

Flood risk vs property value: A sector specific market perception study of commercial properties

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Abstract

This study examines the perception of commercial property occupiers in the context of flood risk and property value. Relevant literature was reviewed to understand the factors affecting perception of commercial property occupiers. Questionnaire survey was conducted within selected areas of the two regions in Wakefield and Sheffield in the UK. Respondents were examined on a sector specific manner their response to vulnerability of property value towards flood risk. Apart from understanding the overall situation, the focus was on the perception of repeatedly flooded respondents to understand impact of flood memory of previous events within the system. Majority of the respondents from all sectors agreed that indirect impacts of flooding have a lingering effect on recovery activities and loss of income as a result of reduced usability of property as a business unit. Flood risk in general is not perceived to have a major economic impact but they are aware of the impact of reduced value or historical incidences of flooding can make value of properties to be vulnerable. Those with memory within the system in the form of experience of repeated incidents of flooding perceived the risk slightly differently in terms of importance of resilience enhancement against flood risk to minimise reduction of utility of commercial properties during flood events. The perception of commercial property owners were then validated by response from real estate commercial property experts via email survey. Since risk is not equal for all property sectors it is important to understand the perception of people separately for proper asset management, to make well informed investment plans and enhancing resilience against the vulnerability of value in the real estate market.

Keywords: repeat flood; perception; property value; commercial properties; memory

1. Introduction

In the UK, as elsewhere, commercial property sector makes a significant contribution to the economy. The value of core commercial properties in the UK which includes retail, office and industrial properties, according to Property Data Report in 2013 is £683 Billion (British Property Foundation, 2014). The UK endured a number of major flood events in the last few years which resulted in large scale damage and disruption of the commercial property sector

both directly and indirectly. Pitt's review after 2007 flood recommended the need for appropriate advice to flooded property owners (Pitt, 2008). Based on the level of vulnerability in commercial property sector, there is a need for understanding the attitude of the commercial property holders towards the existing flood risk in order to make future decisions on property value (Bhattacharya and Lamond, 2011). Economic theory, suggests that flood risk might have an impact on property value, however empirical evidences are either mixed or tentative in this field (Wyatt, 1996). Due to the differences in location of study areas, data availability, characteristics and nature of properties it becomes difficult to compare the results from those studies to gain understanding of the level of vulnerability and the perception of people at risk. While this line of enquiry is relevant it is also important to understand the perceived change in economic value of properties from the perspective of potential owners and occupiers of different sectors of commercial property, as nature of use of property can influence their attitude towards investing in properties in future. Perception of property value in terms of flood plain development, hazard adjustment and risk evaluation have been performed in the field of residential properties with respect to contaminated land (Raaijmakers et al., 2008; Syms, 1997), however insights gained from such studies in commercial property sector involving real estate experts are minimal. Therefore this study sought to measure perception of future vulnerability as an alternative to more conventional market transaction oriented studies in the field of real estate research.

In psychology, risk perception is defined as a subjective evaluation of the occurrence of future event and the potential damage that may be caused as a result of such event (Miceli et al., 2008). Evaluation of environmental risk in this case will deal with the concept of property value and the differences in perception among different sectors within the commercial property sector. Literature emphasized that emotions and perceptions can serve as a basis for lay and expert assessment of the probability of occurrence of an event in future and that individuals react based on their past experiences (Bhattacharya-Mis and Lamond, 2014a; Slovic et al., 2004). A single generalization that risk of flooding may precisely have an impact on property value is difficult to ascertain. This is mostly because of the specific influences of factors such as income generation, locational characteristics and so on for different sector of commercial properties. Therefore taking a sectoral perception approach will be able to provide better information for sector specific vulnerability and risk administration. However it is possible to identify the causes that might influence the perception of people towards potential changes in property value. It was argued that there is a link between perception and management of risk based on the manner risk is demarcated by organisations (Tierney, 1999) such as delineation of risk zones by Environment agency in the UK. Such demarcations may have direct influence on people's perception. Birkholz *et al* (2014) indicated that stakeholders at different risk levels and holding different interests in their properties can prioritize their flood risk management strategies. The psychological issue of vulnerability not only refers to event consequences on an individual but can have a wider impact on the whole real estate market. It was observed in literature that perception can have an impact upon issues of preparedness and recovery from an event (Bhattacharya-Mis and Lamond, 2014b; Kienzler et al., 2015). Therefore it becomes more important to better understand the perception of commercial property occupiers at different risk levels with varied experience of flooding. This leads to the following questions which require further investigation:

1. Which characteristics are perceived to influence property value in the context of flood risk and how do they differ within different sectors at different level of risk and flood experience?
2. How does the commercial property holder's perception of the criteria and their impacts on property value compare with the perception of real estate experts?

