

THE UNIVERSITY OF HULL

Doing Business Underwater: Flooding, Entrepreneurship and Resilience

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by

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LIST OF ABBREVIATIONS

ABI	Association of British Insurers
BC	Business Continuity
BCM	Business Continuity Management
BCP	Business Continuity Plan
BIA	Business Impact Analysis
BIS	Department for Business Innovation and Skills
COSO	Committee of Sponsoring Organizations of the Treadway Commission
DCLG	Department for Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EWE	Extreme Weather Event
FAME	Financial Analysis Made Easy
FCERM	National Flood and Coastal Erosion Risk Management Strategy for England
FWMA	Flood and Water Management Act 2010
HCC	Hull City Council
HEPS	Humber Emergency Planning Service
IPCC	Intergovernmental Panel on Climate Change
LLFA	Lead Local Flood Authority
NRR	National Risk Register of Civil Emergencies
ONS	Office for National Statistics
SCC	Sheffield City Council
SME	Small and Medium-Sized Enterprise
SYLRF	South Yorkshire Local Resilience Forum
UK	United Kingdom

ABSTRACT

Small and Medium Sized Enterprises (SMEs) are extremely important to the health of the UK economy. Yet their continued survival is threatened by a plethora of risks on a daily basis. Floods affect more people and cause more economic losses than any other hazard in the UK. Accordingly, the aim of this thesis was to explore flood risk from the SME perspective by looking at case examples of Hull and Sheffield, two cities which were hit extremely hard during the summer 2007 floods. Through the conduction of 38 semi-structured interviews and the distribution of a postal questionnaire with a response rate of 8.7%, it was found that for SME owner/managers flooding is not a significant risk. It is one in a 'package of disruptions' which causes discontinuity to the 'order of business'. These perceptions differ to those held by local regulatory bodies. It was revealed that the Environment Agency, Hull City Council and Sheffield City Council are at cross-purposes in regards to the resilience measures implemented to address flooding. This variation leads to the production of a 'responsibility game' scenario between SMEs and regulatory bodies, the catalyst for SMEs remaining vulnerable to the risk of flooding. The responsibility game develops due to limitations associated with regulatory body resilience measures. As regulatory body resilience measures are dictated by national policy, their shortcomings are attributed to constraints at a national level. Flooding has a 'local profile'. Therefore it is recommended that flooding policies should be generated at a local scale on a place-by-place basis. Local characteristics can be taken into account and assistance can be provided by regulatory bodies which is tailored to those stakeholders in need. By doing so, it is predicted that SME vulnerability will reduce, and owner/managers will not spend a future *"doing business underwater"*.

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1. SMEs AND FLOODING: A COMPLEX RELATIONSHIP

1.1. INTRODUCTION

The fundamental aim of this thesis is to explore flood risk in Hull and Sheffield from the perspective of Small and Medium Sized Enterprises (SMEs). This is in order to gain insights into the relationship between flood risk management policy and SME business continuity. The relationship between SMEs and flooding is a complex one composed of a plethora of risks, stakeholders and perceptions. Yet it is one that needs to be understood as researchers predict more frequent and more severe flooding episodes (IPCC, 2012, p8).

The United Kingdom (UK) is currently experiencing a ‘flood rich period’ with the occurrence of this hazard bringing losses of an estimated £1 billion each year (Wilby *et al.* 2008 p2511, Johnson, 2012, online). At present 15.0% of the UK’s urban land is at risk; 4.6 million people and 5.2 million properties, including 185,000 commercial properties, are susceptible to flooding within England and Wales (Environment Agency, 2009, p3; Geographical Association, 2009, online; Chuck, 2010, p597). In order to protect those who are vulnerable against further flood events, there needs to be an awareness of the potential for this hazard to occur in the future, and the potential damage that could be inflicted. Many academics, including Barnett *et al.* (2006), Hannaford and Marsh (2006) and Malby *et al.* (2007), continue to look at past flooding trends. They, along with the Pitt Review which emerged following the extreme UK flooding events of 2007, state that current trends are predicted to rise exponentially, with a proposed increase in the occurrence and magnitude of localised UK floods (Pitt *et al.* 2008, pxi; Reynard *et al.* 2001, p345; Prudhomme *et al.* 2003, p1; Holman *et al.* 2005, p10). This is arguably attributable to the impact of climate change (Tunstall *et al.* 2004, p480). Hull and Sheffield are two cities that experience a “*very real risk*” in regards to flooding both at present and in the future. By examining flooding in these locations, the implications for the wider context can also be examined.

The UK hosts a diversity of industries and exhibits a heavy reliance upon SMEs (Mason *et al.* 2006, p2). SMEs account for 99.2% of all UK enterprises, a 58.8% share of all private sector employment and contribute 48.8% to private sector turnover (Simpson and Docherty, 2004, p328). SMEs are one of the most important stakeholders related to

business present within the nation. The ‘backbone’ of UK commerce, they are critical to the continued well-being of local communities (Alesch *et al.* 2001, p6). Through the provision of employment, goods and services, SMEs generate the indispensable ‘social glue’ which binds communities together (Anderson and Jack, 2002, pp193-210). Nevertheless, SMEs tend to have a high failure rate and small budget which makes them extremely vulnerable to hazards such as flooding in comparison to larger corporations (Weems, 1991, cited in Botha *et al.* 2002, p331). In cities with fragile economies, such as Hull and Sheffield, the loss of a number of SMEs through the occurrence of a flood would be severe for local commerce, with repercussions reverberating throughout the local communities who rely upon their presence for services and employment (CECA, 2013, p2).

The rise in recent flood events, the predicted increase in their occurrence and severity, and the importance of SMEs has:

- A. Highlighted the need for a focus down from the large, macro-economic picture of the impact of climate change to a more granular understanding at the lower levels of community and business (Hallet, 2013, p12).
- B. Intensified the need for a greater academic understanding of flood risk in terms of SMEs (Crichton, 2006, p15).
- C. Heightened the requirement of business owners to adapt their businesses to the threat of future flooding (Pitt review, 2008, pxvi; Wedawatta *et al.* 2011b, p1).

Exploring the specific issues of flooding and SMEs is an emerging field. Recent studies have examined the impacts of Extreme Weather Events (EWEs) and flooding upon SME operations to review how owner/managers respond to and prepare for these risks (Crichton, 2006; Ingirige *et al.* 2008; Thurston *et al.* 2008). They have also scrutinized the variables which influence owner/manager reactions (Wedawatta *et al.* 2009; 2010a; 2010b; 2011a; Ingirige and Wedawatta, 2011a; 2011b and Wedawatta and Ingirige, 2012). However, there are still relatively unexplored topics, allowing this thesis to make an original contribution to knowledge. SME perceptions of, and resilience to, major disruptions has been identified as very under-researched. At present, it is unknown whether SME owner/managers and regulatory bodies have a shared perception of the risk of flooding, and how these opinions influence SME business continuity and flood risk management. To explore this issue, this research takes an interdisciplinary approach. Building upon a wide range of well-established fields of research, this thesis will examine stakeholder perceptions of flood risk from the social science approach and business practice, two contending explanatory interpretations.

It is predicted that understanding the social science approach to flood risk has positive implications for business practice. Highlighting how SME owner/managers perceive and respond to the risk of flooding makes it possible to identify the type of ‘expert’ or ‘state’ assistance desired by these stakeholders before, during and after a flood event. These requirements can then be more effectively incorporated by the relevant regulatory bodies (those authoritative bodies who make large scale decisions to protect the public) including local councils and the Environment Agency. It is envisaged that these alterations will help improve flood risk management policies, campaigns and resilience techniques, and complement those measures already taken by SME owner/managers as opposed to working against them. In doing so, SME owner/managers will increase their resilience and not spend a future *“doing business underwater”*.

1.2. DEFINITION OF KEY TERMS

The social science and business practice approach share common ground. Both approaches seek explanations of behaviour on the assumption that it has causes which are knowable and measurable (della Porta and Keating, 2013, p3; Bird *et al.* 2014, p207). However, the focus of this exploration varies between the two disciplines. The sociological perspective does not focus upon the individual (Charon, 2013, p2). Exploring social life and behaviour, it supports a holistic investigation into a specific group’s flood perceptions (SMEs) (Hassard, 1995; p7 Andersen and Taylor, 2011, p5). By concentrating upon issues important to business, a focus upon business practice allows flood risk perceptions to be explored within a particular context at the SME level (Ingirige and Wedawatta, 2011a, pp269). The influence of SME owner/manager flood risk perceptions (business practice) can be outlined at a micro and macro level. This highlights both the ‘in house’ effects upon SMEs, and the implications upon society (social science); effects which can be considered when regulatory bodies are formulating anti-flood policies and resilience schemes.

Within the social science approach and business practice, there are a number of ambiguous key terms which can be defined in a variety of ways depending upon the approach being taken (Bogardi, 2006, p11-12). It is important to clarify these concepts before they are placed into the context of the study.

Despite its argued constant presence in almost every activity, there is little consensus about how to define risk (Damodaran, 2008, p5). When looking for a definition, attention must be paid to the disciplinary lens to research being taken. Physical or natural scientists tend to prefer a quantitative view of risk (Fjeld *et al.* 2007, p4). Social scientists favour the inclusion of qualitative social and psychological elements, viewing the concept

in terms of 'hazards', 'likelihood' and 'vulnerability' (Fjeld *et al.* 2007, p4). Risk arises from exposure of a vulnerable population to an adverse event, with risk not existing if this exposure to a harmful substance or situation does not occur (Fjeld *et al.* 2007, p5). From a social science perspective, risk is defined as the *"likelihood of a hazard occurring and creating loss to people such as finance or possessions"* (Smith, 2001, p4). The hazard referred to in this definition is a potential source of danger which can be present in a number of formats (Smith, 2001, p4). Hazards are often seen as the potential consequences of decisions taken by others (Luhmann, 2002, p22). As a result the social sciences approach to 'risk' and 'hazard' tends to be focused upon negative, unwanted risks and extreme physical events (hazards) such as earthquakes or floods. Another view is held by Susman *et al.* (1983), who describes an interface between an extreme physical event and vulnerable population as potentially causing a disaster (p264). Other approaches, such as business practice, take a more holistic viewpoint and can see the benefit of some forms of risk.

Within business practice, risk is defined in two ways:

1. Non-entrepreneurial risks (Miles, 2011, p99). These are the occurrences of hazards with negative consequences and can include fire, pollution and fraud.
2. Entrepreneurial risk tends to be voluntary. It occurs when a company chooses to make alterations to everyday operations. This could include building a new plant, launching a new product or buying a company (Sadgrove, 2005, p3). It could be argued that if a company does not engage in entrepreneurial risk, it may find it difficult to meet certain objectives or develop as an enterprise (Hilson *et al.* 2012, p1).

Contrary to the social science perspective, business practice classifies some risks as acceptable and deems enterprises as having a certain level of *"risk appetite"*: *"the amount of risk an entity is willing to accept in pursuit of value"* (COSO, 2004, p6). A further difference is that business risk applies to any management decision that could have a positive or negative outcome (Sadgrove, 2005, p3). Moreover, business practice is more holistic in terms of the risks included such as strategic, compliance, financial and operational, alongside physical or natural events.

Despite these different definitions, within certain contexts flooding is the driver which can bring different types of risk together. By investigating the kind of risk floods pose to SMEs, the social science approach and business practice will 'cross-over', with floods simply the instance in which these different types of risk come to bear. It is not only the hazard of flooding that can bring these two risk perceptions together. Both the social

science approach and business practice are connected by the themes of vulnerability and resilience. Once more, there are disparities in the way they are viewed.

