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PROMOTING SEISMIC RETROFIT IMPLEMENATTION THROUGH THE PROPERTY MARKET PLACE

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ABSTRACT

Recent damaging earthquakes have clearly shown that seismic strengthening of earthquake prone buildings (EPBs) is one of the key issues in earthquake hazard mitigation. A key question raised by most earthquake prone countries is how to reduce future disaster losses while still providing financial protection to property owners and investors. Most investors and owners are burdened with the questions, "how strong is the market for the proposed retrofit building, can the revenues from the building pay off the debt for seismic retrofit"?, before making any investment decisions. Using the property market to create value for seismic safety has been suggested as a strong motivator for improving the seismic performance of buildings in literature (May et al. 1998 and Hopkins, 2005) but the extent to which this is achievable has not be empirically investigated. This research employed this perspective to investigate how the property market can be used to drive investments and motivation for seismic retrofit implementation. It examined the interrelationship between property investment decisions on seismic retrofit decisions. It further investigates the impacts of investments decisions on seismic retrofit decisions and how these impacts are likely to change seismic retrofit implementation and the investment product landscape. Interviews were conducted with various stakeholders involved at various levels of seismic retrofit and investment decisions. The findings revealed that a full understanding of the impact of the property investment landscape on seismic hazard mitigation can only be found using a holistic approach understand which the effects of investment, built, regulatory and external environments in which these decisions are made. It further suggest how the insurance industry, financial institutions, building owners, tenants, professionals in building and real estate communities can work together to foster seismic rehabilitation. Also, market-based incentives can offer prevailing reasons for different stakeholders and the public at large to retain, care, invest, and act responsibly to rehabilitate EPBs.

Introduction

Strengthening of EPBs has been a major challenge confronting earthquake prone regions over the years. Although, significant amount of technical solutions, resources and legislative means have

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been provided to ensure appropriate implementation of seismic retrofit measures, retrofitting to maximum permissible strength is not always undertaken because many factors interact to influence retrofit decisions. Also, some characteristics of the commercial property market tend to influence building owners mitigation decisions. One of the significant challenges in the property market place in New Zealand is the property value assessment of earthquake prone buildings (EPBs). Other challenges confronting seismic retrofit implementation include; cost of strengthening, regulatory constraints from the Building Act (2004) and perception of earthquake occurrence and risks (Egbelakin and Wilkinson 2009 and Tierney 2004). This is further complicated by the several stakeholders involved in property market and seismic retrofit decisions. This research aims at examining how seismic retrofit implementation can be promoted through the property market place. It examined the decision making processes of the several stakeholders involved in seismic retrofit implementation decisions and the property market.

The research focused only on the commercial property sector. The importance of this sector can be demonstrated in terms of high percentage of older buildings (which are usually earthquake prone due to age and decaying of construction material) used for commercial purposes in New Zealand. For instance, Wellington has about 52% of its building stock as EPBs (Stevens and Wheeler, 2008). Also, the Building Act (2004) in its attempt towards earthquake hazard mitigation captures buildings mainly used for commercial purposes (S. 122 (1) and (2). In addition, economic benefits that would accrue from seismic loss estimation, in terms of loss of lives and property, business continuity and preservation of heritage buildings make this sector worthy of consideration.

Background

Seismic Retrofitting in New Zealand

A regulatory framework has been put in place in New Zealand to ensure that appropriate seismic retrofit implementation is undertaken. The Building Act enacted in 2004 seeks to reduce the level of earthquake risks to the public over time, recommending minimum level of seismic retrofit (one-third of the strength of a new building). The Act further delegates each territorial authority (TA) to develop an earthquake prone building policy and carry out an initial evaluation procedure to identify buildings within its jurisdiction that are vulnerable to seismic risks. Table 1 summarises building owners' response rate to the initial evaluation procedure conducted by one of the major cities in New Zealand driving earthquake hazard mitigation.

Formal notices were issued to owners of identified potential EPBs to strengthen or demolish their susceptible buildings. Owners are invited within six months to provide any information specific to their buildings that may affect the initial evaluation. From Table 1, owners of approximately 34.5% of buildings identified as potential EPBs are yet to respond to the initial assessment. Also, property owners of 43% of the identified EPBs are not ready to take any mitigation action in the near future, thereby requesting time extensions ranging between 10-15 years. This further indicates that owners of EPBs are reluctant to take appropriate mitigation decisions. However, Steven and Wheeler (2008) mentioned that buildings where prompt responses were received were mainly properties on sale in the market. This perhaps indicates that there is a relationship existing between buildings seismic risks and the property market that is worthy of investigation.

