RESEARCH PAPER
Stakeholders' approaches to disaster risk reduction in built environment

S. Mohammad H. Mojtahedi
School of Civil Engineering, The University of Sydney, Sydney, Australia, and
Bee Lan Oo
Faculty of Built Environment, The University of New South Wales, Sydney, Australia

Abstract

Purpose – In disaster risk reduction (DRR), it is important to realise stakeholders' approaches against disasters in the built environment. The purpose of this paper is to explore why stakeholders take proactive and/or reactive approaches in DRR.

Design/methodology/approach – Using a review of existent literature, this work scrutinises disaster theories and their applications in the built environment to develop a theoretical framework for perceiving stakeholders' proactive and/or reactive approaches in DRR.

Findings – Stakeholders' organisational attributes – power, legitimacy and urgency – and decision-making paradigms – value maximisation and intuitive reasoning – are fundamental factors affecting stakeholders' approaches against disasters. Power and legitimacy of stakeholders result in a proactive approach if stakeholders consider value maximisation paradigm in their decision-making process. Powerful and legitimate stakeholders may take reactive approaches because of intuitive reasoning paradigm. Stakeholders may shift from a reactive to proactive approach and vice versa based on the combination of urgency attribute and decision-making paradigms.

Research limitations/implications – It is essential to consider the classification of respective stakeholders in applying the idea of this paper. Furthermore, this paper does not attempt to validate the proposed theoretical framework empirically, but it combines stakeholder and decision-making theories by which this could be undertaken.

Originality/value – Little attention has been paid to systematic theorising in managing stakeholders' approaches against disasters. Furthermore, many researchers have focused on similar underlying theories and heuristics in the context of DRR. Thus, this paper introduces a theoretical framework to examine stakeholders' proactive and/or reactive approaches in the built environment, by synthesising stakeholder and decision-making theories.

Keywords Disaster risk reduction, Socio-economic, Built environment, Disaster approach, Disaster theories, Stakeholder attributes

Paper type Conceptual paper

Introduction

Stakeholders' approaches towards disasters refer to activities such as mitigation, preparedness, response and recovery, which are planned and conducted before, during and after disasters (Peek and Mileti, 2002; Altay and Green, 2006; Moe and Pathranarakul, 2006). They represent stakeholders' proactive and reactive intent to manage disasters by employing decision-making mechanisms involving a combination of stakeholders' institutional attributes, socio-economic and the built environment exposures. Scholars have dedicated considerable attention to the study of disaster impacts on socio-economic and the built environment conditions (e.g. Alexander, 1997; Bosher, 2008; Hunt and Watkiss, 2010).

However, there are two issues that suggest further conceptual development is needed in this research domain. First, there is a lack of stakeholders' awareness before, during and after disasters (Perry and Lindel, 1978; Pearce, 2003; Bosher *et al.*, 2007). Despite the detrimental impacts of disasters, Bosher *et al.* (2009) noted that there is still insufficient evidence that key stakeholders are playing a proactive role in mitigating disasters in the built environment and hazard awareness is absent from their decision-making process. However, far too little attention has been paid to systematic theorising in managing stakeholders' approaches against disasters. Second, many researchers have focused on similar underlying theories and heuristics in the context of disaster management (DM) (McEntire, 2004; Sementelli, 2007). For example, crisis and chaos theory has become an increasingly fundamental underpinning theory for scholars to support their research on DM context (Pauchant and Douville, 1993; Pearson and Mitroff, 1993; Shrivastava, 1993; Pearson and Clair, 1998; Ritchie, 2004). Furthermore, the research to date has tended to fall into the realm of decision rules, procedures and policies applying similar theories rather than integrating other administrative theories to address stakeholders' approaches and decisions before, during and after disasters.

Using a review of existent literature, this study explores and expounds upon the stakeholders' approaches in disaster risk reduction (DRR). We have scrutinised disaster theories and their applications in the built environment and have encountered the following research question:

RQ1. What are the stakeholders' attributes and decision-making paradigms that influence stakeholders' proactive and/or reactive approaches in DRR.