Socially, vulnerability is defined as *“the characteristics of a person or group and their situation that influences their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard”* (Wisner *et al.* 2008, p11). When defining vulnerability within business practice, more attention is paid to who is at risk rather than the risks exposed to: *“an exposure to serious disturbance arising from risks within the business as well as risks external to the business”* (Department of Trade and Industry, 2002, p2). Within the social sciences, resilience is *“the capacity of a community or society potentially exposed to hazards to adapt by resisting, or changing, in order to maintain an acceptable level of functioning and structure”* (United Nations, 2005 cited in Paton and Johnston, 2006, p90). Within business practice, resilience is defined as *“an organisation’s ability to successfully adjust to the compounded impact of internal and external events over a significant time period”* (Sundström and Hollnagel, 2007, p235). Once again this definition is more definitive in regards to who is being included, and less explicit in regards to what events are being considered. For both approaches, resilience also includes the ability to *“learn from a disturbance”* (Surjan *et al.* 2011, p19).

The definitions outlined above show that there are differences between the social science approach and business practice in regards to their focus: society as a whole versus individual businesses. By bringing these approaches together, it is possible to gain an understanding of how the concepts of risk, hazard, crisis, vulnerability and resilience are related to or have an influence upon an SME’s business practice with respect to business continuity.

1.3. THE NATURE OF RISK

The world has always been a place where social actors are confronted by a large variety of risks (Ransome, 2010, p383). As such, the notion of risk is something which is studied both within the social science approach and business practice, yet with variations in the terms of definition. Changes in social practices mean that communities are witnessing the emergence of ‘new’ risks, including climate change or terrorism, and the almost complete eradication of others, such as smallpox (Winkelstein, 2002, pp169-174; Hovden, 2003, p2; Bonoli, 2005, p432). However, there are hazards that will always remain a threat, flooding arguably being one. Risk is the possibility that something unpleasant or dangerous will happen (Soanes and Stevenson, 2005, p1521). A risk assessment matrix can be used in order to categorise risks and hence, prioritise remedial

actions (Figure 1.1)(Elliot *et al.* 2010, p127). Within the matrix below, risks are identified according to their *likelihood* and *consequence*. They are allocated a rating from low to extreme taking into account the context of the risk, the need for management, the source of risk, the impacts of the risk, the treatment of the risk and whether the risk is acceptable or not (Elliot *et al.* 2010, p128). Flooding is one such hazard which can be placed into a risk assessment matrix. Highlighting the risk level of flooding allows the priority of this hazard to be attained, and adequate responses to be developed. However, even when provided a rating, the same risk is not experienced identically. Divergences in the risk exist depending upon definitional, cultural, societal, temporal and locational variations (Kasperson and Kasperson, 2001, p31; Tombs and Whyte, 2006, p170).

Degree of Threat	High	Priority C	Priority B	Priority A
	Medium	Priority D	Priority C	Priority B
	Low	Priority E	Priority D	Priority C
		Low	Medium	High

Probability of Occurrence

Figure 1.1: The risk assessment matrix

Source: Adapted from Elliot *et al.* 2010, p127

1.3.1. RISK IN THE UK, HULL AND SHEFFIELD

Designed for individuals and businesses wishing to become better prepared for crisis, the National Risk Register of Civil Emergencies (NRR) summarises the main kinds of ‘emergencies’ that affect UK society (Cabinet Office, 2013, p10). Again this is something both social scientists and business managers are concerned with. The NRR includes a risk matrix demonstrating how the main threats compare with one-another in terms of likelihood and extent of impacts (Figure 1.2). It also outlines the scale of consequences and how government or emergency responders are preparing for, and going to respond to, these hazards.

This matrix highlights coastal flooding as one of the highest priority risks facing the UK alongside pandemic influenza, catastrophic terrorist attacks and volcanic eruptions abroad. As coastal flooding “*has the potential to have the most widespread impact in a single event*” and “*the frequency of inland flooding is increasing*”, this risk is seen as more

significant than other threats (Cabinet Office 2012, p14-15). The way a risk is perceived or rated is strongly related to how a stakeholder defines the term (Vlek and Stallen, 1981, p6). The UK Government's chosen definition also leads them to judge inland flooding as one of the highest possible threats to the UK; thus providing a rationale as to why this hazard is being investigated. By understanding flooding, stakeholders including SME owner/managers and localised regulatory bodies are able to adequately prepare for, respond to and recover from their occurrences, thus minimising the cascade of impacts upon society. Is this national significance of flooding observed in a local context?

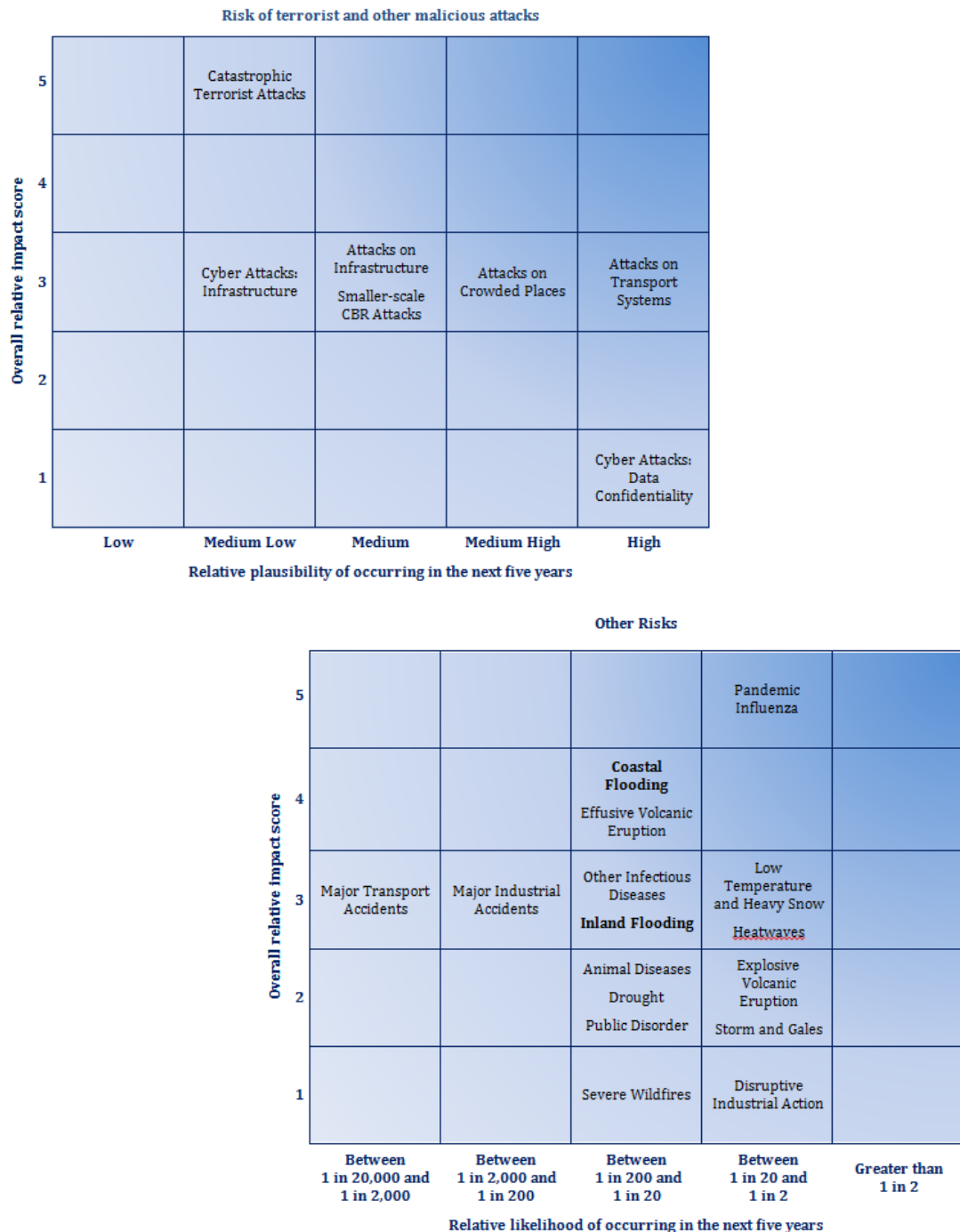


Figure 1.2: The National Risk Register of Civil Emergencies Risk Matrix

Source: Cabinet Office, 2013, p10

(IMPACT)	CATASTROPHIC	Aviation accident	Very large toxic chemical release	MAJOR FLUVIAL AND COSTAL FLOODING (MORE THAN 2 REGIONS)		
	SIGNIFICANT	Fire/explosion at oil refinery	Fire/explosion at fuel distribution site	Large toxic chemical release LOCAL COASTAL/TIDAL FLOODING (1-2 REGIONS)	LOCAL COASTAL/TIDAL FLOODING (1 REGION) URBAN FLOODING LOCAL FLUVIAL FLOODING REGIONAL AND LOCAL FLUVIAL FLOODING	Pandemic disease
	MODERATE	Bridge collapse Maritime pollution Sinking of passenger vessel Large scale public protest	Storms and gales Emerging infectious diseases Disruption to oil and gas production	Heat wave Industrial explosion Low temperatures and heavy snow Biological substance release Telecommunications failure	Epidemic disease	Major pollution of controlled waters Major land contamination
	MINOR	Forest or moorland fire Maritime accidents Land movement Water infrastructure failure	Building collapse Coastal erosion	Major accident on motorway/trunk road	Targeted industrial protest Fuel supply constraint	No notice failure of public telephone provider
	INSIGNIFICANT			Public events and mass gatherings	Prison officer strike	Major contamination incident with implications for food chain
		NEGLIBLE	RARE	UNLIKELY	POSSIBLE	PROBABLE
(LIKELIHOOD)						

Figure 1.3: The Humber Community Risk Register Matrix*Source: Adapted from the Humber Emergency Planning Service, 2011*

(IMPACT)	CATASTROPHIC	Fire/explosion at fuel distribution site MAJOR RESERVOIR FAILURE				
	SIGNIFICANT	Very large toxic chemical release Accidental release of radioactive material	Large toxic chemical release	MAJOR COASTAL FLOODING (EAST COAST) MAJOR FLUVIAL AND FLUVIAL FLOODING (>10,000 PROPERTIES) URBAN FLOODING	MAJOR FLUVIAL AND PLUVIAL FLOODING (1,000 – 10,000 PROPERTIES)	Pandemic disease
	MODERATE	Biological substance release	Aviation accident Accident involving transport of hazardous chemicals/fuel/explosives MAJOR RESERVOIR OVERTOPPING	Large scale public protest Disruption to oil and gas production Electricity network failure	Low temperatures and heavy snow	Major pollution of controlled waters LOCAL PLUVIAL AND FLUVIAL FLOODING (100 – 1000 PROPERTIES) FLASH FLOODING
	MINOR	Fire explosion involving gas or fuel pipeline Sewage treatment works failure	Building collapse No notice failure of public telephone provider	Railway accident Gales Heatwave Epidemic disease Telecommunications failure	Industrial explosions and major fires Storms Major accident on motorway/trunk road	Major contamination incident with implications for food chain
	INSIGNIFICANT		Sinking of passenger vessel Bridge collapse	Land movement	Tunnel collapse Targeted industrial protest Forest or moorland fire	Prison officer strike
		NEGLIBLE	RARE	UNLIKELY	POSSIBLE	PROBABLE
(LIKELIHOOD)						

Figure 1.4: The South Yorkshire Community Risk Register Matrix*Source: Adapted from the South Yorkshire Resilience Forum, 2011*

The regions of Yorkshire and Humberside, and the cities of Hull and Sheffield, face a plethora of risks. The majority of these have been identified by the Humber (Figure 1.3) and South Yorkshire (Figure 1.4) Community Risk Registers. Similarly to that of the UK, the Humber register highlights all types of flooding as one of the most significant hazards to affect the region. It is therefore classified as ‘critical’, requiring immediate attention (HEPS, 2011, online). This is alongside risks such as aviation accidents, toxic releases and pandemic diseases (HEPS, 2011, online). Within South Yorkshire, all flood types are seen to be one of the most prominent risks to affect the region, being categorised as either ‘medium’, ‘high’ or ‘very high’ risk (SYLRF, 2011, online). Other risks assigned these rankings and also deemed to be significant to the region are fire/explosion at a fuel distribution site or oil refinery and the release of radioactive/toxic materials (SYLRF, 2011, online).