Table 1 Initial Evaluation Procedure (IEP)

Analysis of potential earthquake prone buildings responses	Percentage (%)
Buildings where information received or time extensions requested (10-15yrs)	43
Buildings where further clarification sought	4.4
No of buildings where no response received within 6 months or information received to confirm earthquake prone	34.5
No of buildings where time extensions given to provide additional information	16.7
Buildings served with Section 124 notices after assessment under EPB policy	1.4

Stevens and Wheeler (2008)

Property and Investment Market

Property markets usually exist when both property sellers and buyers involved come together to undertake transactions within identifiable locations. However, there exists no single market but a series of multi-linked submarkets. Each submarket is characterised by its own distinctive routines, procedures and relationship with other institutions. There are three main submarkets defined in literature and are usually defined by geography, sector and motive of acquisition (Adams, 2008). The New Zealand property market is not an exception. Its sector submarkets consist of five traditional market divisions namely; agricultural, residential, commercial (retail/office) and industrial and leisure. The market has witness dramatic changes since its opening up of the New Zealand economy in the mid-1980s (Economist, 2003). New Zealand has been very susceptible to boom-bust cycles having undergone three major cycles. Badcock (2004) construed that the factors such as the deregulation of New Zealand financial sector, high in-flows of people and capital into New Zealand, employment conditions as well as growth in real earnings significantly contributed to the susceptibility of the New Zealand property market. He concluded that the high-in flow of people into the country could also dictate the type of stakeholders in the market.

There are several stakeholders influencing investment decisions in the property market. The owner or investor buys and sells existing or recently completed/renovated property in the market and is interested in the income stream from the occupier's rents, capitalised into the exchange or investment value of the property. The building occupier lease or buys space in the property market. This means that they are interested in use value and especially in matters affecting business productivity and operating costs, such as appearance, comfort, convenience and efficiency. The developer aims to exploit development value created by opportunities such as building sites or redundant premises suitable for renovation or demolition. He seeks to minimise development costs and capitalise on development revenues, in order to maximise profits. The property valuers appraise and calculate the market value of a building i.e. the price at which the property can be sold to a willing buyer or lease to a potential occupier. Also, the insurance and financial institutions work together to ensure the sustainability of the property market. The financial institutions give out loans and mortgages to procure properties while insurance companies ensure the continuity of the business transactions and properties. On the other hand, the government provide legislations to regulate the activities of the property market.

Seismic Retrofit Implementation and Investment Decisions

Seismic retrofit implementation decisions are usually based on how to reduce the risks posed by a building to the owner, occupier and the general public at large (EERI, 2000), while investment

decisions are usually based on ensuring that the investor achieves a satisfactory return. There are several similarities between investment and seismic retrofit decisions based on the assumption that both can be taken simultaneously on a property at a given time. Firstly, both decision-making processes usually constitute the same stakeholders. The multi-disciplinary nature of the decision-making processes indicates that decisions are crucial and all stakeholders need to contribute selflessly to the final decisions in order to significantly reduce the level of uncertainty associated with the decisions. Secondly, both decisions are made within the same real estate market influenced by same property market conditions. Also, they are both made with some level of uncertainty and with similar risks such as return on investment and related hazards. One major difference between the two decisions is the time period involved. Seismic mitigation decision covers through the building life span while investment decisions usually depend on the motive of acquisition either, on long or short term basis. Based on these similarities and differences, Bostrom *et al.* (2006) emphasised that there is an increasing complexity and interplay between the issues associated with property investment decisions. Bradley *et al.* (2002) elucidated that presently, these two decisions are usually considered individually which sometimes negates the promotion of improved seismic retrofit implementation, while Langston *et al*. (2007) explained the need for a transformation in the traditional decision-making processes of property stakeholders towards more sustainable practices, strategies and outcomes. It is thus necessary to examine the interplay between investments and retrofit decisions.