Drawing upon the literature review, we proposed a theoretical framework in answering this research question using stakeholder theory and decision-making theory. First, we adopt Freeman (1984) and Mitchell *et al.* (1997) contention that power, legitimacy and urgency are stakeholders' attributes, which contribute to stakeholder identification and management. Second, we use value maximisation and intuitive reasoning paradigms developed by Von Neumann and Morgenstern (1945) and Tversky and Kahneman (1974), respectively, to address decision-makers' approaches towards choosing different alternatives in an administrative context. Finally, we synthesise stakeholder and decision-making theories to bring the role of stakeholders and their decisions for proactive and/or reactive approaches in DRR into the context of the built environment. In this paper, we focus on disasters as a general concept which covers natural, technological and man-made hazards. It should be noted that the focus of this study is on DRR rather that DM. DRR is the systematic development of mandates, strategies and practices with the purpose of minimising vulnerabilities and disaster impacts throughout society and environment (UNISDR, 2004). DRR encompasses preparedness, mitigation, response and recovery activities to reduce the impacts of disasters and to develop resilient environment (IPCC, 2012) and it has stronger connotations with proactive and reactive approaches. The focus of DM, on the other hand, is mostly on response and recovery phases which for many scholars have connotations of "reactive" approaches to dealing with disasters (Moe and Pathranarakul, 2006). The proposed theoretical framework forms a foundation for further empirical work in DRR in the built environment.

Conceptual underpinnings of disasters
Overview of disaster theories and their applications
There is a substantial amount of theories used for theorising disasters in the literature. Administrative and leadership theories have been fundamental pillars for building

organisational capabilities through crisis management activities (Boin and Hart, 2003; Wooten and James, 2008). Paraskevas (2006) used complexity theory to introduce a complexity-informed framework for the design of an effective organisational crisis response system in disastrous situations. Moreover, disaster studies need to be expanded to incorporate a political administrative perspective on crises management (Rosenthal and Kouzmin, 1997). Stallings (2002) claimed that sociological theory including conflict theory, political sociology and the application of Max Weber's political sociology, could provide precious insights in disaster studies, because the structure of society, which is hidden in everyday affairs, are vulnerable to disasters. Gotham (2007) used critical theory to explore the processes and conflicts over efforts to present tragic events as spectacles, focusing on a case study of the Hurricane Katrina disaster. Interestingly, there has been significant emphasis on DRR studies in the tourism industry from proactive pre-crisis planning through strategic implementation over the past decade (Faulkner, 2001; Ritchie, 2004; Hystad and Keller, 2008).

Sementelli (2007) reviewed extensive literature on theories of disasters by focusing on a concern for tools and a process to categorise them into four groups as: decision theories; administrative theories; economic theories; and social theories. Decision theories apply approaches to disaster by using a series of stages, steps, heuristics or procedures to cope with disasters. Administrative theories, in contrast, have a great tendency to emphasise on processes as well as tools. Economic theories tend not to focus on process or tactical outcomes, but instead present abstraction to cope with long-term economic impacts of disasters. Finally, social theories try to tackle disaster predicaments by process-oriented actions. He urges that substantial advancements should be made in the realm of theory development and theorising in disasters and crises, and suggests that decision and administrative theories can and most likely could get managers to an acceptable solution to the problem.

Crisis theory has become an increasingly dominant theoretical pillar for scholars to support their research on DM and DRR context (Pauchant and Douville, 1993; Pearson and Mitroff, 1993; Pearson and Clair, 1998; Ritchie, 2004). Shrivastava (1993) identified urgency of decision, large impacts and system restrictions as fundamental characteristics of crisis. Parsons (1996) suggested three types of crises as:

(1) immediate crisis: little or no warning exists;

(2) emerging crises: sluggish developing; and

(3) sustained crises: long-lasting duration.

Ritchie (2004) argued that strategies to deal with these three different crisis situations would vary depending on time pressure, the extent of control and the magnitude of these incidents. Crisis management theory is a holistic process involving prevention, planning, acute response, recovery and learning (Boin and McConnell, 2007). However, there are some limitations in applying crisis management theories in DM and DRR perspectives (Kumar, 2000; McConnell and Drennan, 2006; Boin and McConnell, 2007) including: first, preventing all disasters are simply impossible; second, there are political, cognitive, informational, cultural and resource barriers to being able to prevent every possible threat; third, contingency planning is not able to solve all problems or make all situations better; and fourth, crisis management cannot cover all phases of a DM and DRR. Among the above-mentioned theories, crisis theory has been the most popular theory in DRR context. Although stakeholders who are involved in DRR should be systematically analysed and anticipated in disasters (Hsu *et al.*, 2004;

Bosher *et al.*, 2007), there is little evidence of borrowing ideas from stakeholder theory in the previous studies of DRR and DM. Also, despite the variety of applications of theories to DRR and DM, there has been little attention paid to the built environment.

Disaster theories and the built environment

Built environment and the construction industry play a significant role in having a resilient society (Bosher, 2008; Haigh and Amaratunga, 2010). The term "built environment" refers to the products and processes made by humans for their activities. Built environment is a combination of facilities and infrastructure systems that people use as a core foundation for developing a society (Vanegas, 2003). Designing and building a resilient built environment needs profound understanding of the expertise and knowledge of avoiding and mitigating the impact of disasters (Lorch, 2005; Bosher, 2008). According to Haigh and Amaratunga (2010), the discipline of the built environment plays a key role in the development of society's resilience to disasters. They claimed that a suitable theoretical framework to explore the interaction between the built environment, its disciplines and the DRR process is highly required.

The built environment can itself results in disasters, particularly in places where building codes and planning regulations are not conducted very well (Ofori, 2004). With socio-economic progress, the built environment becomes more vulnerable to disasters in terms of community loss, and economic and infrastructure damages (Menoni, 2002; Bosher, 2008). Bartuska and Young (1994) categorised the significance of the built environment in the context of disasters into four groups as:

(1) built environment is an extensive area which covers all human needs;

(2) built environment is a product of human's mind and purposes;

(3) built environment protect us from disasters and change the environment for our comfort; and

(4) all built environment elements contribute either negatively or positively to the overall quality of environment.

Few scholars have applied theories and paradigms to DRR and DM in the built environment. These theories include: practice-based theory and a theory-based practice (Gillespie and Streeter, 1987), planning perspective (Perry and Lindel, 1978) and emergency management theory (McEntire, 2001; McEntire *et al.*, 2002). Although it is noted that the most frequently used theory is the emergency management theory, it does not seem to provide a solid foundation to guide the development of disaster preparedness tools; furthermore, emergency management theory has two fundamental problems for developing disaster response tools as follows: first, it explains about emergency situations but not disasters and second, the focus on emergency makes the field reactive and limits its applicability for proactive approach.

Numerous researchers have claimed doubt on the theoretical disciplinary development for the built environment (e.g. Betts and Lansley, 1993; Loosemore, 1999; Knight and Ruddock, 2009; Brandon and Lombardi, 2010); increasingly, DRR is still an under developed area in the built environment. There is a need to relate practice and theory by using human-centred approaches (Janssen *et al.*, 2010). Haigh and Amaratunga (2010) presented an integrative review of the literature to explore the nature of the built environment discipline's potential role in the development of society's resilience to disasters. Their review supports the calls for a multi-sectoral and interdisciplinary approach to DRR. They discovered that development of theoretical

framework for DRR in the built environment is highly necessary. The first step towards theoretical development in the built environment involves amalgamation and juxtaposition of an interdisciplinary strategy for DRR through buildings, spaces and places. A suitable theoretical framework should explore the interaction between the built environment, its disciplines and the DRR process. Furthermore, it is important to understand the nature of the stakeholders involved in creation and maintenance of the built environment towards theoretical development, because stakeholders have a vital role to play in effective disaster planning (Haigh and Amaratunga, 2010).

Theoretical framework
The context for this study is the stakeholders' approaches to DRR in the built environment. Figure 1 depicts a proposed framework of proactive and/or reactive approaches by stakeholders for DRR in the built environment. The following discussion provides the theoretical justification for the conceptualisation.

Society, economic and built environment are at risk from the impacts of hazards associated with climate change. Disasters affect socio-economic and built environment conditions not only in developing countries but also in developed countries (Nicholls, 2004; Wilby, 2007). Stakeholders' approaches towards disasters in order to reduce the consequences of disasters are firmly recommended in the built environment (Moe and Pathranarakul, 2006; Bosher *et al.*, 2009). It is obvious that disasters have direct and indirect impacts on society, economy and the built environment. It is noted that the focus of most previous studies of disasters is on socio-economic and built environment conditions separately (Bosher, 2008; Hunt and Watkiss, 2010). Thus, there is a need to consider socio-economic and built environment exposures simultaneously. The significance of the proposed theoretical framework in this paper is to develop a theoretical framework that combines socio-economic and the built environment exposures in DRR perspective while considering stakeholders' proactive and/or reactive approaches to managing disasters.