The local regulatory bodies responsible for the composition of these registers perceive flooding to be a likely event. Flooding is therefore considered one of the highest potential threats present in Humberside and South Yorkshire and consequently Hull and Sheffield. Why is this the case?

1.4. THE NATURE OF FLOODING

As floods affect more people and cause more economic losses than any other risk, they are one of the most studied natural hazards (Brilly and Polic, 2005, p345). There are many different types of flood including fluvial (river), pluvial (rain) or surface water, coastal (sea), estuarine flooding and flash floods (Munich Re, 1997, p18). As a result, the terms ‘flood’, ‘flooding’ and ‘flood hazard’ cover a wide range of phenomena and are highly ambiguous terms with a multitude of definitions (Smith and Ward, 1998, p8). Due to the questionable understanding of the term, the concept of flood means different things to different people and a precise definition cannot be found. As a consequence, one of the research questions to be addressed (Section 1.8.) will explore and understand what the word ‘flood’ means to SME owner/managers. How a flood is comprehended can influence how it is responded too.

1.4.1. FLOODING IN THE UK, HULL AND SHEFFIELD

As flooding is a problem to society, the social science approach is playing an increasing role within flood risk management research. A large amount of studies exist which examine the risk of flooding within the United Kingdom. Over the last 60 years, the

UK witnessed 173 separate flood events, a rate of nearly three floods a year (Eden, 2008, p204-344). There are even suggestions that flooding is becoming more frequent (Eden, 2008, p199). With this frequent occurrence, in comparison to other physical risks, flooding is the largest and most widespread hazard the nation faces. The UK also has a very large population vulnerable to this risk. Within England, there are 2.4 million properties at risk of flooding from rivers and the sea, a further 2.8 million properties susceptible to pluvial flooding alone and 4.6 million people at risk to flooding of any type (Environment Agency, 2009, p6). The vulnerabilities of those 4.6 million vary for reasons such as income, class, occupation, gender and mobility (Wisner *et al.* 2008, p7). The largest influence upon flood risk is location, as not all areas within the UK are exposed to the same degree of flood risk. Moreover, not all areas that are affected by floods experience them in the same way leading to geographical variations in the risk (Saul and Ashley, 2007, p150).

Despite possessing different characteristics, Hull and Sheffield have both witnessed flooding in the past, are at risk of flooding today, and face an uncertain future. In regards to historical flooding, it is the 'big events' of the 1864 Sheffield Flood and the Summer 2007 floods, which affected both Hull and Sheffield, that dominate the headlines and are the focus of numerous academic studies (Coulthard *et al.* 2007; Harrison, 2011). In fact, the principal reason as to why Hull and Sheffield were chosen as case studies is due to their experiences of the significant flooding which occurred in June 2007. Analysis of local newspapers, including the *Hull Daily Mail* and *The Sheffield Star*, also reveals occurrences of more frequent, smaller and more contained flood events. Both areas have witnessed a flood event of some form in every decade since 1950. There are 100,000 properties in Hull and 10,000 properties in Sheffield at risk from a flood with a 1 in 100 or greater probability (Environment Agency, 2010a, p3; Environment Agency 2010b, p3). Due to climate change, flood depths in Hull are set to increase by 62cm by 2090, and those residents currently at risk in Sheffield will be susceptible to more frequent and severe floods (ABI, 2006, p9).

Hull and Sheffield experience regular flooding due to their vulnerable geographical locations. Hull is located on the North bank of the River Humber, to the West of the River Hull, with 90.0% of the city built on reclaimed marshland lying below high tide level (Hull City Council, 2007, p34). Its low elevation and lack of natural drainage means the drainage system of the area is entirely pumped (Coulthard *et al.* 2007, p22). In contrast, the urban centre of Sheffield is intersected by five water courses and is nestled in a natural bowl created by several hills (Sheffield City Council, 2008a, p21). The majority of the city is built on hillsides, with the city's lowest point falling just ten metres above sea level. Nevertheless, whether it is 10,000 or 100,000 properties, both cities are home to a 'flood

vulnerable' population. Flood frequency, and the vulnerability of locations such as Hull and Sheffield is not constant. As such, changes over time cause the nature of flooding to evolve, having important consequences for those who are at risk.

1.4.2. THE CHANGING NATURE OF FLOODING

It is often said that floods in the UK are becoming more commonplace (Jain *et al.* 2001, p3196; Milly *et al.* 2002, p514). Floods are also changing in nature in three ways:

1. Causes.
2. Physical characteristics.
3. Social vulnerability.

The way a flood originates has altered (Kron, 2005, p58). Under the hazards-based approach there has been a tendency to focus upon the 'naturalness' of a flood (Tobin and Montz, 1997, p49). Causes are explained in terms of physical characteristics such as storms, precipitation and runoff (Mitchell *et al.* 1989, p392). However, it can be problematic to focus solely upon the hazard itself (Handmer, 1996, p45; Hewitt, 1997, p11). Floods are now seen as the product of a natural hazard and the social, economic and political environment it occurs within. They are also partially constructed by human action, including the exacerbation of climate change through burning fossil fuels (disaster-based view)(Parker, 2000).

Anthropogenic actions and developments also contribute to a change in physical flood characteristics including occurrence, frequency, magnitude and flow dynamics (Kron, 2005, p61). The cities of Hull and Sheffield are each built upon floodplains which have witnessed an increase in population. The number of Hull residents has increased by 5.6% over the last ten years, and Sheffield's population has risen by 7.2% (Hull City Council, 2013, online; Sheffield City Council, 2011a, online). This expansion has led indirectly to a reduction in the storage volumes and natural retention areas of the city (Hollis, 1975, p431). Additionally, a growing disposable income has led to a demand for large shopping centres such as Meadowhall (Sheffield) and St Stephens (Hull), developments which ultimately result in an increase in anthropogenic ground sealing (Kron, 2005, p61). Ground sealing, or a rise in impermeable surfaces such as car parks and business premises, causes an increase in the run-off and peak flows of the rivers within the cities (Barnes *et al.* 2002, p5). Lastly, protecting cities from flooding leads to the installation of flood defences which disrupt the hydrological flow regime of the rivers, causing floods in areas that have not previously been affected (Cabezas *et al.* 2009, p274).

Floods have also changed in nature due to alterations in social vulnerability. Societies are now perceived as being 'more socially vulnerable' to a flood event than in previous years. Using SMEs as an example, the past few decades has seen an increase in assets possessed in terms of technology, business premises, company cars, excess stock and white goods. These items are all susceptible to water damage. Moreover, as previously outlined, the population of both cities has increased. When a flood occurs they tend to have a bigger impact, as the number of people affected and damage caused in terms of finance and disruption is much higher than on previous occasions (Kunkel *et al.* 1999, p2515; Emerson and Stevens, 1995, online). As floods have changed in nature, so too have the state mitigation measures designed to manage and protect this hazard.

1.4.3. REGULATORY BODY FLOOD MANAGEMENT

Regulatory bodies are groups of scientific experts and administrators with the power to regulate and control. These bodies exist in a wide variety of contexts, including the regulation of SMEs or the media. There are many bodies connected with flood hazard. These include riparian owners, utility companies, local councils, fire and rescue services, Internal Drainage Boards or the Department for Environment, Food and Rural Affairs (DEFRA). This research concentrates upon those regulatory bodies that are seen as the 'big players' in regards to flood management in Hull and Sheffield, The Environment Agency and both local authority councils.

As a constant threat, regulatory body policies towards flood management have altered over the last 50 years through both incremental and catalytic change (Johnson *et al.* 2003, p447). Gradual alterations in social and economic conditions, organisations, political contexts, underlying attitudes and the behavioural norms of key policy actors has led to incremental changes to flood policy (Tunstall *et al.* 2004, p448). Between the 1940s and 1970s, policy focused upon rural land drainage implemented on a site-by-site basis rather than in a holistic or strategic way. The aim was to increase, secure and protect agricultural and food production alongside maintaining farm profitability. The importance of protecting agriculture was influenced by World War II, as food productivity and self-sufficiency had been crucial to the nation's survival during the conflict, remaining a major influence on policy objectives well into the post war period (Collingham, 2011, p89).

The 1980's and 1990's saw a transition towards urban flood defence. This reflected the decline in the significance of the agricultural sector following a fall in international commodity prices (Adams *et al.* 1998, p355). Increasing access to computer facilities and developments in modelling and mapping created powerful tools for flood

management, enhancing the understanding of flood problems (Tunstall *et al.* 2004, p450). At the same time, changing societal values and growing public awareness of environmental issues associated with land drainage led to an increase in engineering approaches. From the mid 1990's to the present there has been a transition towards a more strategic, multi-method, integrated and holistic approach to flood risk management. Focus has moved away from 'hard' defences towards measures which abate, control and alleviate the risk (de Bruijn *et al.* 2007, p63). Flood events are also recognised as a 'window of opportunity' for catalytic policy change. For example, the 1953 storm surge led to a realisation of a need to implement long-term flood warning systems and raise flood defence standards (Johnson *et al.* 2005, p566). Furthermore, the Autumn 2000 floods reinforced the view that it was essential to plan for extreme events which might occur as a result of climate change (Tunstall *et al.* 2004, p450).

Floods hold different meanings to different people and are experienced in different ways. Any flood policies implemented are developed using regulatory body perceptions of flood which reflect governmental priorities. It is proposed that these perceptions and priorities may differ to SME owner/managers perceptions of flooding. At present, studies which examine the difference in SME owner/manager and regulatory body flood perceptions, and also the impacts of regulatory body anti-flood policies and measures upon SMEs, hardly exist. There is a small field regarding the general notion of SMEs and flooding. Yet, before this relationship is considered, it is crucial to outline what an SME is.

1.5. THE NATURE OF SMEs

Within general business practice research, SMEs are a central focus. However, they have very rarely been considered by the social science approach, let alone considered in regards to flooding. SME is an ambiguous notion as they are not homogenous entities; they can range from local grocery stores to larger manufacturing operations (Nieschlag, 1981, p2; Levy and Powell, 2005, p19). The term covers a wide range of definitions or measures, while the importance of the sector varies greatly across countries (Ayyagari *et al.* 2005, p3). Within the UK, the definition provided by the European Commission (2003) (Table 1.1.) is adopted with size dependent upon number of employees and/or turnover.

SMEs are much easier to describe than define being distinguished by three major attributes: market influence, independence and personal influence (Beaver, 2002, pix). They can diversify a national economic base and assist in employment creation (Lenihan *et al.* 2010, p2). Yet organisations do not exist in a vacuum. SMEs form part of a wider, or larger, interconnected network where SMEs interact with each other, the natural

environment, other services, customers and suppliers, reflecting SMEs as socio-technical systems (Comfort *et al.* 2006, p310; Morel *et al.* 2006, p603). It is these interactions that generate uncertainty, risk and problems for both SMEs and those networks associated with them. The characteristic of interaction is not just limited to these enterprises. Larger businesses can also form part of this interconnected network. SMEs are not simply scaled down versions of larger organisations (Burns, 2001, p18). They invariably have special qualities which differentiate them from their larger counterparts, and render their business management process a very different affair (Jennings and Beaver, 1997, p63-75)(Box 1.1.).

Company Category	Number of Employees	Turnover
Large	> 250	> €50 million
Medium	< 250	≤ €50 million
Small	< 50	≤ € 10 million
Micro	< 10	≤ € 2 million

Table 1.1: The European Commission (2003) categorisation of enterprises

Source: European Commission, 2003, online

BOX 1.1: THE DIFFERENTIATION BETWEEN SMEs AND LARGE ENTERPRISES

Number:

- SMEs far outnumber the amount of large organisations (Buonanno *et al.*, 2005, p395).

Financial Performance:

- SMEs are typically short of a cash flow which constrains the strategies and resilience measures adopted meaning decisions must have a quick 'pay-off' (Sullivan-Taylor and Branicki, 2011, p5567).

Response to Market Conditions:

- SMEs operate in a single, or limited, range of markets and deliberately restrict product and service offerings (Porter, 1985, p211).
- SMEs are highly flexible and able to respond to changing market conditions quicker and at a smaller cost than larger organisations (Griffin, 1990, p225).

Customer Base:

- The heavy reliance of SMEs on a small customer base makes them vulnerable to losing any one customer/client, with the effects of such a loss disproportionately large (Saleh *et al.*, 2006, p26).

BOX 1.1: CONTINUED**Communication:**

- SME communication systems are less formalised and simple (Karami, 2007, p87).
- SME communication takes place more efficiently and effectively (Karami, 2007 p54).
- The telecommunications structure is less complex and the volume of data supported is also lower than larger organisations (Beckmeyer, 2001, cited in Botha, 2002, p1xi).

Job Creation:

- SMEs play a larger role in job creation than large firms by exhibiting rapid workforce growth (Performance and Innovation Unit, 2001, p3).

Management Structure:

- SMEs have much smaller management teams than large organisations (Devargas, 1999, in Botha *et al.* 2002, p5).

As previously mentioned, it is the issue of SMEs having a high failure rate and small budget which highlights an SME's increased vulnerability to hazards such as flooding in comparison to larger corporations (Weems, 1991 cited in Botha *et al.* 2002, p331). In fact 43.0% of businesses affected by a hazard never re-open, and 75.0% fail within three years of a disaster (Novelli, 2007, p4). At present, there has been a limited amount of research which has identified the organisational, managerial and financial variations between micro, small and medium sized enterprises. Consequently, it was not possible to present these variations in this research. Furthermore, due to the factors outlined in Box 1.1, it was required that SMEs were studied as individuals rather than holistically under the term of 'businesses'.

1.5.1. SMEs IN THE UK, HULL AND SHEFFIELD

One of the most significant characteristics of growing commerce in the UK is an expanding SME sector (Palma, 2005, p73). SMEs have a significant presence providing jobs and innovation (Robbins *et al.* 2000, p294; Alesch *et al.* 2001, p6; Deakins *et al.* 2007, p308). Due to their large number and economic and social importance, it is essential that SMEs retain a strong presence in the UK to maintain the country's economic performance and provide employment. Studying the operations of these stakeholders is essential in order to better understand how to develop strategies which will ensure their survival during and after a hazard event. This is of particular priority given the rising flood risk

within the UK. Yet is the importance of SMEs experienced at a national level as prevalent in a local context?

There are regional variations in the distribution of SMEs as the UK exhibits a distinct 'North-South' regional divide (BIS, 2011, p9). As such, some regions are more dependent upon SMEs than others. With only 33.0% of all UK SMEs located in London and the Southern regions (BIS, 2011, p9), SMEs are disproportionately prominent in the economies and communities of those cities located in the Northern half of the country; in cities such as Hull and Sheffield.

In 2011, Hull and Sheffield were home to 41,832 SMEs (13,617 in Hull and 28,215 in Sheffield), accounting for an average of 99.3% of all enterprises within these locations (ONS, 2011b). This shows how SMEs are disproportionately prominent in the two cities. These businesses are key to the economic and social vitality of the local economies and communities. They provide 78.8% of all employment in Hull and Sheffield (ONS, 2011b). It is not just their large number which led these two cities to be chosen as study locations. Both Hull and Sheffield have fragile economies founded upon industries that have dramatically declined; fishing and steel respectively (Robinson, 1998, p76; Mollona, 2009, p94). As a result, a large part of their economic revenue now comes from the presence of SMEs, the services they provide, and the effects their operations have upon attracting other, larger firms who rely upon them for custom or supplies (Hong and Jeong, 2006, p293). Furthermore, Hull and Sheffield are categorised as deprived areas where educational attainment falls below the national average. SMEs provide very few skilled jobs. As such, SMEs can become a source of income for those residents with a low educational attainment ensuring an acceptable standard of living (Lange *et al.* 2000, p5).

A heavy reliance upon SMEs means the economies of Hull and Sheffield are vulnerable. The loss of a number of SMEs through the occurrence of a hazard would be serious to both cities. A flood is seen as particularly significant as it can cause disruption to a large number of SMEs at the same time. Moreover, the 'knock on' effects are strongly felt by residents as employment opportunities and service provisions are reduced (Esteves and Barclay, 2011, p206). This key position in the local economies makes the continued operations and prosperity of SMEs a matter of vital concern. In the local context, studying SMEs and their vulnerability to flood provides the opportunity to highlight how owner/managers can adequately respond to this hazard. By ensuring their own survival, SMEs can also maintain the welfare of the economy and community at a larger scale. This importance and prevalence of SMEs in the two cities has not always been as it appears today.

1.5.2. THE CHANGING NATURE OF SMEs

Since 1995 the number of SMEs within the UK has increased by approximately 1.8 million; an increase of 64.5% over 16 years (ONS, 2011b). Hull and Sheffield have also witnessed a rapid increase, with the number of SMEs almost doubling since 1998 (ONS, 2011b). Clearly then, the presence of SMEs within the UK, and more specifically the two study cities, has not always been as significant as it is today. Hull originally found its prosperity through the whaling trade, fishing industry and as a port (Gillet and MacMahon, 1989, p437). Sheffield's origins are in the steel and iron industry (Hey, 1998, p1). Over time, changes in societal demands, UK manufacturing reductions and a restructuring of the UK economy towards the service sector saw a decline in these industries (Burns, 2001, p21; Beaver, 2002, p77). Therefore, local economies have been forced to diversify leading to an increase in SME numbers.

In conjunction with changing demands, the flexibility of SMEs in responding to market changes and opportunities has placed them at the forefront of economic thought and policy initiatives at both a national and local level (Beaver, 2002, p2). The evolution of new technologies eases communication, encourages home-working, allows smaller market segments to be serviced and reduces fixed price costs allowing production to be more profitable thereby facilitating SME growth (Burns, 2001, p23). Finally, social and market trends have accelerated growth, with customers increasingly expecting firms to address their particular needs and employees wanting to 'control their own destiny' through self-employment (Megginson *et al.* 2003, p9). These are demands SMEs can easily fulfil.

The emergence of an SME sector is both a response to a decline in heavy industry and a harbinger of future growth. The temporal emergence of a large SME sector within Hull and Sheffield has exacerbated an economic and social dependency upon their continued existence. Due to their increasing number, their role within the economy has become increasingly important over time. These stakeholders remain vulnerable to the occurrence of a hazard; 42.0% of UK SME owner/managers have no plans in place to help with the recovery of their business should it be affected (Woodman and Hutchins, 2011, p4). SMEs are at risk from a plethora of hazards. Due to Hull and Sheffield's dependence upon them, it is important to highlight these risks to SME owner/managers so they can respond accordingly and continue to contribute to the welfare of the wider community. What are the risks which SMEs need to address?

1.5.3. RISK IN AN SME CONTEXT

Risk Category	Description	Risks included within category
Physical	Risks associated with damage to property, premises and contents.	Structural, fire, flood, winds, storms, hazardous materials, drought, snow and low temperatures.
Strategic	Risks associated with operating in a particular industry.	Merger and acquisition activity, changes among customers or in demand, industry changes, research and development.
Compliance	Risks associated with the need to comply with laws/regulations and in a way customers and investors expect.	Employment legislation, health and safety requirements, trading laws, criminal laws, international laws.
Financial	Risks associated with the financial structure of the business.	Cash flow, debt, embezzlement, bankruptcy, foreign currency, customer credit and payment.
Operational	Risks associated with business operation and administrative procedures.	Recruitment, supply chain, transportation, accountancy controls, IT systems, regulations.

Table 1.2: The nature of risk to an SME

As previously outlined, within business practice risk to an SME can be divided into non-entrepreneurial risk, which includes the social sciences focus upon natural hazards, and entrepreneurial risk (Sadgrove, 2005, p3). The notion of risk can also be divided into two categories:

1. Risk perception: the subjective assessment of the probability of a specific type of risk occurring, and the level of concern over the consequences (Sjöberg *et al.* 2004, p8).
2. Actual risk: the counterpart to perceived risk (Rohrmann and Renn, 2000, p15). It considers the likelihood of a perceived risk becoming a reality. It is a compound measure combining the numerical probability and magnitude of an adverse effect (Adams, 1995, p8)

Some business risks are described as residual risks meaning that in principle they cannot be eliminated or reduced below a certain level (Bell *et al.* 2001, p36). Categorised into five different types, these risks can originate from factors present either internally or externally to an SME and can bring both positive and negative consequences (Table1.2).

For example, the current economic recession has seen a decrease in SME ownership within the Yorkshire and Humber Region (Yorkshire Forward, 2009, p12). A strike can severely disrupt day-to-day running and accrue costs. A loss of reputation can completely destroy a customer base (Deelman and Loos, 2002, p2214; Federation of Small Businesses, 2009, online). Conversely, businesses have a ‘window of opportunity’ they can use to their advantage after a hazard has struck (Solecki and Michaels, 1994, p588). For example, after the occurrence of an event some industries, including the construction sector, can witness an increase in trade during the recovery period. This reaffirms why a social science definition of risk and concentration upon negative hazards should not be taken in isolation.

Nevertheless, risk is often never fully known until it materialises (Fragniere and Sullivan, 2007, p56). Within an SME, the fundamental aim is to continuously provide a product or service which will ultimately make profit (Elliot *et al.* 2002, p4). However, the running of a business does not always progress smoothly. At any point the above objective can be interrupted by the occurrence of a multitude of risks. Due to the interdisciplinary approach taken, when the word risk is used within the context of an SME it will attempt to draw together the social science and business definitions of risk and refer to the occurrence of any natural hazard, non-entrepreneurial or entrepreneurial risk (Table 1.2.). This choice of risk definition is supported academically as Kash and Darling (1998) maintain “*whether it is a natural disaster...or man-made disaster...a business will eventually face some form of crisis*” (p179). Furthermore, for Mitroff *et al* (1996) it is no longer a question of if an SME will face a hazard (perceived risk) but rather a question of when, what type and how prepared the SME is to respond to it (actual risk)(p44). Due to their concerns over business continuity and profit, SME owner/managers need to consider all the ‘actual risks’ posed to their enterprise in order to be able to protect against them. In doing so, their survival will contribute to the continued well-being of the local economy and communities.

Within business practice, flooding is categorised as a physical risk. When a flood takes place, it causes many issues, issues which are interconnected. A flood can cause the loss of power, resulting in loss of IT and perhaps the loss of data, all impacts which can be categorised as individual risks to an SME. It can close roads prohibiting the supply and delivery of goods or prevent staff from attending work, again crises that could be studied in isolation. Floods have the potential to interact with other identified individual risks within an SME, such as loss of amenities or supply chain problems, to create ‘complex flood issues’. Once again this demonstrates that the notion of flooding can bring the social science approach and business practice together. To ensure survival, it is critical that

entrepreneurial and non-entrepreneurial risks do not interrupt with day-to-day business operations when they occur. As such, SMEs are required to implement resilience procedures which ensure continuity within their business for the benefit of themselves, the local economy and local communities.

1.3.4. BUSINESS CONTINUITY

An international standard is a document that provides requirements, specifications, guidelines or characteristics that can be used consistently to ensure that materials, products, processes and services are fit for their purpose (International Organization for Standardization, 2013, online). The international standard defines Business Continuity (BC) as:

"[A] holistic management process that identifies potential threats to an organisation and the impacts to business operations those threats, if realised, might cause, and which provides a framework for building organisations' resilience with the capacity for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities". (ISO 22301, 2012, cited in Moh Heng, 2012, p1)

Accordingly, BC refers to the ability of a business to maintain continuous operations in the face of disaster (Rittinghouse *et al.* 2005, p3). It is the practice of formally preparing for variations in the business environment associated with the occurrence of a risk. As outlined, these variations can be of any kind. The primary aim of business contingency is to ensure the survival of an organisation by preparing for, reacting to, and adjusting to those variations. (Rittinghouse *et al.* 2005, p2). As a subset of business contingency, Business Continuity Plans (BCP) are plans which outline a standard set of procedures designed to increase a businesses' resilience to sudden changes. As such, during their formulation it is required that owner/managers:

- A.** Recognise the social and technological characteristics of business risks.
- B.** Recognise that if managed properly, the occurrence of a business risk does not inevitably result in disruption.
- C.** Build resilience to business risks through processes and changes to operating norms and practices (adapted from Elliot *et al.* 2010, p5).

Prior to the June 2007 floods, there was an emerging awareness that climate change risks, particularly flooding, were growing and serious risks for SMEs (Crichton,

2006). Furthermore, Brilly and Polic (2005), Wedawatta *et al.* (2011b) and Wedawatta and Ingirige (2012) have all alluded to the fact that floods are one of the biggest hazards an SME faces. The CREW (Community Resilience to Extreme Weather) report highlights a need for a change in focus from the large, macro-economic picture of the impact of climate change, to a more granular understanding at the lower levels of community and business (Hallet, 2013, p12). Their ability to withstand, or be resilient, to a major disruption is important not just for the SME itself, but for the economy both locally and nationally. It is essential to understand how SME owner/managers perceive the significance of flooding and ensure continuity during its occurrence.

1.6. THE NATURE OF FLOODING AS A RISK TO SMEs

By considering flooding as a risk to SMEs, this research will allow the social science approach to flooding and business practice perceptions of risk to come together. Pearson and Woodman (2012, p10) assert that EWEs, including flooding, are one of the most common crises to affect an SME. Due to their frequent occurrence, (e.g. 2007, 2009 and 2011) and the significance of SMEs, there is a need to study the interaction between this hazard and these stakeholders. SMEs are required to be aware of how to prepare for the effects of a flood in a way that minimises disruption to them. This allows SMEs to return to near normal working conditions as soon as possible after an event (Ingirige *et al.* 2008, p582). At present, SME resilience to flooding has been identified by authors such as Runyan (2006), Elliot *et al.* (2010), Vargo and Seville (2011) and Herbane (2013) as under-researched, leaving many opportunities for investigation.

1.6.1. SME VULNERABILITY TO FLOODING

In contrast to larger businesses, SMEs are the most vulnerable to floods as evidenced by their high failure rate after a crisis has occurred (Wenk, 2004, online; Crichton, 2006, p13; Cumbie, 2007, p126; Wedawatta *et al.* 2010a, p362). As such they are often affected disproportionately by floods in comparison to their larger counterparts (Tierney and Dahlhamer, 1996, p3; Webb *et al.* 2000, p3; Finch, 2004b, p185). Local in their operations, and rooted in local communities, SME owner/managers are often affected twice by flooding, in their capacity as both local citizens and also as local business owners (Runyan, 2006, p24). Moreover, they can suffer even without being physically affected due to the vulnerability of supply chains, utilities and transport infrastructure. As such, SMEs are both directly and indirectly exposed to a flood event (Burnham, 2006, p12).

The direct vulnerability of Hull and Sheffield's SMEs arises because of the small scale of their human and financial resources (Bannock, 2005, p30). SMEs have fewer resources, less capital and a smaller employee base with which to plan for, respond to and recover from a flood (Ingirige *et al.* 2008, p583; Wedawatta *et al.* 2009, p3; 2012, p13). Furthermore, they are susceptible through their location. Historically, floodplains were suitable locational choices for cities to develop upon as they provided flat, fertile land and easy access to water (Kelly, 2004, p161). SMEs choose to locate where there is a large population, large customer and/or supply base and access to materials, transport links and employment (Parker, 1995, p11). Often, these are locations prone to flooding. By siting their operations in these areas, owner/managers directly expose themselves to the occurrence of a flood event (Kron, 2005, p62). The industrial sector in which an SME operates can also contribute to their vulnerability (McWilliams, 2009, online). In the UK, 99.0% of construction enterprises are SMEs. As their activities are dependent upon the weather, and their operations rely upon access to sites, they are arguably the most vulnerable sector to flooding impacts (Mills, 2003, p257; Bosher *et al.* 2009, p11). However, they are often the least prepared in terms of continuity plans (Norrington and Underwood, 2008, p4). SMEs can also be vulnerable to flooding through the characteristics of their owner/manager in terms of the amount of 'assets' they possess (Cutter *et al.* 2003, p254; Tierney, 2007, p276). In other words, owner/managers may not have the drive or knowledge available to implement flood resilience measures.

On the other hand, SMEs can be indirectly vulnerable to flooding due to their reliance upon other businesses through their supply chain (Faisal *et al.* 2006, p884). A flood may result in a failure of the supplying organisation to manufacture or deliver goods and/or services. This leads to a lack of 'in bound' supply, financial loss and failure of the receiving SME to satisfy customer requirements on time (Zsidisin and Ritchie, 2009, p4). SMEs can also be indirectly vulnerable due to the lack of resilience against risk they possess (Brown and Damery, 2002, p413; Cardona, 2011, p108). If SME owner/managers are unable to respond and recover from the occurrence of a flood, perhaps through a lack of contingency planning or flood defence measures, then their vulnerability will increase (Sayers *et al.* 2002, p38; McConnell and Drennan, 2006, p60). Finally, the predicted global increase in flooding, caused by an exacerbation of the climate change process, can also contribute to indirect exposure (Church *et al.* 2001, p644; Eskröm *et al.* 2005, p234). Yet, vulnerability is not a static process meaning the impacts this hazard has upon SMEs can also vary over time (Dixit, 2003, p155).

1.6.2. FLOOD IMPACTS UPON SMEs

The 2007 UK floods cost businesses, including SMEs, £1 billion in damages and loss leading to 35,000 insurance claims ranging between £24,000 and £90,000, as well as £160 million claimed in business interruption (Environment Agency, 2010c, piv). An inability to conduct business operations is only one of the effects floods can have upon SMEs. The consequences of flooding are composed of a mixture of direct, indirect, short, long and financial impacts (Figure 1.5).

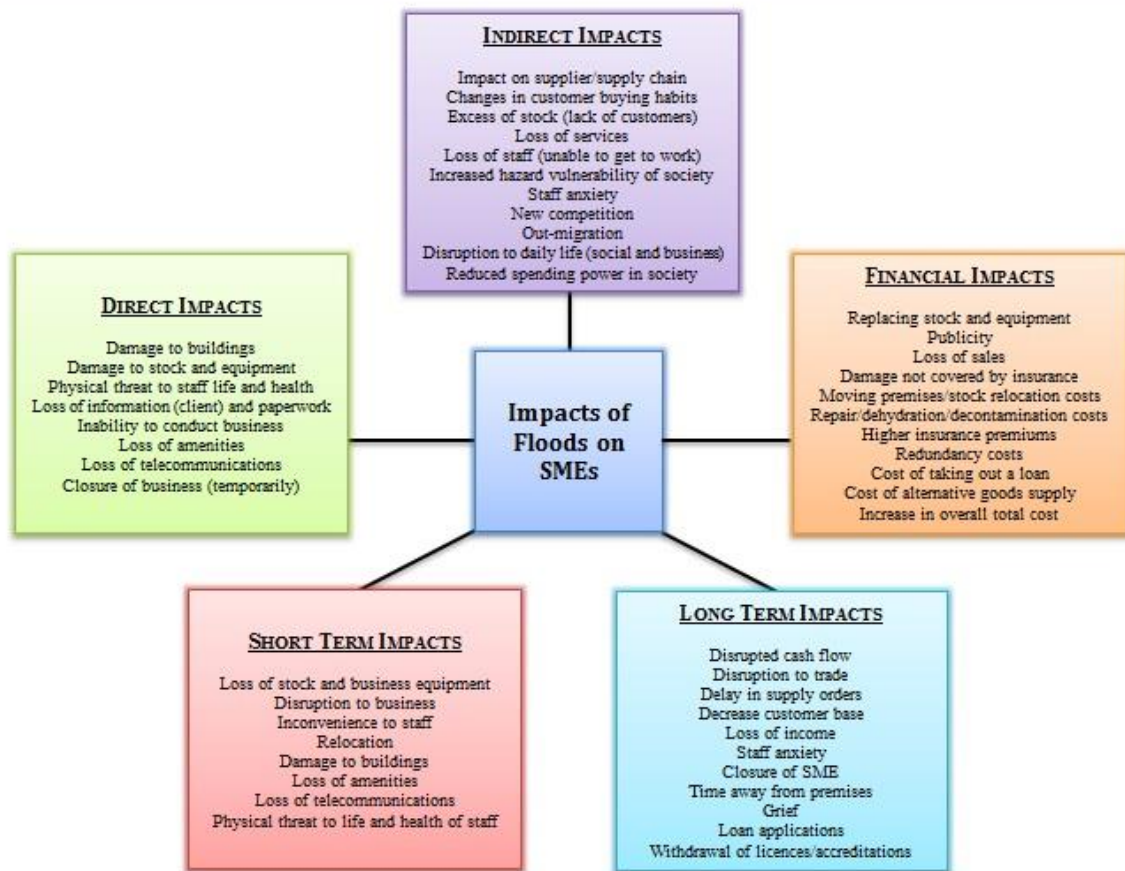


Figure 1.5: SME Flood Impacts

Source: Adapted from Tierney 1994a; 1997; Smith et al. 1998; Gautam and van der Hoek, 2003; Shepherd 2003; Metcalf and Jenkinson, 2005; Burnham, 2006; Aba-Bulgu and Islam, 2007; Wedawatta et al. 2009; Wedawatta and Ingirige, 2012

Direct impacts arise from people and/or property being in direct physical contact with flood water (Das, 2005, p95). Indirect impacts are those tangible or intangible effects which are induced by a flood after the event (Das, 2005, p95). Short-term impacts are effects which occur immediately after the occurrence of a flood. Long-term impacts are those effects which continue to cause problems long after the flood waters have receded.

Finally, financial impacts are the resulting expenses or falls in revenue experienced (Benson and Clay, 2004, p3). The impact of flood upon SMEs varies depending upon the nature of the business, and other factors relating to vulnerability (House of Commons, 2004, p59). Although the impacts of floods tend to be negative for most businesses, for some SMEs they are beneficial (Meehl *et al.* 2000, p414).

Climate-related disasters can have long-term positive economic consequences relating to physical and human capital and productivity (Faulkner and Vikulov, 2001, p342; Skidmore and Toya, 2002, p664). After the occurrence of a hazard, SMEs benefit if they are in a position to capitalise on favourable conditions (Wedawatta *et al.* 2009, p6). These conditions include owner/managers learning from their mistakes, or a rise in revenue due to an increase in the demand for their products and/or services such as building, plastering or laying flooring (Dlugolecki 2004, p11). This, however, depends upon the industrial sector they operate in (Popper and Lipshitz, 2004, p182; Firth and Colley, 2006, p15).

Nevertheless, for the majority, negative effects are experienced and owner/managers must protect against them. While the loss of an individual SME may not cause a significant impact on the local economy in terms of general income or number of employees, the collective loss may be detrimental to local commerce (Yoshida and Deyle, 2005, p2).

1.6.3. SME RESILIENCE TO FLOODING

An SME's ability to continue to function in the face of unexpected events will have a large influence upon the length of time that their services are unavailable, and the duration of recovery for the community as a whole (Brunson and Dalziell, 2005, p1). Being resilient can decide the survival or failure of an SME (Wedawatta *et al.* 2010a, p363). Most SMEs are not adequately prepared to cope with and recover from a flood, despite the main emphasis of responsibility for individual resilience lying with property owners (Tierney and Dahlhamer, 1996, p3; Ingirige *et al.* 2008, p590). As the Pitt Review states, "*local authorities, in discharging their responsibilities under the Civil Contingencies Act 2004 to promote business continuity, should encourage the take-up of property flood resistance and resilience by businesses*" (Pitt, 2008 pxvi). Some SME owner/managers address flood risk by implementing a portfolio of structural and non-structural flood management measures (Dawson *et al.* 2011, p630). This is most frequently achieved through the use of property-level protection and business continuity plans (Wedawatta and Ingirige, 2012, p5).

Property-level protection strategies focus upon preventing flood waters from entering premises (resistant), and minimising the impact of these waters on property (resilient)(Bowker et al. 2007, p2). They represent the 'hard', tangible measures that act to protect and restore business premises. This includes a relocation of utilities and stock to upper floors, flood proofed tanks, adapted building structures and water barriers (Kreibich *et al.* 2008, p296; Ingirige and Wedawatta, 2011b, p5). BCPs are 'soft', intangible measures allowing SMEs to minimize negative flood impacts and recover smoothly from an event (Wedawatta and Ingirige, 2012, p6). As a series of procedures designed to restore normal operations following a disaster with maximum speed and minimal impact, BCPs include measures such as insurance, online data back-up systems, reviewing risks to premises and working flexibly. Therefore they maintain continuity during the occurrence of a plethora of hazards, not just flooding (McManus and Carr, 2001, p6). Despite this advantage, and the fact that firms with BCPs can recover twice as quickly as those without, 69.0% of SMEs have no such plan in place (Crichton, 2006, p15).

Both hard and soft measures are necessary for SMEs to prevent flood damage, withstand the effects of a flood, and facilitate quick business recovery and continuity (Wedawatta and Ingirige, 2012, p11). Whereas some SMEs actively take resilience measures, others do not. Barriers and drivers exist which encourage or hinder an SME's resilience (Lamond and Proverbs, 2009, p64). Factors such as industrial sector, flood knowledge, type of property/premises, lack of capital, infrastructure problems, individual attitudes, and time can all be attributed to a general resilience inertia (Pearson and Mitloff, 1993, p52; Pearson and Clair, 1998, p69; Petts, 1998, p308; Mendelsohn, 2000, p585; Berkhout *et al.* 2004, pp7-8; Runyan, 2006, p21; Kreibich *et al.* 2007, p19). The variables of size and previous experience have also been proven to affect the preparedness of businesses (Dahlhamer and D'Souza, 1997, p4). As such, they can be identified as both a driver and barrier (Kreibich *et al.* 2010, p12). However, few SMEs install measures directly related to being flooded. As such, the main reason for taking resilience steps is due to SME perceptions of flood (Mullins and Soetanto, 2010, p301).

1.6.4. SME FLOOD RISK PERCEPTIONS

Perception is the main focus of this thesis. At present there is little understanding of how SME owner/managers view floods. Humans are constantly faced with the need to make decisions involving actual or projected risks (Pigeon *et al.* 1982, p1). What one person perceives as a risk, may not be seen as such by another. Perception is an attitude towards risk derived from personal choices in the context of limited or uncertain information (Slovic, 1987, p3; Weber and Milliman, 1997, p123). Given this fact, many

approaches and theories maintain that risk perceptions are biased, with a number of factors present which can impact upon risk cognition (Fischhoff and Kadvany, 2011, p12). These include:

- Knowledge theory: people 'know' certain risks to be dangerous (Douglas and Wildavsky, 1982, p75).
- Personality theory: perceptions are dependent upon particular attributes or characteristics (MacCrimmon and Wehrung, 1986, p49).
- Cultural theory: individuals choose what to fear in order to support their way of life (Cotgrove, 1982, p110).
- Economic theory: judgements are influenced by an individual's wealth (Ingleheart, 1977).
- Political theory: people are told what to fear by political parties, the media and risk communications from 'experts' (Mitchell *et al.* 2000, p384).

Whyte (1986) proposed three groups of factors which influence perceptions of flood risk: (1) personal characteristics (e.g. age, gender, education), (2) situational factors (e.g. controllability of the flood) and (3) risk characteristics (e.g. consequences) (Fischhoff and Lichtenstein, 1980, p45; Fothergill and Peek, 2004, p91; Raaijmakers *et al.* 2008, pp308-309). Moreover, factors such as past experience, risk knowledge and social resilience also play a role (Ittleson *et al.* 1974, p190; Tobin, 1995, p360; Miceli *et al.* 2008, p165; Parker *et al.* 2009, p105). It is a combination of these variables which leads to an underestimation of flood risk by the majority of individuals residing in flood prone areas (Gardner and Stern, 1996, p209).

Although there are a variety of investigations analysing perceptions of flooding, including Brilly and Polic (2005) and Whitmarsh (2008), this field of investigation is still to be fully applied to SMEs. Drawing on these studies, it is apparent that SME perceptions of flood risk are influenced by past disaster experience, owner/manager characteristics and ethnicity (Riad *et al.* 1999, p922; Webb *et al.* 2000, p6). As few studies regarding business perceptions of flood risk exist, the generalizability of these results is questionable. Flood risk perceptions should be fully explored in an SME context to ascertain whether there is a correlation between attitudes and behaviours (Weinstein and Nicolich, 1993, p237). "*When an individual examines a risk or determines his or her favour towards it, he or she has three options: (1) accept the level of risk, (2) reduce the risk or (3) avoid/ignore it altogether*" (Sharlin 1989, p. 262). It is this reactive behaviour which influences vulnerability and resilience (Paton *et al.* 2000, p175). These perceptions may

vary in comparison to regulatory bodies who also react to this hazard based upon their views, perhaps implementing resilience schemes that have negative repercussions for SMEs. By revealing how SMEs view flooding, regulatory bodies can be made more aware of how these judgements influence SME flood vulnerability and resilience. This can then lead regulatory bodies to use this knowledge to develop appropriate state mitigation measures and SME assistance.

Classifying a hazard is the first step to controlling it (Gundel, 2005, p106). In regards to flooding, SMEs often underestimate the risk which tends to have a low priority on their business agenda (Wedawatta and Ingirige, 2012, p1). At present, a comprehensive academic analysis of how SMEs view flooding in comparison to other risks has not been conducted. Since 1999, the Chartered Management Institute has conducted a Business Continuity Management (BCM) Survey where UK business managers rank their perceptions of 20 different threats (Woodman and Hutchins, 2011, p11). This survey cannot be directly applied to SMEs as the questionnaire was conducted at a national level and encompasses the opinions of micro, small, medium and large enterprises. However, important conclusions regarding business continuity can still be drawn from the findings. From 1999, between 67.0% and 78.0% of owner/managers viewed loss of information technology as a risk to their business, making this the largest perceived risk. This was followed closely by loss of access to site, telecommunications and skills. EWEs, including flooding, were seen as a threat by between 9.0% and 45.0% of respondents making it average as the eleventh largest perceived threat. Therefore, for UK owner/managers, hazards other than flooding are perceived as being more significant to their continued business operations.

The lack of specific data on SMEs contained by the BCM survey provides research opportunities. Not only have SME owner/manager perceptions of flood received little academic attention, so too has their perceptions of flooding in comparison to other risks. Those that do explore floods and SMEs choose to prioritise flood as a significant and unique risk, but fail to look at it in relation to other crises SMEs face. Flood perception is interlinked with susceptibility and resilience. If SME owner/managers choose to prioritise other risks instead of flooding, they may also prioritise adaptation to these hazards thus leaving themselves vulnerable to a flood.

When helping owner/managers prepare their SME for a flood, regulatory bodies need to be 'educated' in regards to the nature of what flood means to SMEs. Poor understanding can lead to poor resilience advice and an SME remaining vulnerable to the occurrence of a flood. Highlighting SME perceptions of risk and associated resilience makes it possible to judge whether the current flood risk management approaches taken

by the regulatory bodies are the most suitable for SMEs, the answers to which may have implications for government policy and SME business continuity.

1.7. RESEARCH RATIONALE

Three reasons predominate as to why this thesis is being conducted:

- 1.** Flooding is the largest physical threat to the UK and is a problem exacerbated by climate change. Flooding is also one of the largest threats present in the cities of Hull and Sheffield, with the risk set to intensify both in terms of frequency and impact.
- 2.** Following the 2007 floods, The Pitt Review (2008) highlighted the need for businesses to become more resilient to flood and specifically called for a greater acknowledgement of business continuity. SMEs are critical to the UK economy, with cities such as Hull and Sheffield extremely dependent upon their existence. Consequently, an SME's susceptibility and ability to withstand or be resilient to a major disruption is important, not just for the business itself, but for the economy and community as a whole.
- 3.** The relationship between flood and SMEs is an emerging field with many opportunities for original research. SME perceptions of, and resilience to, flooding has been identified as under-researched. At present, it is unknown how SME owner/managers perceive the risk of flood and how these perceptions influence both SME business continuity and flood risk management policies.

By bringing together the social science approach and business practice, this thesis will explore perceptions of flood risk. Understanding SME perceptions of, and responses to, flood will make it possible to identify the 'type' of resilience assistance required by these stakeholders. By drawing a comparison with regulatory body perception and resilience, it will also be possible to highlight whether current flood risk management policies include owner/manager requirements and are effectively assisting SMEs in increasing their business continuity, or have the opposite effect. It is this consideration which forms the central focus of the thesis aim and subsidiary research questions.

1.8. RESEARCH QUESTIONS

AIM:

To explore flood risk in Hull and Sheffield from the SME perspective, in order to gain insights into the relationship between flood risk management policy and SME business continuity.

RESEARCH QUESTIONS:

1. To what extent are SMEs in the cities of Hull and Sheffield at risk from flooding and other hazards?
2. How do SMEs and regulatory bodies in the cities of Hull and Sheffield perceive the risk of flooding and other hazards?
3. To what extent does perception of the risk of flooding influence policy and continuity practice for regulatory bodies and SMEs?

1.9. THESIS STRUCTURE

In presenting this research and fulfilling the above aim, the overall structure of this thesis will take an eight chapter format including this introductory chapter:

1. SMEs AND FLOODING: A COMPLEX RELATIONSHIP

- Introduces the thesis's main aim, the two approaches taken, places the research in context and outlines the rationale behind the investigation.

2. METHODOLOGY

- Describes the philosophical and epistemological approach taken, research methods used and any limitations or ethical considerations.

3. FLOODING: WHAT DOES IT MEAN TO HULL AND SHEFFIELD?

- Begins the results section. Provides the past, present and future flood risk of Hull and Sheffield. SME owner/manager perceptions of both cities flood risk are presented before influences upon these perceptions are considered.

4. FLOODING: WHAT DOES IT MEAN TO SMEs?

- Explores how SME owner/managers perceive the risk of flood within the context of their business and in comparison to other risks.

5. SME FLOOD RISK PERCEPTION: WHAT DOES IT MEAN FOR SME FLOOD RESILIENCE?

- Considers how the perceptions outlined in chapter four influence SME owner/manager responses to the risk of flooding.

6. FLOOD: WHAT DOES IT MEAN TO REGULATORY BODIES AND THEIR FLOOD RESILIENCE?

- Explores how regulatory bodies perceive the risk of flooding in Hull and Sheffield and how these perceptions influence regulatory body responses to the risk of flooding.

7. SMES AND REGULATORY BODIES: WHAT ARE THE IMPLICATIONS OF ALTERNATIVE FLOOD RISK PERCEPTIONS?

- Compares SME owner/manager and regulatory bodies perceptions of, and responses to, flood risk. This effectively brings together the social science approach and business practice. It outlines the implications of any variations and similarities upon business continuity and flood risk management policy.

8. DOING BUSINESS UNDERWATER: SOME SYNTHESIS

- The main findings from chapters three to seven are linked together and interpreted, thus answering the three research questions and fulfilling the main thesis aim.

2. METHODOLOGY

2.1. INTRODUCTION

Academic research must be conducted systematically, sceptically, ethically and based on empirical data (Robson, 2002, p18). To fulfil these requirements, this chapter:

- A. Demonstrates how methodologies from the social science and business practice approach were used in conjunction to obtain both quantitative and qualitative data.
- B. Rationalises the philosophical position taken.
- C. Explains why a case study and triangulation approach was favoured.
- D. Discusses the primary and secondary research tools employed including sampling frames, preparation, execution, analysis and limitations.

2.2. PHILOSOPHICAL POSITION

“No research takes place in a philosophical vacuum” (Hill, 1981, p38). Studies are guided by a set of ‘philosophical beliefs’. These can have serious implications upon the topics chosen for study, and how questions are framed, asked and answered. It is often the case that *“one philosophical position is more appropriate than another for answering particular queries”* (Saunders *et al.* 2009, p109). Consequently, due to the interdisciplinary nature of this research and the key questions requiring fulfilment (Box 2.1), it was decided that the most suitable approach to epistemology and ontology for this investigation would be pragmatism.

BOX 2.1: KEY RESEARCH QUESTIONS

1. To what extent are SMEs in the cities of Hull and Sheffield at risk from flooding and other hazards?
2. How do SMEs and regulatory bodies in the cities of Hull and Sheffield perceive the risk of flooding and other hazards?
3. To what extent does perceptions of the risk of flooding influence policy and continuity practice for regulatory bodies and SMEs?

Pragmatism, also known as the “*philosophy of common sense*”, uses purposeful human enquiry as a focal point (Shields, 1998, p197). It is a well-developed and attractive philosophy for integrating perspectives and approaches (Johnson *et al.* 2007, p125). It is also a recognised approach to social science research and certain types of business research, e.g. case studies (Joas, 1993; Pan and Tan, 2011). For a pragmatist, the aim of science is not to find truth or reality, but to facilitate human problem-solving and enable individuals to cope more successfully with the physical environment (Rorty, 1991, p27). Pragmatism is a philosophical stance centred on the linkage of theory and practice in order to resolve physical problems. Theory is acquired or extracted from practice, processed to form a knowledgeable solution, then applied back to practice (Pierce, 1905, p162). SME owner/managers use previous flood experiences to solve the issue of flooding within their organisation (Webb *et al.* 2000, p6). The solutions employed can, in some instances, bring about positive practices, for example the utilisation of flood mitigation (Tashakkori and Teddlie, 1998, p30). As a result, a pragmatic approach was deemed to be applicable to this research.

The pragmatic approach to science is also the most useful philosophy to support mixed methods research (Johnson *et al.* 2007, p125). A triangulation of methods has the benefit of uncovering complementary data from several sources in order to strengthen arguments (Denscombe, 2010, p349). Due to this, and the many other advantages associated with triangulation (see section 2.4), this thesis will use a plethora of methods within a case study context to obtain both quantitative and qualitative data. This reinforced the decision to adopt a pragmatic approach. Although the pragmatic approach does not require an ontological commitment or conformation to a particular epistemology, this investigation has chosen to align itself with two approaches in order to aid understanding of the findings (Johnson *et al.* 2007, p125).

Epistemology is the “*theory of knowledge*” (Audi, 2011, p1). It is concerned with beliefs and how people discover knowledge about the world. Within epistemology, the school of phenomenology is predicated upon a belief that ‘deep’ information and individual perceptions can be used to understand subjective experiences, and gain insights into people’s motivations and actions. Therefore, phenomenologists typically emphasise the need to illuminate the specific, and identify phenomena through how they are perceived by the actors in a situation (Lester, 1999, p1). In other words, the approach accentuates the importance of personal perspective and interpretation, or combining an individual’s ‘point of view’ with methods particularly effective at utilising experiences and opinions (Bryman and Bell, 2007, p20). This thesis focuses upon SME owner/managers and the risk of flooding. It seeks to access the experience and perspectives of these

stakeholders in order to gain insights into motivations related to the reduction of vulnerability and increasing resilience. It is also concerned with how owner/managers view the physical risk of flooding, both within a city and the SME context. Due to the similarities between these aims and the approach, a phenomenological stance was deemed appropriate.

Ontology is concerned with assumptions about the natural world (Morgan and Smircich, 1980, p492). The phenomenological approach views human behaviour as a product of how people interpret the world. It advances the notion that humans are creative agents in the construction of social worlds (Bogdan and Taylor, 1975, p13-14; Ainlay, 1986, p44). This stance corresponds with the ontological position selected for this thesis. Social constructivism is favoured within the social sciences and asserts that humans do not find or discover knowledge, they use their minds to actively construct or 'make' knowledge (Schwandt, 2003, p276). It is maintained that perceptions of vulnerability and resilience associated with the notion of flooding are also constructed socially (Nelkin, 1989, p96). These constructions are not static. They change over time, meaning they are in a "*constant state of revision*" (Bryman and Bell, 2007, p23). As no two floods are identical and also change temporally, they are not passive entities. Once again, this makes social constructivism an appropriate ontological position to be applied.

Epistemology and ontology inform theories of research design (Feast and Melles, 2010, p1). Despite the importance of this inter-dependence, in the field of SME research the issue of philosophy in relation to methodology is often ignored. In theory, a lack of both an epistemological and ontological approach for research means that any preconceptions are not taken out into the field during data collection, and an element of naivety still remains thus reducing bias (Cope, 2005, p15). However, if done poorly, this can limit the power of the results in academic audiences (Blackburn and Kovalainen, 2009, p133).

2.3. RESEARCH IN AN SME CONTEXT: A CASE STUDY APPROACH

The past 30 years has seen an increase in the volume of research on SMEs within the UK, with the dominant focus being the firm or individual (Blackburn and Kovalainen, 2009, p127-128). Constructivism is pragmatic (Perkins, 1999, p6). Therefore within the constructivist approach, the aim is to understand the behaviour of individuals by examining the influence of their environment upon their actions (McMillan and Schumacher, 1984, p307). The interaction between floods and SME behaviour is not

straightforward. SMEs are complex social systems, whilst flooding holds different meanings to different people (Gagnon, 2010, p1). Consequently, an in-depth understanding of flood situations and the actors involved within an SME context demands a holistic approach (Ghauri 2004, p112).

Case studies are one of the most frequently used approaches for researching SMEs within business studies, and for studies taking a pragmatic approach. This is owing to their flexibility and their ability to situate the research within a particular geographical location (Marschan-Piekkari and Welch, 2004; Pan and Tan, 2011).

Within this research, the cities of Hull and Sheffield will form two medium-size, independent case studies which will frame the whole thesis. Consequently the same quantitative and qualitative methodologies will be applied to both locations to ensure the reliability of data collection and resulting conclusions (de Vaus, 1996, p54). The scope and context of these two case studies extends to include all SME owner/managers within all areas of the city boundary. This city-wide resolution has the advantage of being able to infer meaning and draw conclusions from a representative sample, yet accurately and validly generalise these results to other SMEs within that city. Adopting two case studies provides the opportunity to extend the scope and resolution of the research and again improve the generalizability of results. As the same methodology is adopted in both cities, once the in depth exploration of Hull and Sheffield in isolation is completed, these findings can be fairly compared and contrasted in order to identify any similarities or differences. This can remove the limitation of all results being tied to one particular location when only one case study is adopted. In other words, if similar results are found and conclusions drawn in Hull and Sheffield, then this provides supporting evidence for the tentative application of the results to other cities.

There are other benefits associated with this method. Case studies make it possible to observe and analyse phenomena as a single integrated whole, and build and validate theories or hypotheses. They are appropriate for describing, explaining, predicting and controlling processes associated with a variety of circumstances at the individual, group and organisational level (Bullock, 1986, p33; Dyer and Wilkins, 1991, p613; Woodside and Wilson, 2003, p493). In other words, rather than using samples and examining a limited number of variables, case studies involve in-depth studies of several variables related to a single unit (Srivastava and Rego, 2011, p222).

The case study method seeks to systematically infer meaning from observed events (Rothe, 1982, p3). It is suitable for this investigation as one aim is to examine to what extent flooding poses a threat to SMEs by exploring how they interact with this

hazard. This approach is also required when a study aims to examine phenomena within a 'real life' situation (Yin, 1981, p98; 1994, p98). The case study is well suited to new areas of research, or research areas for which existing theory seems inadequate (Eisenhardt, 1989, p548). Accordingly, this approach is suited to exploring the small, yet emerging field of research related to flooding and SMEs, where current theories are questioned and critiqued due to the short time period over which they have existed (Blackburn and Smallbone, 2008, p267; Wedawatta *et al.* 2009, p1).

Despite its suitability, there are weaknesses associated with this methodology. It is time consuming and the external validity is questionable as it is difficult to reproduce an identical case study (Gagnon, 2010, p3). It is also strongly argued that there is little chance that comparable research will be conducted to generalise findings inferred from the study. This is owing to the specificity, diversity and narrow focus of the method not being readily compatible with universal scope (Lecompte and Goetz, 1982, p38; Worthman and Roberts, 1982,). As such, the result of a case study is in-depth analysis and unique theory applying to particular phenomenon within one context (Eisenhardt, 1989, p533; Gagnon, 2001, p2-3). Within the context of this thesis, many case studies were used within an organisational and locational setting. This allowed for the construction of a richly layered picture from a multitude of perceptions, thus overcoming the limitations outlined above and making case studies a viable research tool.

A further issue associated with the case study method is that researchers claim the approach to be synonymous with qualitative methods. This is far from the truth (Marschan-Piekkari, 2004, p112). Within a case study, data needs to converge in a triangulating fashion and use multiple sources of evidence in order for some of the method's weaknesses to be overcome (Dul and Hak, 2008; Yin, 2008, p14).

2.4. TRIANGULATION

"Triangulation is the combination of methodologies in the study of the same phenomena" (Jick, 1979, p602). Within the SME research field, many of the 'simple' and straightforward research problems relating to SMEs have been investigated numerous times. This has left more complex, and interdisciplinary SME issues under-researched (Hurmerinta and Nummela, 2011, p210). When conducting research within an emerging field, there is a requirement for scholars to acquire original knowledge through the use of new and novel research methodologies such as convergent interviews (Hine and Carson, 2007, p2; Rao and Perry, 2007, p86; Blackburn and Kovalainen, 2009, p127). By doing so, the SME research field will not become constrained to conducting investigations using one

particular method. Due to the interdisciplinary nature of SME and flooding investigations, traditional, single research methods are inadequate. The methodology used within this research should reflect this interdisciplinary nature. Additionally, the methodology is also required to take into account the case study approach adopted, and be directly informed by the research's philosophical position in what is known as the "*methodological fit*" (Darlaston-Jones, 2007, p19; Edmonson and McManus, 2007, p1155; Hurmerinta and Nummela, 2011, p222).

Pragmatism, phenomenology, constructivism, business practice research and the social sciences all favour qualitative research methods. The collection and analysis of qualitative data emphasises the ways in which individuals interpret their social world (Kvale, 1983, p172; Bryman and Bell, 2007, p28). In some cases, the methodological fit of a philosophy is not perfect (Bryman and Bell, 2007, p631). Quantitative methods are favoured by the positivist and objectivist approach as they can be used to understand human interactions (Outhwaite *et al.*, 1993, p506) Quantitative research can also be useful in the analysis of the social construction of events (Chen and Meindl, 1991, p522).

Edmondson and McManus (2007, p1160) maintain that too few studies in SME research use both qualitative and quantitative data. By adopting a triangulation of methods, this thesis will contribute to the small yet growing field of integrated SME research strategies. Although case studies can be entirely quantitative or qualitative in nature, this thesis will use both qualitative and quantitative case studies to complement one another (Ghauri, 2004, p109). The use of quantitative, numerical data overcomes the difficulty of generalisation associated with qualitative findings (Stake, 1994). Qualitative data provides a comprehensive and in-depth understanding of a certain phenomenon or individual. These results can then be utilised to develop quantitative data collection methods which can then be applied to statistically representative samples of the population (Benbasat *et al.* 1983, p371). A triangulation of both quantitative and qualitative methodological tools within this thesis is a suitable approach to fulfil the research aim.

In regards to motives, triangulation is adopted for three reasons (Hurmerinta and Nummela, 2006, p210):

1. A method may only be used as an instrumental or facilitating role to lead to further methodologies (Bryman, 1992, p10).
2. Using mixed methods can improve the validity of research (Hammersley, 2008, p42-54).

3. Multiple methods can be used when a deep understanding of the research subject is required (Jick, 1979, p604).

The adoption of a triangulation of methods is not always motivated by a single reason (Hurmerinta and Nummela, 2006). As such, this thesis employed qualitative techniques to act as a facilitating role. It also adopted quantitative methods to obtain a deep understanding of the topic.

2.5. RESEARCH STRATEGY

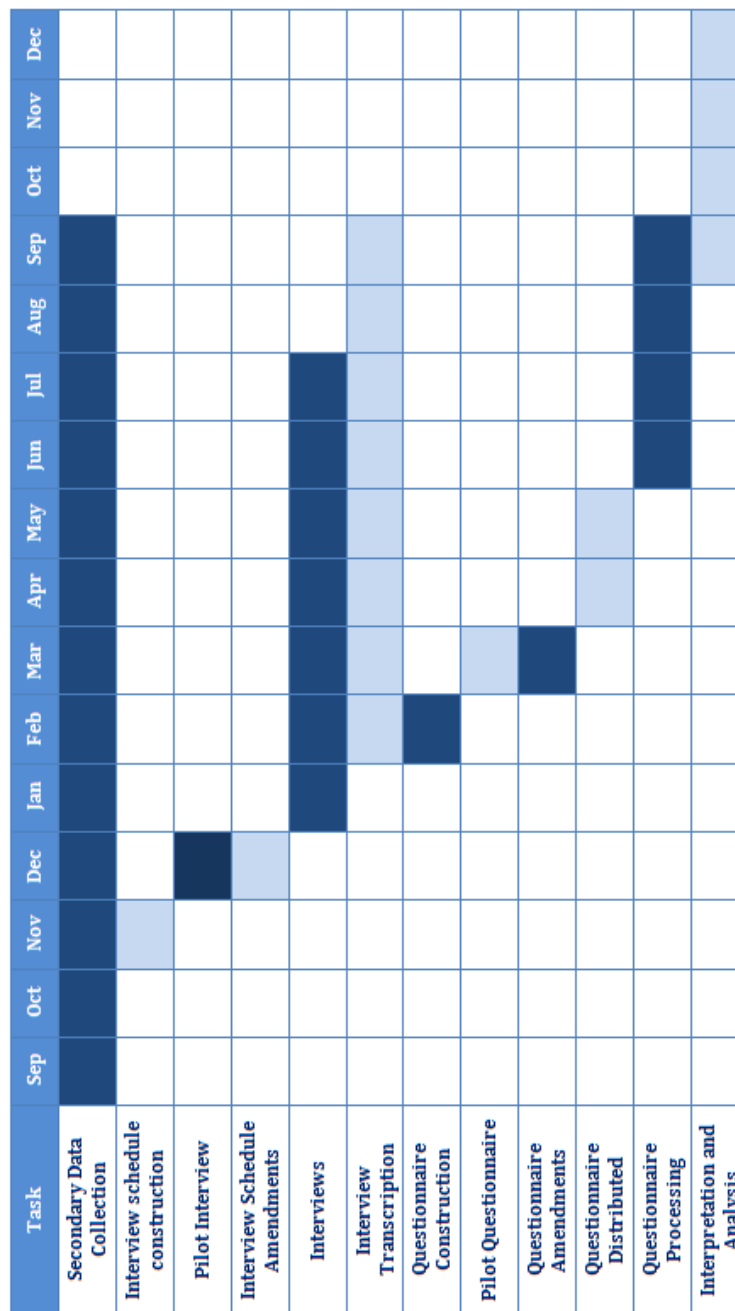


Figure 2.1: A Gantt chart demonstrating the method collection research structure and time period over which it was executed (2009 – 2010)

Research strategy is a plan of action designed to achieve a specific goal (Singh and Bajpai, 2008, p164). The use of a mixed methods approach in a case study context means that this thesis required a sound research strategy. An overview of the whole project provided the research paradigm or philosophical position which influenced the way the research was approached (Denscombe, 2010, p3). A clearly identifiable and ‘solvable’ specific research problem informed the choice of research methods (Denscombe, 2010, p4). Finally, a carefully constructed plan of action was rationally designed in order to offer the best prospects of success (Denscombe, 2010, p3). As a result, a suitable, feasible and ethical strategy was chosen that was ‘fit for purpose’ in relation to the particular research aim (Denscombe, p4-5)(Figure 2.1). The rest of this chapter will outline the research strategy in further detail. Systematically, each stage of the research strategy will be discussed to provide a justification of methods used within that stage, an outline of how these methods were utilised, and any associated ethical issues or limitations.

2.6. SECONDARY DATA COLLECTION AND ANALYSIS

Secondary data is information that has been collected by another party for another purpose (Boslaugh, 2007, p1). Many academics including Dale, Arber and Proctor (1988), have justified why secondary analysis should be considered a serious alternative to collecting new data. This includes the time-consuming and costly process involved in collecting primary data, the breadth of data available, the fact that the data required for the study may not be available in other forms, and a potential lack of professionalism associated with small research projects (Rose and O’Reilly, 1998, p120; Kitchen and Tate, 2000, p60; Bryman and Bell, 2007, p328).

A large amount of highly detailed data is available covering a wide range of topics. The uses to which secondary data can be put are extremely varied (White, 2003, p74; Neelankavi, 2007, p60). Within this thesis, secondary data was utilized in two ways. Firstly, previous literature was obtained in order to lay the conceptual, empirical and practical foundations of the study. Current and historical publications from a variety of sources, including books and academic journals, were analysed to identify key themes, concepts, theories and debates. These were then used to refine the choice of study topic and location. This process assisted in the formulation of the study’s main aim and accompanying research questions, alongside highlighting which themes the interviews and questionnaire would explore (Anderson, 2009, p169).

The second way in which previously collected data was utilised was as the basis for analysis. This research adopted a historical approach through the exploration of past

flooding events. Kitchen and Tate (2000, p60), alongside Bryman and Bell (2007, p331), state that secondary data has the advantage of allowing the possibility of longitudinal and trend analysis. This is something which is rare in business research due to the time and costs involved. In order to overcome this restriction and the limitations of human memory, newspaper articles, photographs and official documents, which related to past flood occurrences, were collected (Appendix 1)(Wickens, 1984, p63-101). These were then analysed, and either compared with or used to support the results from the questionnaire and interviews.

The historical documentation was acquired from a plethora of sources including the Brymor Jones Library of Hull University, Hull History Centre, Sheffield Archives, online search engines (e.g. Google) and official websites (e.g. A Vision of Britain). There are limitations to using this type of data. As secondary data has been collected by another stakeholder for another purpose, it may have been manipulated for a specific reason and hence be subjective in nature. For example, newspaper flooding accounts may have been 'sensationalised' in order to sell more copies. There are also questions over cultural conditions and the spatiality of data (Hoggart *et al.* 2002, p105). Whilst these issues must be borne in mind by the researcher, this is not to say they render such documents uninformative. For many investigations, secondary data is indispensable with some projects unable to proceed without it (White, 2003, p75). It was the presence of secondary data which helped in the formulation of the initial schedule for the semi-structured interviews.

2.7. PRIMARY DATA COLLECTION: SEMI-STRUCTURED INTERVIEWS

2.7.1. JUSTIFICATION

When selecting data collection methods, *"some areas of study naturally lend themselves more to qualitative types of research, for instance, research that attempts to uncover the nature of a person's experience with phenomena"* (Strauss and Corbin, 1990, p19). The phenomenological, pragmatic, social constructionist and case study approaches all advocate the use of a qualitative methodology (King, 2004, p11). Talking with people is an excellent way of gathering a large amount of information regarding personalised perceptions in a short space of time (Longhurst, 2003, p113). As a large proportion of this thesis aimed to uncover individual SME owner/manager experiences, motivations and views of flooding, interviews were utilised to collect primary, qualitative data.

Interviews enable the development of inter-subject depth with the interviewee about a particular subject (Miller and Glassner, 2004, pp126-127). Avoiding forced choices by using questions such as *“what do you think....”*, and allowing interviews to proceed in a conversational manner, facilitates the task of interpreting participants’ experiences from their point of view (Ely *et al.* 1991, p50; Kvale, 1996, p19-37). Providing *“an authentic insight into people’s experiences”* through the use of interviews is particularly important within the setting of this thesis, as the fundamental aim was to explore flood risk from the SME perspective (Silverman, 1993, p91).

There are three different formats associated with interviews:

1. Structured interviews rely upon the interviewer having a structured schedule or script to follow, usually with closed questions (Arksey and Knight, 1999, p7). This does not allow for much improvisation.
2. Semi-structured interviews are an integral part of exploratory qualitative research. They use a less rigid script or format to probe for description and interpretation of less well understood topics (Schensul *et al.* 1999, p148).
3. Unstructured interviews do not involve the creation of an interview script (Janz, 1982, p578). They employ a more naturalistic approach, with the hope for a more natural ordering of questions, led by the responses and discussion with the interviewee (Janz, 1982, p578).

Within both structured and semi-structured interviews, control lies with the interviewer in terms of questions asked and their order. Semi-structured interviews are considered a more flexible data collection tool than structured interviews, as the direction of conversation is not completely predetermined. The less rigid format of semi-structured interviews allows them to be used to explore unexpected discoveries (Cohen *et al.* 2007, p439). This is particularly advantageous as the relationship between flooding and SMEs is currently under-researched. As emergent findings were a regular occurrence over the course of this research, the interviews allowed a full investigation of these discoveries. Moreover, the reliance upon a semi-structured format and open-ended questions such as *“Could you please explain what effects/impacts flooding had upon the running of your business?”*, created the potential to generate data sets more elaborate than those produced by structured, closed questions (Anderson and Burns, 1989, pp117-118). The interviews gathered a vast amount of rich data about a wide variety of topics including flooding experience, perceptions of vulnerability and motivations behind resilience from a wide variety of individuals.

2.7.2. SAMPLING

Interviews take a conversational, fluid form requiring someone to converse with (Valentine, 2005, p111). *"Selecting participants for semi-structured interviews is vitally important"* (Longhurst, 2003, p123). However, within business investigations it is *"sometimes more or less impossible to discern from researchers' accounts either how their interviewees were selected, or how many there were"* (Bryman and Bell, 2007, p497). 'Purposeful sampling' selects participants on the basis of their experience related to the research topic (Swenson *et al.* 1992, p462; Cameron, 2000, p89). This sampling method was employed to select participants for this thesis. When using quantitative techniques, the aim is often to choose a random or representative 'subjective sample'. Yet, the purpose of qualitative data and interviews is not to be representative, but to understand how individual people experience and make sense of their own lives (Valentine, 2005, p115).

When selecting which areas of Hull and Sheffield would be sampled, flood risk maps for the years 1958 to 2010 were obtained from the Environment Agency, Hull City Council and Sheffield City Council (Figure 2.2, 2.3 and 2.4 and Appendix 2). These maps displayed locations of historical flood occurrences over time, and areas within the two cities considered to be at risk at present. They helped to identify locations where it would be possible to compare perceptions of those SMEs owner/managers who had, and had not, been flooded. