在 98 年洪水之后重建过程中有没有发觉上述法律法规中存在的问题和不合理之处？（有哪些？现在是怎样解决的？）

上述法律法规基本上是随着国家发行国债实现扩大内需的积极宏观财政政策，针对建设管理的需要逐步出台的。98 年灾后重建使用的大多是国债资金，建设过程是遵照执行的，只是开始时法律法规不完善，不配套，后来逐步完善、配套，基本未发现有什么问题。

3、重建过程中的人力资源（如合格的施工队伍）和建设用物资是否感觉到匮乏？这些人力和物资资源是如何分配的？（例如政策法规规定，国家计划调配或者受灾单位自行筹措等等）

重建过程开始阶段感觉人力、物力比较缺乏，主要是多个项目同时开工，需要大量的涵盖各个方面的队伍。首先是监理队伍，监理人才匮乏，省内原有一家监理单位，人员很少，当时起步才几年，经验也不是十分丰富，后来通过几次大规模培训，主要是选拔省内具有一定专业知识水利骨干进行培训，一大批有一定专业知识和实践经验，即将退休又丰富力强的水利系统各级领导和专业技术人员充实到监理队伍，同时以现有设计、科研单位为基础成立了几家不同资债的监理单位，迅速打开了局面，适应了监理工作需要。从设计方面来说，感觉设计人员不足，重建工作一启动，设计工作量非常大，而且各个项目几乎都要同时开始，过去省内多年一直没有这么多项目设计，陡然增加大量的设计任务，难以迅速完成，一时间，各个项目都在等设计，各路人马都在催设计单位拿报告，设计单位不是水平不足，主要问题是在手不足，骨干不足，设计单位通过优化组合，实行项目经理负责制，争取激励机制，设计人员加班加点，省院与地方资质低一些的院
合作设计等等措施，各院设计人员也在实际工作中逐步成长，逐步加快了设计进度，基本满足了设计工作的需要。

合格的施工队伍，争取招标的办法，主要在水利建设市场中选择，本省不够，争取全国公开招标，外省市有很多大型施工企业参与湖北灾后重建工作。大规模建设，大量企业参与灾后重建，极大地考验了各级建设管理单位的建管能力，也极大地考验了地方政府的协调能力。

重建中人力资源的分配，主要是靠市场经济的手段来配置。物资的分配也是如此，少部分是靠行政手段来调配，这主要是从事管理工作的人力资源，计划调配的几乎没有。

四、灾后重建资金的来源

1、灾后重建资金的来源是怎样的

移民建镇，在湖北是长江、汉江及支流河口洲滩民垸内的群众通过在干堤内安全地带建房、拆除民垸内原有住房，建房补助每户 1.5 万元，另外 0.2 万元配套费，前 1.5 万元是给群众建房的，后 0.2 万元不直接给群众而作为公共设施配套，如学校、下水道等等，不论是好房坏房、房多房少，按户计算，每户 1.5 万元。在湖北，1.5 万元当时只能建一处 80 平方米左右比较简陋的住房，尚不包括地基费。移民建镇采取了很多优惠政策减免群众建房负担，地方政府还采取划拔土地建房等等措施后，每户要花费 3～4 万元建房，部分经济宽裕还要超过这个数。1.5 万元由国家移民建镇资金补助，其它建房款由群众自筹，除国家补助的 0.2 万元配套费外地方政府从多个渠道筹集了一部分资金，用于移民建镇集中安置点的公共设施配套。在湖北，共对 332 处民垸内 56.7 万人实行了移民建镇。

堤防建设、水库加固、河湖疏浚及平垸行洪工程资金都是国债资金安排，按国家基本建设程序，由国家发改委、水利部审批后下达资金实施，其中还要求地方配套一部分。
Appendix E: Case studies photos highlight

D. 1 Banda Aceh, Indonesia after 2004 Indian Ocean Tsunami

- UNHCR tents at Lampulo, Banda Aceh
- Building transitional houses at Lampulo, Aceh
- Transitional house model at IFRC warehouse
- Foundation preparation for BRR prefabricated model house
- Timber for reconstruction
- The author preparing the span for timber testing
Sloping formwork support