Stakeholders' approaches and DRR in the built environment
Stakeholders, whether they are individuals or groups, choose how to cope with disasters in their natural, society and the built environment (Peek and Mileti, 2002). This notion used decision-making theories to justify that stakeholders behave acceptably, but not often optimally, based on their limited knowledge and within constraints set by the social system in which they live (Simon, 1991). Stakeholders are becoming increasingly frustrated not only with being excluded from the decision-making process, but also with being excluded from DM planning (Rubin and Barbee, 1985; Pearce, 2003).

Although there are two approaches to tackling disasters – proactive and reactive approaches – most studies have claimed that stakeholders often resolve the predicaments
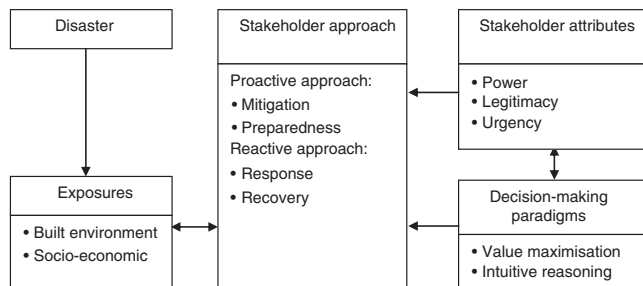

Figure 1.
Theoretical framework of stakeholders' disaster approaches in the built environment

arisen in disasters by reactive approaches (Loosemore and Hughes, 1998; Brilly and Polic, 2005; Bosher *et al.*, 2009). It is also noted that few studies exist on stakeholders' approaches towards DRR in the built environment. Loosemore (1998) investigated reactive crisis management in construction projects. Brilly and Polic (2005) studied a case in Slovenia to provide an integrated flood mitigation decision-making process with considering stakeholders' approaches. Moe *et al.* (2007) proposed a balanced scorecard technique considering proactive and reactive approaches to provide a continuous assessment of performance in each life-cycle phase in DM projects. Bosher *et al.* (2009) claimed that there is a need to proactively address strategic weaknesses in maintaining the built environment from a range of disasters. They also emphasised that there is still insufficient evidence that key construction stakeholders are playing an active role in DRR.

Proactive approach
Moe and Pathranarakul (2006) refers a proactive approach to those activities such as mitigation and preparedness that are planned and conducted before disasters by stakeholders in order to tranquilise the adverse impacts of disasters effectively. Mitigation refers to structural and non-structural activities aimed at eliminating and reducing the probability and consequences of disasters in the environment, society and infrastructure facilities before a disaster occurs. Mitigation activities attempt to keep hazards away from society and the built environment by constructing resilient infrastructures and developing practical managerial measures. Preparedness activities include developing emergency procedures and stakeholder institutional capability taken in advance to ensure effective response to the impact of disasters. This includes developing warning systems, identifying evacuation routes and shelters, maintaining emergency supplies and communication systems and conducting disaster exercises to train and educate personnel, citizens and community leaders (Peek and Mileti, 2002; Altay and Green, 2006; Moe and Pathranarakul, 2006). They concluded that a high-level proactive approach towards disaster helps us to reduce deaths, injuries, property damage and loss of dollars.

Reactive approach
In contrast, responses and recovery activities which are conducted by stakeholders during and after disasters is called reactive approach (Moe and Pathranarakul, 2006). Response refers to the activities taken immediately during and following a disaster. The main aim of effective response to disaster is to save the community and minimise damages. Activating the emergency operation plan and centres, evacuation and sheltering of victims, searching, rescuing and medical care are some examples of response activities (Peek and Mileti, 2002). On the other hand, recovery activities involve rehabilitation (short-term) and reconstruction (long-term) endeavours aim at restoring vital support systems and returning life to normal. This includes the rebuilding of residential and non-residential buildings, roads and bridges and infrastructure and coordinating governmental activities (Peek and Mileti, 2002; Altay and Green, 2006; Moe and Pathranarakul, 2006). Stakeholders often take reactive approaches to managing disasters (Loosemore and Hughes, 1998; Brilly and Polic, 2005; Bosher *et al.*, 2009).