Research Method

Qualitative research design was adopted in this study. Eisenhardt (1989) emphasised that qualitative designs are most appropriate when the phenomenon being studied is poorly investigated or when little empirical study has been carried out. Limited research in literature on the research area within the earthquake mitigation and construction sectors highlights the need to adopt a qualitative research design. Most of the research on seismic hazard mitigation has focused mainly on providing technical solutions and legislation to ensure appropriate implementation. Research to date on how the property market place can be use to promote seismic retrofit implementation is yet to be fully developed. Personal interview were chosen as the data collection tool as it allow in-depth understanding of the topic and allow the use of intensive probing questions to gain more insight into the research problem. Stakeholders involved in seismic retrofit implementation and the property market were considered as the unit of analysis. The stakeholders identified include; building owners, property managers, professional and consultants such as engineers and architects, managers of insurance and financial institutions, governmental and industry organizations, property valuers and building occupiers. 33 interviews have been conducted to date. The interviews ranged between one to two hours with majority taking a little more than an hour and are audio-taped.

In order to analyse the data collected, the recorded interviews were transcribed. The transcripts provided a complete record of the interviews which facilitated the content analysis of the discussions. The main aim of this analysis was to identify trends and patterns or themes that appeared in individual interviews, or reappeared among various interviews. Attention was paid to ‘how’ words or sentences were expressed by the interviewees. In order to ensure reliability and validity of the results, care was taken so that the information provided by the participants was transcribed accurately and the information validated by the participants.

Participant Characteristics

The data collected comprises of different types of participants. Table 2 summarises the different participants characteristics, used as the main unit of analysis. Majority of the participants are in the senior management category. 45% were building owners and investors, while 55% are other stakeholders in seismic retrofit decisions and the property market. Within the building owners/investors category, they range across three types; private (53.3%), Public owners (26.7%) and Non-profits (20%). About 42% of the participants have personally experienced EQ, while 57.6% are without EQ experience. The average working experience of the participants in seismic retrofit implementation is 5.5years, with a minimum and maximum of 3years and 8years. The average of 5.5years experience indicates that, most respondents have reasonable working experience in seismic retrofit implementation, hence the reliability of the data.

Table 2. Participants Characteristics

Characteristic	Category	No	Percentage %	Characteristic	Category	No	Percentage %
Participants	Building owners/ investors	15	45.5	Years of Experience with EPBs	≤ 5 Years	3	9.1
	Professionals	6	18.2		6 - 10 Years	7	21.2
	Insurance providers	3	9.1		11 - 15 Years	6	18.2
	Governmental Organisations	5	15.2		16 - 20 Years	8	24.2
	Property Valuers	4	12.1		21 - 25 Years	4	12.1
Type of Ownership	Private Owners	8	53.3		> 25 Years	5	15.2
	Public Owners	4	26.7	Location	Wellington	8	24.2
	Nonprofits	3	20.0		Gisborne	10	30.3
Designation	Upper mgt	23	69.7		Christchurch	7	21.2
	Middle mgt	7	21.2		Auckland	8	24.2
	Professionals	3	9.1	Personal experience of EQ	Yes	14	42.4
					No	19	57.6

Findings and Discussion

Impact of the Property Investment Landscape on Earthquake Hazard Mitigation Decisions

While the property investment landscape as a whole has gained considerable attention in moderating the market value of a building, little attention has been given to understanding its full impact on seismic retrofit implementation. This research reveals that one approach to assessing this impact is to understand how the stakeholders function within their operating environments amidst the property market and how their interaction influence seismic retrofit and investments decisions. The stakeholders involved in property investment and seismic retrofit decision-making processes were identified and examined. They include buildings owners, property valuers and managers, professionals in the financial and insurance industry, building occupiers/users, investors and developers. The stakeholders operating environments include; built environment, investment

environment, regulatory environment and external environment. Figure 1 shows the different property environments, its stakeholders and how they potentially influence the building owner's earthquake hazard mitigation decision. The interplay between these environments provides an important role in fashioning the property investment decisions and consequently the type of earthquake hazard mitigation adopted by building owners. It can be argued that any earthquake hazard mitigation plan falling to recognise these interrelationships between these environments and their respective stakeholders may be deficient and lead to a suboptimal outcome.