2. Method and Measures

To understand perception of commercial property holders towards vulnerability of value, the average sector wise perception of flood plain respondents' selected postcodes in Wakefield and Sheffield, Yorkshire, UK was analysed in terms of flood risk. Some of the respondents from specific sectors had experienced flooding (once or repeatedly) more than others while some were less experienced or inexperienced. The choice of population was based on their level of risk delineated by Environment Agency flood maps. Similarly, the perspective of real estate experts in commercial property market with experience in dealing with properties affected by flood was also essential to gain an understanding of the assessment criteria from the market perspective. Since the 2007 flood event had a major impact on the commercial property sector in the UK, the two locations flooded during this event were selected as the case study areas. The selection of the study areas was based on the maximum number of affected commercial properties, historical flooding in the area and their present flood risk. Based on the data produced after 2007 flood event, the selected areas matched the criteria as suitable areas of interest (Environment Agency, 2009). A two phase questionnaire survey was conducted to gather the perceptions among commercial property occupiers and to validate the result with the real estate experts in the commercial market. The first phase consisted of a postal questionnaire which was distributed among commercial property holders in selected postcodes of Wakefield and Sheffield. The understanding of perception of commercial property occupiers in the context of their potential attitude towards change in property value was the prime focus. The postal questionnaire consists of three sections dealing with business and ownership information, flooding and property value viewpoints based on respondents perception and nature of risk, impact of flooding and experience of recovery. The main themes around which factors were selected to analyse perception of people were the utility of property, its desirability in the market and the actual impact on marketability in short and long term. These themes were divided into sixteen statements and included in the questionnaire using a Likert style scale. The Likert style scale ranged between 1 to 5; where 1 indicates complete disagreement, 3 indicate neutral attitude and 5 indicates full agreement. A total of 3660 questionnaires were distributed in the region out of which 300 responses were received and 213 had the full information useful for the analysis. In the second phase of data collection, a web based survey instrument was designed for property experts based on questions dealing with changes in property value as a result of change in flood risk status. A stratified sampling strategy was implemented from a database obtained from CoStar commercial property agents' online list. Sampling criteria was based on experts having experience of dealing in properties at high and medium risk of flooding in the selected area. The identification was done by overlaying property transaction database associated with particular real estate expert with environment agency risk maps using GIS software. The broad themes and factors included in the questionnaire were flood risk perception

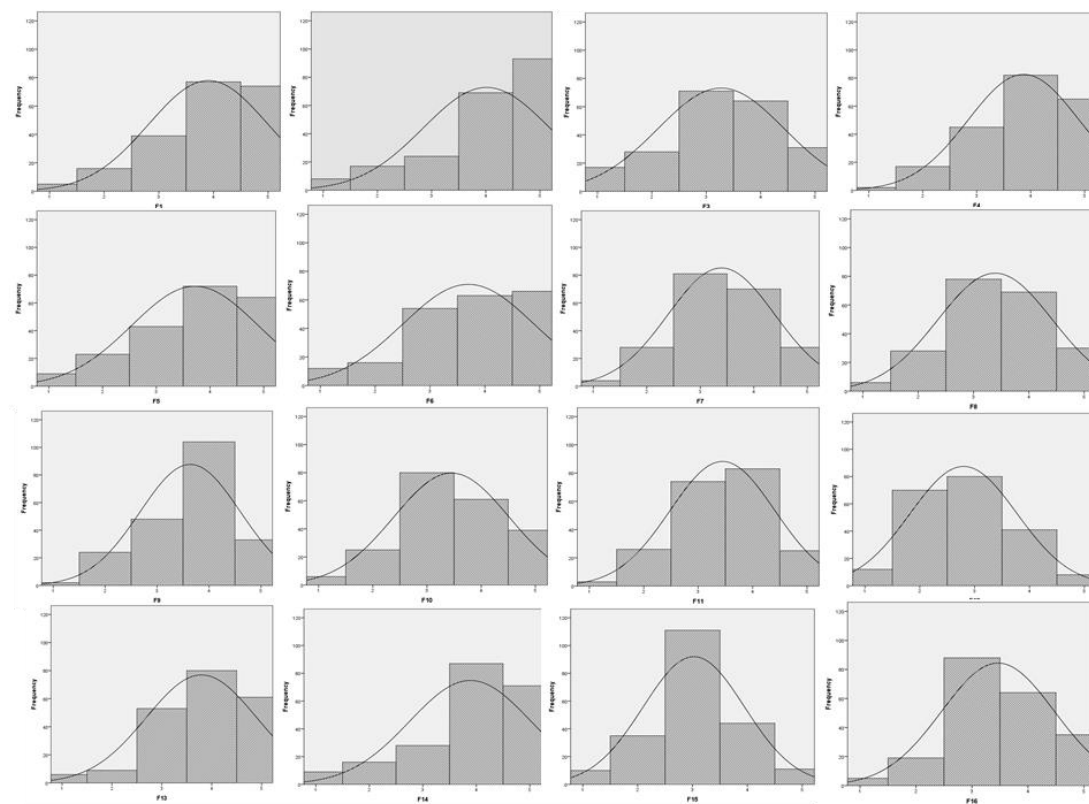
in property deals and factors affecting commercial property values. The purpose of the questionnaire was to gain better understanding of external market condition and the potential effect of flooding on the property transaction deals. Total 11 real estate experts responded to the questionnaire and these results were compared with the results from the commercial property owners/ occupiers. Based on the data collected from the respondents and the real estate agents, exploratory descriptive statistical analysis such as histogram generation and median value calculation was performed to understand and compare the perception factors.