Integration of theories into the conceptual framework
Stakeholder theory and attributes
Any kind of entity can be a stakeholder in managing disasters. Local people, groups, organisations, institutions, societies and even the natural environment are generally thought to qualify as actual or potential stakeholders. For the first time, Freeman

(1984) borrowed the notion of memo from Stanford Research Institute in 1963 to define stakeholder. The memo defined that a stakeholder is an entity without whose support the institution would not survive. Although there have been a few other stakeholder definitions, the latest describes a stakeholder as someone who has input in the decision making as well as who benefits from the results of the decision makings (Phillips *et al.*, 2003). In Freeman (1984) stakeholder theory, power, legitimacy and urgency are the three distinctive stakeholder attributes. The power of a stakeholder allows them to mobilise social and political forces and to withdraw resources from an organisation (Post *et al.*, 2002; Olander, 2007). Legitimacy gives opportunity to a stakeholder to abide some sort of beneficial or harmful risk pertinent to an organisation. Urgency is a degree to which a stakeholder claims call for immediate attention (Mitchell *et al.*, 1997; Olander, 2007). These suggest that power, legitimacy and urgency cause them to take proactive or reactive approaches in a decision-making process. Stakeholder theory amalgamates power, legitimacy and urgency attributes to propose dynamism in the systematic identification of stakeholders (Olander, 2007). By utilising the stakeholder theory, we can identify pivotal stakeholders for DRR in the built environment; consequently, this theory helps us prioritise stakeholders by considering power, legitimacy and urgency attributes. Power and legitimacy help stakeholders to bring about the outcomes they desire; hence, these attributes are very crucial for stakeholders to take proactive approaches against disasters in the built environment. In other words, a combination of power and legitimacy can create authority for stakeholder's organisations to take proactive responses independently. For a reactive approach, however, urgency helps stakeholders to respond in a timely fashion during or after disasters.

In order to distinguish key stakeholders in the built environment for DRR, it is important to categorise stakeholders into different groups based on power, legitimacy and urgency attributes. Mitchell *et al.* (1997) classified and defined stakeholders into seven main groups as: dormant stakeholders; discretionary stakeholders; demanding stakeholders; dominant stakeholders; dangerous stakeholders; dependent stakeholders; and definitive stakeholders. Although dormant stakeholders have little or no interaction with an organisation, they possess the power to impose their wills on an organisation. Discretionary stakeholders hold the attributes of legitimacy, but they do not have enough power to affect an organisation's decisions. Demanding stakeholders possess urgent claims but having neither power nor legitimacy. Dominant stakeholders have enough power and legitimacy to direct a firm's decision-making process. Coercive behaviours among dangerous stakeholders make them dangerous to an organisation. Dependent stakeholders depend upon others for the power necessary to conduct their decisions. Lastly, definitive stakeholders have enough power and legitimacy to mandate their claims in an organisation. A generic set of stakeholders in managing disasters in the built environment would include local government, prime (general) contractors, subcontractors, suppliers, architects/designers, structural and civil engineers, urban planners, emergency relief organisations, financial institutions, insurance companies and the affected local community (Moe and Pathranarakul, 2006; Bosher *et al.*, 2009).

Although some other organisational theories also cover the concepts of power and legitimacy, most of them tell us about the role of power and legitimacy independently, but those theories do not explain stakeholder classification and do not justify why power and legitimacy are important factors in defining stakeholders' approaches. Furthermore, urgency is not a main focus of any organisational theory (Mitchell *et al.*, 1997). Therefore, stakeholder theory overshadows the other organisational theories in terms of considering all stakeholders' attributes in an integrated framework.

Apart from stakeholders' attributes, decision-making process can definitely influence stakeholders to migrate from proactive to reactive approach, or vice versa. Harrison *et al.* (2010) claimed that the stakeholder theory should consider the decision-makers' roles, their decisions and who takes advantages of the outcomes of those decisions. In the next section, we explain how the decision-making theory can affect the stakeholders' approaches towards disasters in the built environment.