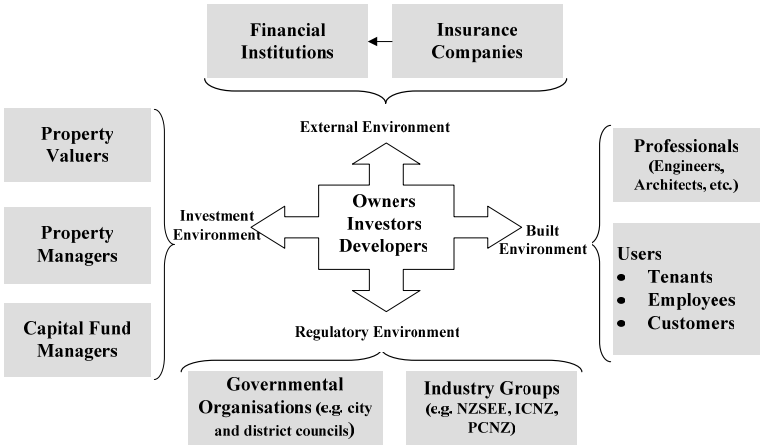

Figure 1. Seismic retrofit implementation and investment decisions

The Investment Environment comprises of property managers, valuers and managers of capital fund. Each of these players contributes to the market value of a property. For instance, property managers' sorts out the tenancy profile (type of occupier) and leasing structure (long or short term) which significantly influence the rental income streams of the property. The valuer determines the property value from the income streams. The pertinent issue considered in the investment environment revolves around the assessment of property valuations. There is currently no consensus on how to effectively embed the seismic retrofit cost analysis within the valuation process. The study showed that most property valuations carried in New Zealand does not consider the seismic risks of the properties being valued. About 68% of the property valuers interviewed explained that seismic risks are not usually catered for in property valuation. This can be attributed to the New Zealand Property valuation policy not directly addressing issues relating to seismic risks. The onus is left to the valuers' discretion. Valuers usually include a disclaimer about any related seismic risks in their valuation report, to delimit the scope and rights that may be exercised in cases that may lead to litigation. 92% of the building owners consulted explained that the expenditure on seismic retrofit is not usually reflected on the property value i.e. does not increase the market value. They also added that the functional utility of the building may not be increased by seismic retrofit and sometimes may be impaired. An example is the possible loss of useable or rentable floor area. These constraints discourage any form of appropriate mitigation decision. On the other hand, the 86% property valuers argued that in determining the property value of buildings with or without seismic risks, it is difficult to differentiate the income producing capacity of buildings that has been retrofitted from the ones that has not been retrofitted as the occupiers are likely to pay the same rents for the buildings provided they are similar in terms of rental space and location. It thus becomes a challenge for the owner to capture the added value from their expenditure on seismic retrofit.

However, 58% of the valuers with over 20 years of industry experience mentioned that the property market reacts to uncertainty by increasing the risk premium for investment. They argued that if investors and owners can accurately assess the financial cost and levels of retrofit for seismic strengthening, then the risk premiums relating to seismic retrofit will reduce. This could optimally reduce the capitalisation rates of retrofitted buildings due to lower risk in investment. Another way to capture the added economic value to retrofitted buildings is for the building to achieve lower operating costs to the users, in term of building sustainability, or obtain higher occupancy rates by overcoming market concerns regarding heath and safety issues (Nakhies, 2009). In addition, insights from the interviews suggest that only an informed market could possibly force down the market value of the non retrofitted buildings. If most occupiers are well informed about the importance of seismic retrofit and its benefits demonstrated, they might be willing to pay appropriate rents to retrofitted buildings. It will require balanced seismic retrofit education awareness within the property market, where owners, investors and occupiers can make sound investment decisions. Also, the provision and recognition of seismic risks by the property valuation policy will be an added advantage to promote seismic retrofit decisions and implementation.

The Built Environment has been of much focus and discussion in relation to seismic retrofit implementation. The environment has concentrated more on seismic techniques and design solutions, with little attention to the adoption of the design solutions during implementation. As show in Figure 1, the players include professionals such as Engineers, Architects and tenants. A fundamental issue of concern in the built environment is the financial involvement of seismic retrofit, past experiences of earthquakes and trust and belief in retrofit solutions. Findings to date revealed that past earthquake experiences among the building owners and occupiers demonstrate the need for seismic retrofit implementation. 87% of building owners and investors with earlier experience of earthquakes are knowledgeable and well informed about seismic risks and the corresponding mitigating decisions. Most of the participants within this group are concerned for their safety and business disruption. For instance, one building owner explained, *"Earthquake occurrence is real to me now and I think my safety and that of others is much more important than any other thing."*

While those with no earlier experience of earthquake risk were found to possess nonchalant attitude towards seismic mitigation. Also, the interviews gathered that informed investors, potential owners and occupiers who understand the property seismic risk would bid for the appropriate value for an intended investment. However, they are usually outbid by uninformed buyers or investors, who invest in non retrofitted properties without considering the seismic risks. Subsequently, it becomes economically unfeasible to strengthen these properties as the retrofit cost was not factored into the investment decisions. Such buildings may eventually be demolished and the associated building characters would be lost forever. Also, informed potential occupiers could request for adequate seismic strength before leasing the property, thereby initiating mitigation actions for the property owner.

Cost associated with seismic retrofit is another major economic force influencing seismic retrofit and investment decisions. Cost involved in seismic retrofit can vary widely making it difficult to adequately estimate the total cost that might be involved. This variation is dependent on a number of factors such as location and type of structure, characteristics of individual buildings, rehabilitation scheme, level of performance desired and other work(s) in the building code triggered by this decision. Both direct costs (construction cost, non-seismic related construction cost and non-construction cost) and indirect costs (costs due to business disruption and revenues)

associated with seismic retrofit further complicate the whole process of cost estimation in seismic retrofit projects. 90% of building owners and investors interviewed are usually faced with the burden of cost and the question, "is this investment worth it?" They pointed out that one of motivators to invest in retrofit is the likelihood of cost recovery (through increased rents or at the time of sale) at an acceptable period of time. While about 10% of the owners on the other hand believed that though the investment may be exorbitant at the time of retrofitting, it helps to minimise future business disruption that may be due to future changes in regulation and cost savings from future seismic rehabilitation. One of the participants suggested that a crucial strategy for managing the cost of improved seismic performance is to roll cost into larger upgrade i.e. build as much as possible buildings into the ongoing facility management program. Also, team work during the design of rehabilitation project can help to reduce cost as all stakeholders discuss and evaluate cost cutting measures as a team.

Trust could have significant influence on mitigation decisions (Hopkins et al., 2006). Lack of trust and belief in seismic retrofit techniques and associated professionals was identified as an impediment to hazard mitigation in New Zealand (Egbelakin and Wilkinson, 2008). The findings show that that these factors are highly inter-related; owner's belief in professionals influences their levels of trust in the retrofit solutions. 83% of the owners interviewed explained that they do not believe in their engineers recommendations. The study uncovered that disparities among consulting engineers are mainly responsible for lack of trust and belief in seismic retrofit. Engineers do not have a consensus on the appropriate level of seismic standard that should be adopted. Most owners become confused when two engineers recommend levels of strengthening that differs widely. Anecdotal evidence suggests that the confusion about engineer's recommendations were interpreted by owners of EPBs as incompetence. Lazar (2000) emphasised the importance of competency in developing and maintaining trust and respect. This research suggests that professionals and regulatory authorities should pay more attention to the designs they recommend and approve. Also, building owners should be advised on the possible outcome of the retrofit solution chosen in the event of an earthquake.

The Regulatory Environment has key impacts on the property industry and building owners' decision to mitigate seismic risks. The players are the governmental organisations both at the national and local government levels, such as Department of Building and Housing (DHB), city councils and district councils. It also include industry organisations that have direct influence on the built environment such as, New Zealand Structural Earthquake Engineers (NZSEE). Building codes and regulations are significant for disaster mitigation as they authorise property owners to adopt mitigation measures. Major issues arising within this environment are the public disclosure of building seismic risks and the economic impact of the Building Act. Suggestions from the interviews showed that that mandatory disclosure of seismic risks from owners or developers at a point of sale or rents to buyers or tenants will enhance seismic retrofit implementation. 85% of the stakeholders apart from about 34% of the building owners agree to mandatory disclosure of building seismic risks. Presently, there is no incentive for risk disclosure at the point of sale or rent. Mandatory disclosure of seismic risks provides some kind of seal on buildings; providing more accurate information to the buyer, insurer and lending institution. All parties involved would understand the risk in the building before continuing with the transaction. Kunreuther (2001) argued that the adoption of a seal of approval from financial institutions on buildings that meets or exceeds the code standard would promote hazard mitigation measures. Also, Cohen and Noll

(1981) provided an economic justification why risk disclosure should be mandatory. He explained that a building that fails in the event of an earthquake may create externalities in the form of economic dislocations and other social costs that are beyond the economic loss suffered by the owners. This could be in the form of social cost to the government or additional cost to other property owners not affected by the disaster. All financial institutions and insurers who are responsible for these other properties at risk would favour building codes to protect their investments. This will help in no doubt promote mitigation measures as property traders know that the property value would be reduced if seismic risk is high and the insurer would be able to adequately estimate the building risk through a risk –based premium.

Regulation is another crucial driver of responsible seismic retrofit and investment decisions. The impact of the New building Act on the property market would depend largely on the number of buildings identified as EPBs. Department of Building and Housing (DBH) (2005) estimated that about 10% of the buildings built prior 1935 are likely to be earthquake prone except, they have been strengthened. While those built between 1935 and 1976 could be an EPB depending on location and structural characteristics. The enactment of the Act has several implications on the property market in New Zealand and particularly for those of EPBs. Cost implication associated with retrofitting buildings tagged as EPBs will affect its value and saleability in the market, if immediate action is required by council. It can also extend the property sales and rents periods as prospective purchasers make the necessary investigations to protect their interests and determine effects on market value for suspected EPBs. On the other hand, owners of EPBs may undertake deferred seismic upgrading works, thereby making no efforts in reducing the seismic hazards of their buildings.

The External environment influencing the property market and consequently mitigation decisions comprises of the insurance and financial institutions. Insurance is a vital consideration in managing earthquake risks and has significant implication for seismic mitigation and investment decisions. The insurance industry has a greater knowledge regarding seismic risks than most owners and investors. Earthquake insurance policies in New Zealand generally cover a portion of shake damage to a structure from an earthquake. The building owner may also need to spend money for rehabilitation in an event of an earthquake for damages not covered under the policy. Insights from interviews indicated that buildings retrofitted well beyond minimum requirement should be eligible for premium discounts. EERI (1998) suggested that the price of insurance premium should reflect risk and take into account mitigation actions on the building if it reduces the expected insurance losses on the structure. 92% of the interviewees viewed discounts in insurance premiums as a key component of any hazard mitigation program. Also, high insurance cost increases the operating expenses of older buildings compared with the newer ones hence making them less competitive. This reduces their economic viability and property values. About 38% of the participants suggested that requirement for higher seismic performance by insurance companies from the insurer would aid seismic mitigation measures. However, one of the participants from the insurance industry viewed this as rather difficult to implement as a result of the dynamic and competitive nature of the industry unless required by regulation.

Conversely, the financial institutions involvement in seismic retrofit implementation has been very minimal. Banks usually consider issues such as loan-loan ratios, credit issues and debt service coverage (ratios of fund available to make loan repayments) before giving out loans. The study showed that banks are often less eager to lend to owners of older buildings unless the owners have built up enough equity to support the loan. The banks claimed that what is most important is the

owner's cash flow and ability to make repayments and not necessarily the value of the property as seismic retrofit will not necessarily increase the property market value. Hence, most small scale owners of EPBs could not secure loans to retrofit their EPBs. Sometimes, the banks request full replacement earthquake insurance on the property before approving the desired loan. As previously discussed, enormous insurance premiums increase the operating expenses on these buildings which make seismic retrofitting uneconomical. Anecdotal evidence suggest that there has been a gradual decline of investors/buyers interest in older buildings, with the exception of buying to demolish and rebuild in future, thus seismic retrofit implementation becomes a non issue. Clearly, the insurance and financial institutions have significant roles to play in raising market awareness and encouraging seismic retrofit implementation.

Conclusion

Using the property market place to create value for seismic retrofit implementation has been suggested as a strong motivator for improving the seismic performance of buildings in literature. The importance of the investment property market on seismic retrofit implementation is reflected by growing number of buildings that are abandoned to decay or demolished and the prevalence low response from building owners to seismic retrofit implementation. This paper has sought to demonstrate that the property market can be used to drive motivation for seismic retrofit implementation in New Zealand provided that property investment decisions are made alongside seismic retrofit decisions. A holistic approach in understanding the impacts of investments decisions in the property market place on seismic retrofit implication was adopted. The different stakeholders involved in both investment and seismic retrofit decisions were examined within their operational environments. The interrelationships within the environments and impacts on the owners retrofit decisions were also investigated. The impacts of the investment property market on seismic retrofit implementation uncovered include; the assessment of property valuations, financial involvement of seismic retrofit, past experiences of earthquakes, trust and belief in retrofit solutions, public disclosure of building seismic risks, the economic impact of the Building Act, high insurance premiums and loan rates. Market-based incentives can offer prevailing reasons for the different stakeholders and the public at large to retain, care, invest, and act responsibly to rehabilitate EPBs. There is a probability that if adequate strategies considering some of these factors could be developed or nurtured, the market place might end up taking care of many EPBs within the communities. It is important to note that these above named factors concern various stakeholders involved in seismic retrofit decision-making process. It further suggest how the insurance industry, financial institutions, building owners, tenants, professionals in building and real estate communities can work together to foster seismic rehabilitation.

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