Missing bricks in a reconstruction house

The author and local workers with Scala Penetrometer for structural testing of reconstruction houses

Sad reminder of Tsunami – a fishing boat on the house, Banda Aceh, Indonesia

An abandoned half-finished reconstruction house that needs structural assessment

A finished reconstruction model house in BRR headquarter
D. 2 Sichuan, China after 2008 Wenchuan Earthquake

Earthquake damage in Dujiangyan City

Posters looking for lost families in a public square in Hanwang town centre, Mianzhu City

A reconstruction house in Penghua Village, Mianzhu City, which is famous for its traditional Chinese New Year paintings on the wall

A rural reconstruction site at Mianzhu City

The research team and the reconstruction manager and representatives from local construction bureau in front of a newly built hospital with lead rubber bearings for seismic isolation at Mianzhu City
<table>
<thead>
<tr>
<th>A rural reconstruction site at Dujiangyan city</th>
<th>Local residents help with cleaning the formworks for their own reconstruction houses, Dujiangyan City.</th>
</tr>
</thead>
<tbody>
<tr>
<td>The author and post-graduate students from Sichuan University, who previously volunteered and helped out at Mianzhu Construction Bureau during the initial response and reconstruction period after Wenchuan Earthquake in 2008.</td>
<td>The research team and the Dean and other professors of construction management from the Department of Architectural and Environmental Engineering, Sichuan University</td>
</tr>
</tbody>
</table>
Appendix F: Participant Information Sheets and Consent Forms

PARTICIPANT INFORMATION SHEET
(Institution)

Title of project: Contractual and procurement systems for reconstruction after a natural disaster.

Name of researcher: Kelvin Zuo

Degree: PhD in Civil Engineering

Department: Civil and Environmental Engineering

Research supervisor: Dr. Suzanne Wilkinson

To:

Introduction

This research is in partial fulfilment of Kelvin Zuo’s PhD Degree programme (civil engineering) and is also a part of the third objective, Legal and contractual frameworks, of a six year research programme (2004 – 2010) “Resilient Organisation41” funded by the Foundation of Research Science and Technology (FRST).

The following is a brief on the research, for which your approval is being sought for individual participation within your organisation. In order to attain the objectives of this research, participation of individuals within your organisation is requested.

Selection of your organisation to participate in this research is due to the imminent basis of the research on the disaster reconstruction and relief, for which your organisation contributes. Your

41 Resilient Organisations is a six year research project designed to assist New Zealand organisations to recover economic competitiveness after hazard events by improving their resilience. Full details of the programme is available on-line at www.resorgs.org.nz
participation is vital to the outcome of the research, to ascertain objectivity, practicality and experience, within the New Zealand construction environment.

**Principal research questions**

The main objective of the research is to review the existing procurement and contractual arrangements and analyze their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster. The principal questions are as follows:

1. *What are the common construction contracts used in New Zealand industry? Are they still useful in the aftermath of a natural disaster? If not, what are the main impediments and how could they be improved?*

2. *What are the procurement systems and contractual models that are used in the construction industry? What are the government regulations on procurement? How are they relevant and useful in a disaster reconstruction situation?*

3. *What are the recent developments in forms of the major international construction contracts as they relate to post-disaster reconstruction? What are the procurement and contractual arrangements that have been used in reconstruction in other vulnerable zones in the world? Are these international experiences useful to New Zealand, if yes, how can they be/ have been modified to suit New Zealand conditions?*

**Terms and Condition of participation**

The main reason for the research is to identify and/or develop the best practice procurement systems for disaster reconstruction and enhance the industry’s disaster preparedness and recovery.

Participants to the research will require no more than a maximum of one (1) hour for the interview. Information provided by individuals within your organisation will be published in the final report. The individual’s identity is assured to be kept confidential. No references will be made to individual’s name, position or status.

It is assured that employee’s participation/non-participation in the research, shall in no way affect their employment.
All “raw data” gathered by the interview or questionnaire, will be kept for the duration of the project until the final research report is completed. With the completion of the final report, all “raw data” including disks, audio tapes or questionnaires, shall be destroyed. It is anticipated that the data will be destroyed by December 2008, by appropriate means of incineration or refuse disposal.

Interviews will be tape-recorded. This is essential to accurately and quickly record the information and reduce the time for the interview. All information will be transcribed by the researcher himself without the involvement of any third party.

At your request, participation in this research can be withdrawn. If you wish to withdraw your organisation or any participant prior to the interview, it is requested that this be done at least one (1) week before the actual interview. Withdrawal at any time during the interview can be done by informing the researcher of the same. Participants to this research have the right to withdraw or annul their information/data, providing that this is so done before February 15, 2009.

Should you have any queries regarding the same detailed below are the persons to be contacted:

Researcher: Kelvin Zuo
Mobile: 021 263 7881
Email: xzuo001@ec.auckland.ac.nz

Supervisor: Dr. Suzanne J Wilkinson
Phone: 64 09 3737599 ext 88184
Email: s.wilkinson@ec.auckland.ac.nz

Head of the Department: Prof. Bruce Melville
Phone: 64 09 3737599 ext 88165
Email: b.melville@ec.auckland.ac.nz

For Ethical concerns contact: The Chair, The University of Auckland Human Participants Ethics Committee, The University of Auckland, Room 005 Alfred Nathan House, 24 Princes Street, Private Bag 92019, Auckland. Tel: 3737599 extn. 87830
INSTITUTION CONSENT FORM

(This form will be held for 6 years)

Title of project: Contractual and procurement systems for reconstruction after a natural disaster

Name of researcher: Kelvin Zuo

Degree: PhD of Civil Engineering

Department: Civil and Environmental Engineering

Research supervisor: Dr. Suzanne Wilkinson

I agree that employees of my organisation to take part in this research.

- I understand that raw data gathered via the interview or questionnaires within my organisation will be stored for the duration of the research - until the completion of the final report and will subsequently be destroyed at the end of December 2010.

- I understand that no references will be made with regards to the name, position or status of the employees that reveals their identities, however, once consent is received, information from participating companies will be made public, along with the company’s name.

- Participation/non-participation, shall in no way affect the employment.

- I understand that participants from my organisation to this research may be tape-recorded for the interviews under their permission.
- I understand that participants may choose to have the recorder turned off at any time during the interview and they may review the transcribed version of the tape or a copy of the audio tape itself once the interview is completed.

- I know that all the data will be transcribed by the researcher himself without the aid of any third parties.

- Findings of the research maybe made public via industries’ newsletter.

- I understand that employees of my organisation are free to withdraw from the research at anytime without giving a reason, by providing a week’s notice before the actual interview date.

- I understand that participants to this research have the right to withdraw or annul their information/data, providing that this is so done before February 15, 2009.

Signed: .................................  Date: .................................

“APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 16/04/2007 for 3 Year(s) from 2007 to 2010
Reference Number 2007/031”

PARTICIPANT INFORMATION SHEET
(Individual)

Title of project: Contractual and procurement systems for reconstruction after a natural disaster

Name of researcher: Kelvin Zuo

Degree: PhD in Civil Engineering

Department: Civil and Environmental Engineering

Research supervisor: Dr. Suzanne Wilkinson
You are invited to participate in the above captioned research. This research is in partial fulfilment of Kelvin Zuo’s PhD Degree programme (civil engineering) and is also a part of the third objective, Legal and contractual frameworks, of a six year research programme (2004 – 2010) “Resilient Organisation42” funded by the Foundation of Research Science and Technology (FRST).

Your participation is vital to the outcome of the research, to ascertain objectivity, practicality and experience. Your selection to participate in this research is based primarily on these facets.

The main objective of the research is to review the existing procurement and contractual arrangements and analyze their applicability and suggest the features that are desirable for reconstruction in the event of a national natural disaster. The principal questions are as follows:

1. What are the common construction contracts used in New Zealand industry? Are they still useful in the aftermath of a natural disaster? If not, what are the main impediments and how could they be improved?

2. What are the procurement systems and contractual models that are used in the construction industry? What are the government regulations on procurement? How are they relevant and useful in a disaster reconstruction situation?

3. What are the recent developments in forms of the major international construction contracts as they relate to post-disaster reconstruction? What are the procurement and contractual arrangements that have been used in reconstruction in other vulnerable zones in the world? Are these international experiences useful to New Zealand, if yes, how can they be/ have been modified to suit New Zealand conditions?

Participants to the research will require no more than a maximum of one (1) hour for the interview. If the information you provide is reported or published, this will be done in a way that does not identify you as its source. No references will be made with regards to your name, position or status that reveals your identity, however, once consent is received, information from participating companies will be made public, along with the company’s name.

42 Resilient Organisations is a six year research project designed to assist New Zealand organisations to recover economic competitiveness after hazard events by improving their resilience. Full details of the programme is available on-line at www.resorgs.org.nz
All “raw data” gathered by the interview or questionnaire, will be stored for the duration of the project until the final research report is completed. With the completion of the final report, all “raw data” including disks, audio tapes or questionnaires, shall be destroyed. It is anticipated that the data will be destroyed by December 2010, by appropriate means of incineration or refuse disposal.

At your request, participation in this research can be withdrawn in a timely manner. If you wish to withdraw prior to the interview, it is requested that this be done at least one (1) week before the actual interview. Withdrawal at any time during the interview can be done by informing the researcher of the same. If you wish to discard or annul any of the data, once the interview is complete, then this must be done before February 15, 2009.

Audio-taping is the preferred medium for recording information. This is essential to accurately and quickly record the information and reduce the time for the interview. You may choose to have the recorder turned off at any time. Access to the tape will be available until February 15, 2009 and can be reviewed at your request. If you wish to review the transcribed version of the interview, this can also be arranged by requesting the researcher to make a copy available once the transcription process is complete. All information will be transcribed by the researcher himself without the involvement of any third party.

Should you have any queries regarding the same detailed below are the persons to be contacted:

Researcher: Kelvin Zuo
Mobile: 64 21 263 7881
Email: xzuo001@ec.auckland.ac.nz
Supervisor: Associate Prof. Suzanne J Wilkinson
Phone: 64 09 3737599 ext 88184
Email: s.wilkinson@ec.auckland.ac.nz
Head of the Department: Prof. Bruce Melville
Phone: 64 09 3737599 ext 88165
Email: b.melville@ec.auckland.ac.nz
PARTICIPANT CONSENT FORM

(This form will be hold for 6 years)

Title of project: Contractual and procurement systems for reconstruction after a natural disaster

Name of researcher: Kelvin Zuo

Degree: PhD of Civil Engineering

Department: Civil and Environmental Engineering

Research supervisor: Dr. Suzanne Wilkinson

I agree to take part in this research.

- I understand that raw data gathered via the interview or questionnaires will be stored for the duration of the research - until the completion of the final report and will subsequently be destroyed at the end of December 2010.

- I understand that if the information I provide is reported or published, this will be done in a way that does not identify me, the individual as its source. No references will be made with regards to my name, position or status that reveals my identity, however, once consent is received, information from participating companies will be made public, along with the company’s name.

- I agree/ do not agree to be tape-recorded of interviews, as it is essential to accurately document the discussions and assess the answers once the interview is complete.
• I understand that I may choose to have the recorder turned off at any time during the interview and I may review the transcribed version of the tape or a copy of the audio tape itself once the interview is completed.

• I know that all the data will be transcribed by the researcher himself without the aid of any third party.

• Findings of the research maybe made public via final thesis and academic papers.

• I understand that I am free to withdraw from the research at anytime without giving a reason, by providing a week’s notice before the actual interview date.

• I understand that I have the right to withdraw or annul my information/data, providing that this is so done before February 15, 2009.

Signed: ........................................... Date: ..............................................

“APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN PARTICIPANTS ETHICS COMMITTEE ON 16/04/2007 for 3 Year(s) from 2007 to 2010
Reference Number 2007/031”
Appendix G: List of published papers