3. Background

3.1 Perception of whole sample

Given that no incentive is provided to the respondents and the sizeable sample of over 200 responses is distributed among all flood risk zones (low-51%, moderate-12% and significant-37%) in Wakefield and (low-80%, moderate-16% and significant-4%) may indicate that bias due to non-response is minimal. The questionnaires sent to different flood risk zones were 51% (Flood zone 1), 12% (Flood zone 2) and 37% (Flood zone 3) for Wakefield and 84% (Flood zone 1), 13% (Flood zone 2) and 3% (Flood zone 3) for Sheffield. The responses returned from different flood zones matched more or less to the percentage of questionnaire distributed. This indicates that the distribution of sample was good enough to avoid subsequent data bias and responses were well distributed in flood risk zones. Out of the total respondents (213) around 27% were from the manufacturing sector, a little more than 20% were from whole sale and retail sector, almost 30% were from service sector and 21% were from leisure, transport and other mixed commercial sectors. Around 2% did not specify their sectors. Histograms in figure 1 show the frequency of respondents responding to the different perception related statements indicated in the questionnaire which were based on the themes described earlier (section 2) through Likert scale of agreement. The questions associated to the main themes are indicated as index of perception statements in Fig 1. Based on the spread of responses it is clearly perceptible that in case of high flood risk having an impact on property utility (F1, F2) the agreement is fairly strong, showing that commercial property holders in general are aware of the direct and indirect impacts of flooding. They are in agreement that reduced utility of property can have an impact on the income generation caused in case of longer recovery time (F13, F14) while higher expected income may help in increasing the demand for the property (F8). However the importance of prime location (F3) showed a broad spread of perception. Respondents also agreed that with cheap and easily available insurance (F4, F5) there might be increased probability of achieving high value in the market. Attitude of all respondents towards flood history and its impact on value (F6) as well as historical low value (F10) of property as a result of flooding leading in lower demand in future both received fairly high agreement with some neutral responses. In case of protection and mitigation measures (F9, F11) the perception represented an understanding of the importance of the measures with some agreement towards their effect in the long run (F12). Both for flexible lease terms and easy mortgage availability (F7, F15) leading to high demand for properties were responded with mostly neutral response.

A mixed message is seen among respondents towards the perception that with increased risk level there might be lower potential of staying and continuing business and intentions to move



Index of perception statements from top left to bottom right

F1: Higher risk lower income	F2: Lower income lower value	F3: Prime location high value	F4: Easy insurance high value
F5: Cheap insurance high value	F6: Historical flood low value	F7: Flexible lease higher desirability	F8: Higher expected income high demand
F9: Higher protection high value	F10: Historical low value and low demand	F11: Higher mitigation high demand for property	F12: Lowering risk has no long term effect
F13: Higher loss in income longer recovery	F14: Longer recovery lower utility	F15: Easy mortgage high demand	F16: High risk low desirability to stay

The x axis indicates the agreement level from 1 to 5 and y axis shows the frequency of respondents

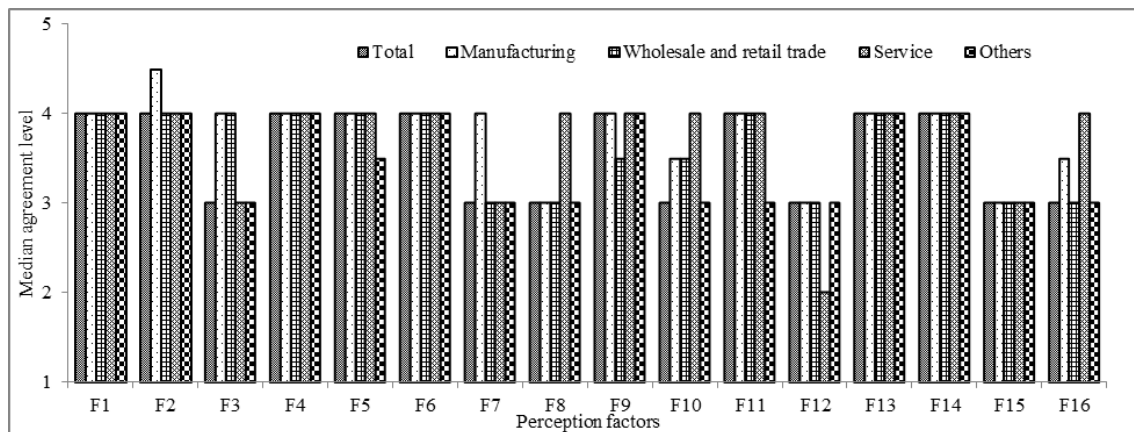
Figure 1 Market perception for Vulnerability of value among flood plain commercial property respondents in Wakefield and Sheffield

to areas with lower risk (F16). The histograms are showing a generalized view of all the sectors; however since flood risk does not affect all sectors equally it is necessary at this point to explore the results in a sector specific manner.

3.2 Perception of different sectors

When the same factors of perception were plotted (median value of agreements observed from the Likert scale) stratified by specific sectors a general consensus can be observed across many of the factors but there were some exceptions as seen in figure 2. All sectors showed primary concern about high flood risk (F1), importance of easy and cheap insurance (F4, F5), impact of

historical flood on property value (F6) and higher loss of income as a result of longer recovery time (F13, F14). As for property marketability, all respondents perceive that with higher loss of income and longer recovery time loss of utility can result in making value vulnerable to changes in the market. The repeatedly flooded respondents, although fewer in number, showed higher agreement towards the factor of recurring loss in income due to longer recovery time. It was unanimously perceived that with lower income for lower utility of the property the value might be potentially affected (F2).



Index of perception statements

F1: Higher risk lower income	F2: Lower income lower value	F3: Prime location high value	F4: Easy insurance high value
F5: Cheap insurance high value	F6: Historical flood low value	F7: Flexible lease higher desirability	F8: Higher expected income high demand
F9: Higher protection high value	F10: Historical low value and low demand	F11: Higher mitigation high demand for property	F12: Lowering risk has no long term effect
F13: Higher loss in income longer recovery	F14: Longer recovery lower utility	F15: Easy mortgage high demand	F16: High risk low desirability to stay

Figure 2 Sector specific perceptions of commercial property owners/ occupiers for vulnerability of value

A difference in opinion among manufacturing, retail and wholesale with service and other commercial sectors regarding prime location (F3) can be observed. It is understandable that for wholesale and retail sectors location can be an important factor for gaining customers. As for the manufacturing sector the importance of location may be related to their need to be close to suppliers. Regarding availability of easy and cheap insurance (F4, F5) the general agreement is high among all sectors as mentioned before with fewer neutral views who are predominantly repeatedly flooded especially for the factor that cheap insurance premium can improve the properties desirability in the market. It is possible that they recognize the importance of easy and cheap insurance in terms of marketability of property but due to repeated flood experience there is increased probability of getting higher insurance premium at the time of renewal which might reflect in neutral attitude. More repeatedly flooded responses from the commercial property sector are necessary to validate this aspect of perception in the future. Despite some neutral responses majority of respondents are concerned about the history of flooding (F6) and for historical low value (F10) service sector showed the highest agreement. The decrease in demand as a result of low historical value in a property is effectively perceived as condition

that may have an impact on future property value. Flexible terms of lease (F7) are perceived to have higher impact on property desirability by the manufacturing sector while others represented a neutral attitude. Majority of the manufacturing sector (48%) have internal repairing and insuring type of lease while few have Full repair and insurance lease terms (26%) and the rest are either not sure or did not answer. The internal repair and insuring type of lease does not permit tenants to make changes in their property without landlord's knowledge; therefore these property holders have less freedom in adopting risk reduction measures which might have influenced them to show fairly high agreement towards flexible lease terms. In terms of investment towards risk reduction through resistance and resilience measures (F9) majority of the commercial property respondents showed high agreement towards their efficiency in reducing risk; few other mixed commercial sectors respondents showed a neutral attitude towards higher mitigation leading to high demand for property in the market (F11) while majority agreed to its usefulness. With little disagreement from the service sector properties, manufacturing, wholesale, retail and other sectors indicated neutrality in their attitude towards the perception that lowering risk has no long term impact on value (F12). The general agreement of all flood affected respondents towards mortgage (F15) and demand for property was neutral. Similar neutral attitude was observed among all sectors when they have been asked to perceive the high flood risk factor and their desirability to move out to a location with less risk (F16) except manufacturing and service sectors. This confirms the earlier result (F3) that location is more influential for these sectors and they would be more reluctant to move. It is perceived that due to the inherent memory of previous floods into the system as a result of experience, some of the perception factors for example importance of insurance (F4, F5) or moving out of the high risk zone (F16) received slight differences of opinion between repeatedly flooded respondents from the general agreement. This is now important to understand how the perception among respondents with or without flood experience compares with the real estate market commercial property experts. This can be observed by comparing and validating the collected perception data with that of real estate experts. The next section will elaborate on the data collected from the real estate experts with experience of dealing in flood affected properties to analyse their perception on potential changes in property value.

3.3 Perception of real estate experts

Real estate experts were asked to indicate their perception towards selected variables and the impacts these factors have on property value. The outcome from this exercise was intended to compare perception of the experts to commercial property holders' criteria those were perceived to have potential effect on property value in the market. The criteria included: high risk of flooding, measures taken to reduce risk, history of flooding and reduced value as a result of previous memory of flooding within the system, locational advantage compared to risk of flooding, availability of mortgage and importance of mitigation measures. Figure 3 illustrate the comparative perception of all respondents from both study areas and the commercial real estate experts. The responses were based on a 5 point Likert scale where a value less than 3 indicated lower agreements and value above 3 indicated higher agreement with 3 being neutral. The general pattern of perception reveals that both property occupiers and property experts were prone towards keeping their opinions neutral. Neutral attitude of commercial property holders

could be observed towards factors like flood defences and mitigation measures, mortgage availability and locational advantages, while the experts also showed lower agreement towards these issues except for locational advantages. The most likely reason for the difference in opinion for existing mitigation and mortgage availability can be the result of the lack of understanding of commercial real estate experts towards flood risk as an issue of concern in the real estate market. It is expected that respondents who are living with risk will provide a better understanding towards the importance of mitigation activities. Consequently defences and mitigation activities were not perceived to have much influence on value as to their perception the more frequent transaction of renting properties does not get affected by risk reduction measures; as for the mortgage issue, it seems that the sudden changes in the economic climate might have affected that perception which some real estate expert indicated in the form of notes in the space provided within the questionnaire.

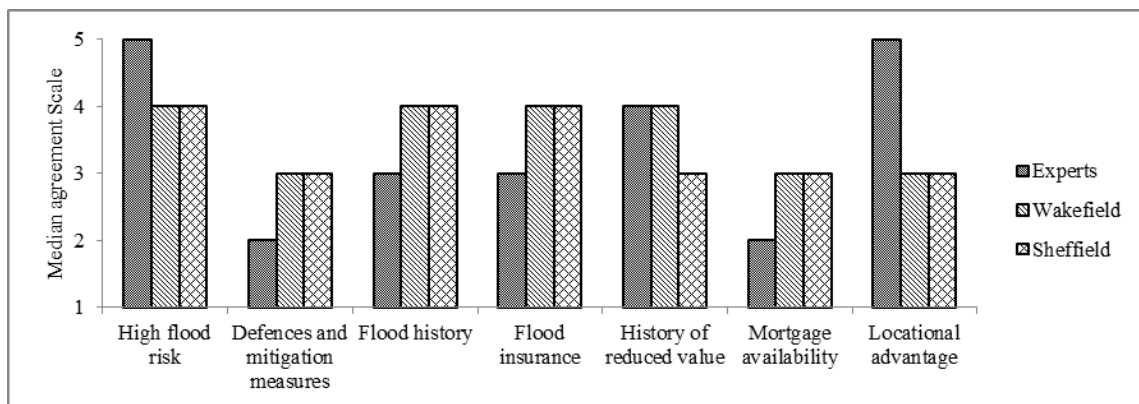


Figure 3 Comparative analyses of perception of flood risk and vulnerability of value of among real estate experts and commercial property holders in Wakefield and Sheffield

The agreement among all commercial property respondents in Wakefield and Sheffield showed very similar perception with minor differences. It should also be noted that there were no total contradictions where high agreement among commercial property holders corresponded to high disagreement among experts or vice versa. The general perception of both experts and property occupiers established to the criteria of high flood risk having impact on property value showing the growing awareness among the stakeholders. While commercial property occupiers both total and repeatedly flooded agreed highly towards availability and accessibility of flood insurance to have effect on property value, experts were neutral on that issue. The consequence of historical flooding and historical value reduction showed higher impact on property's present value. Commercial property holders with repeated flood experience showed higher agreement towards the issue but the experts seem to have neutral view towards this. This attitude can be due to the case specific nature of the issue. Sometimes based on the perception of some buyers, history of flooding and previous value reduction can be an important aspect in negotiation of property value while for others that may not be an issue. As in terms of empirical evidence such cases are hardly visible, the factor of historical flooding is not perceived to be an important aspect in the real estate market. It is acknowledged that, due to low sample sizes within the sectoral breakdown and repeatedly flooded respondents, the observations contained here were not subjected to formal tests of significance and cannot be held to be generalisable. It is acknowledged that a larger sample in this or other locations can provide more robust results and

also reveal differences from one location to another depending on level of risk, awareness, experience and knowledge. However these results indicate that it is important to consider sectoral and experience factors when assessing the vulnerability of value to flood risk and historic floods. Comparative responses from both data sources showed general evidence of agreement on the bigger picture around the role of flood risk still there appears to be a knowledge gap between the real estate experts and commercial property holders regarding the importance of operational factors that might affect value. This lack of understanding could lead to conflict between the two sides of the demand and supply curve. This is acknowledged that flooding is one of the several factors that might have an impact on the peoples' perception. For instance the impact of memory of previous floods and other flood experiences before 2007, the sense of belonging to the place where as a result of their stay in the area for a long period of time, local cultural heritage where the commercial properties feel part of the community may influence their perception and with changes in such factors the overall perception might also vary. Improved understanding of the perception of commercial property occupiers (demand side) could inform the property professionals to provide operational advice and has potential to provide greater incentives to commercial property holders to take risk preventative actions.

4. Conclusion

The research outputs described in this paper is an attempt to overcome the problems of data inadequacies in the field of flood risk and its interaction with real estate value, by bringing together perceptions from different property sectors and those affected or unaffected by flooding. The approach presented integrated understandings derived from the conventional methods of market studies for understanding flood risk and its impact on property values with societal perception. The study found that the differences in opinion between flooded and non-flooded population as well as among different sectors were limited and that there was general agreement around broad risk factors and their potential to reduce utility, marketability and desirability of property at risk in the future. However the exceptions where perceptions were seen to differ revealed the importance of two main experiential factors. First, understanding of the utility of property with respect to functionality and prime location differed among sectors, with certain sectors and those with flood experience expressing greater tolerance of risk in balance with other value factors such as location. Second those with flood experience had a greater knowledge of, and belief in, the impact of mitigation activities such as insurance than the real estate experts. This reflects the current lack of market concern with flooding as a major issue in the property market and reinforces the need to study vulnerability of value rather than rely solely on market based analysis of transaction prices. The repeated flood experience reflects that living with risk has provided the commercial property occupiers an understanding to better deal with risk based on memory of flooding than those inexperienced respondents. Wider propagation of this knowledge may simultaneously inform better investment decisions while improving the take up of sector appropriate mitigation and protection to minimise future flood losses and damages. The contribution from this research provide particular promise as starting points for renewed research agenda around flood risk perception stratified among different commercial property sectors.

Acknowledgements

The authors would like to acknowledge the funding support by EPSRC through FloodMEMORY project. Further to that the financial and administrative assistance received from University of Wolverhampton and the data received from the Environment Agency is also acknowledged.

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