Decision-making theory and paradigms
In a decision-making process, one is supposed to choose one or some choices over different alternatives while considering deficiency of knowledge and uncertainty about the future (Shih *et al.*, 2007). Decision theories have been the imperative pillar for theorising about crises and disasters. Decision theories emerged from the study by many researchers particularly Simon (1945/1976), Allison and Zelikow (1971) and Cohen *et al.* (1972). Context of perception, information access and data quality have been the main research areas using decision theories in disasters and crises (Sementelli, 2007). The kind of decision making with which this body of theory deals is as follows: given the two possible approaches in DM, into either one of which a stakeholder may put himself, the stakeholder chooses proactive in preference to reactive (or vice versa). The theory of decision making is a theory about how to predict such decisions (Edwards, 1954). Prospect theory introduced by Kahneman and Tversky (1979) significantly advanced decision-making theory by considering the theory of risky choices. This theory enriches value maximisation paradigm by addressing three principles: expectation; asset integration; and risk aversion. All above mentioned theories in decision making have utilised two decision-making paradigms, namely, value maximisation paradigm and intuitive reasoning paradigm (Ariely, 2009). Those two paradigms help us realise stakeholders' behavioural approaches against disasters, albeit the domain of decision theory is extensive including different attributes and paradigms such as risk perception, uncertainty and complexity (Sementelli, 2007). The first paradigm assumes that humans have a tendency to maximise the value of selected alternatives based on their desires. The latter paradigm assumes that decisions by humans are influenced by complicated factors. Therefore, in value maximisation paradigms, people have rational behaviour but in intuitive reasoning paradigms humans might involve irrelevant factors in their decision-making process (Levy, 1992; Ariely, 2009). We do not have enough formal models for estimating the probabilities of events such as; the result of an election, the future value of money, the impacts of disasters and so on. In this, an intuitive reasoning paradigm is the only practical method for assessing uncertainty (Tversky and Kahneman, 1983). Based on the concept of expected utility, the value maximisation paradigm proposes that a decision maker will choose the alternative that maximises the weighted factors obtained by utility functions. Von Neumann-Morgenstern Theory, under the value maximisation paradigm, explains that a person or unity is rational if, and only if, their behaviour maximises the expected value of the set of possible outcomes (Von Neumann and Morgenstern, 1945).

The notion of decision theories in realising why stakeholders make different decisions in coping with disasters has not been evaluated adequately in the literature. Little is known about the benefits of different paradigms involved in the stakeholders' decision-making process in different DRR phases. More importantly, a decision-making theory facilitates the selection of appropriate exposures and pertinent variables in the development of stakeholder disaster approaches strategies.

Discussion on decision-making paradigms, stakeholders' attributes and approaches
Although the application of decision theory in DRR is quite clear, it offers little from the perspective of theory development. This may due to the fact that the field of DRR is still in its infancy and developing (Sementelli, 2007). In answering our research question, a combination of stakeholder theory and decision-making paradigms would probably open the avenue for justification of why stakeholders take proactive and/or reactive approaches in reducing disaster risk in the built environment.

We designed this study to determine why stakeholders have different approaches to disasters. For this, we reviewed previous studies pertinent to disaster theories to find the answer for our research question. The most interesting finding was that the stakeholder theory has not been evaluated in a DRR context. Furthermore, decision-making theory plays an indispensable role to justify why different stakeholders take different approaches towards disasters. Power is the key attribute to affecting the stakeholders' decision making, and legitimacy is another important attribute which supports stakeholders to take risks in their decision making (Olander, 2007). Figure 2 presents the intersection of stakeholders' attributes and decision-making paradigms.

It is obvious that the power and legitimacy of stakeholders does not guarantee a proactive approach. This phenomenon happens because of the fact that power and legitimacy do not necessarily lead to noticeable decisions by stakeholders (Mitchell *et al.*, 1997). Power and legitimacy of stakeholders result in a proactive approach if stakeholders consider a value maximisation paradigm in their decision-making process. In other words, they opt for mitigation and preparedness activities before disasters in order to minimise the negative consequences of disasters. Although power and legitimacy attributes of stakeholders help them to take proactive approaches against disasters, they might be reactive by involving irrational decisions in their strategies based on intuitive reasoning paradigms, which is another role player in their decision-making process. Urgency is the third stakeholders' attribute, which contributes to migration from a reactive to a proactive approach and vice versa in DRR. Mitchell *et al.* (1997) argued that time sensitivity and criticality are two criteria arisen from urgency. Time sensitivity defines the degree to which stakeholders delay in approaching to claims or disasters before events. Criticality is the importance of claims

	Intuitive reasoning paradigm	Reactive approach	Proactive to reactive
	Value maximisation paradigm	Proactive approach	Reactive to proactive
		Power/legitimacy	Urgency

or disaster activities. If stakeholders prioritise the claims in the wrong order, their decisions lead to a reactive approach based on intuitive reasoning paradigms. In supporting our proposed theoretical framework, we have combined stakeholder theory and decision-making paradigms for justification of why stakeholders take proactive and/or reactive approaches in DRR. By reviewing previous studies, we found that classification of stakeholders which was introduced by Freeman (1984) and later developed by Mitchell *et al.* (1997) has significant role in determining why stakeholders have different approaches to disasters. This is because of the nature of stakeholder theory which suggesting that the relative importance of stakeholders in the decision-making process depends on the stakeholders' attributes (Mitchell *et al.*, 1997). On the other hand, decision-making theory assumes that humans have a tendency to maximise the value of selected alternatives based on their desires (Tversky and Kahneman, 1983). However, decisions by humans are influenced by complicated factors. Therefore, stakeholders have rational behaviour in their decision-making process but in some cases they might involve irrelevant factors in selecting alternatives (Von Neumann and Morgenstern, 1945; Levy, 1992; Ariely, 2009). Based on the above mentioned theories, Olander (2007) argued that there is a necessary obligation to the powerful and legitimate stakeholders to proactively manage the decisions they have made. In spite of the fact that powerful and legitimate stakeholders most likely have a tendency towards taking a proactive approach in DRR, they might take a reactive approach because of intuitive reasoning paradigm involving in their decision-making process. Furthermore, stakeholders may attempt to maximise the value of their decisions in emergency cases in order to learn how to be proactive instead of taking a reactive approach (McEntire, 2001). Urgent stakeholders are able to shift from a reactive approach to more proactive behaviour if they consider value maximisation paradigms in their decision making. Stakeholders behave acceptably, but not often optimally, based on their limited knowledge and within constraints set by the social system in which they live (Simon, 1991); hence, they might shift from proactive to reactive approach because of urgency and intuitive reasoning paradigm. It is therefore important to note that the validity of the proposed theoretical framework should be studied empirically in future for final justification.

Research limitations and suggestions for further studies
There are some concerns and limitations in the proposed theoretical framework, which suggest the directions for future studies. First, it is recognised that concerns and priorities of stakeholders change over time, and different stakeholders might respond to changing circumstances differently (Post *et al.*, 2002). Second, proactive approaches vary among different types of stakeholders depending on their primary goals (Mileti and Sorensen, 1990; Drabek and Hoetmer, 1991). Hence, one should consider the classification of respective stakeholders in applying the idea depicted in Figure 2. Third, in some cases there are conflicts between stakeholders and decision-making theories, whereas stakeholder theory deals with many objectives, decision-making theories particularly value maximisation paradigm to direct stakeholders to serve single objectives (Jensen, 2010). Finally, this paper has not utilised empirical evidence for evaluating the validity of the proposed theoretical framework.

Conclusion
This paper proposes a theoretical framework to examine stakeholders' proactive and/or reactive approaches to DRR in the built environment, by synthesising two theories – stakeholder theory and decision-making theory. Central to the framework is

disaster that affects socio-economic and the built environment conditions. Power and legitimacy of stakeholders result in a proactive approach if stakeholders consider value maximisation paradigms in their decision-making process. However, powerful and legitimate stakeholders are not always able to take a proactive approach because they may make a wrong decision based on the intuitive reasoning paradigm. Urgency is another stakeholders' attribute that plays like a double-edged sword in DRR. This attribute can mislead stakeholders to shift from a proactive approach to reactive behaviour by including intuitive reasoning in their decisions. On the other side of the coin, urgency can pave the way for less proactive stakeholders to migrate from response and recovery activities to mitigation and preparedness activities by considering value maximisation paradigms in their built environment DRR strategies. Finally, stakeholder prioritisation based on the stakeholders' attributes and classification can be used as a planning and evaluation tool for: first, a direct comparison of different stakeholders' approaches against disasters; second, high-level DRR planning decisions; and third, the development of proactive stakeholder DRR procedures.

This paper offers three theoretical contributions. First, it advocates the need to consider both socio-economic and built environment exposures simultaneously in DRR study. Second, it adopts an integrated theoretical approach – incorporating stakeholder theory, decision-making theory. Third, it introduces a matrix that combines stakeholders' attributes and decision-making paradigms to explain the selection of proactive and/or reactive approaches among stakeholders in DRR in the built environment.

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Corresponding author
S. Mohammad H. Mojtahedi can be contacted at: mohammad.mojtahedi@sydney.edu.au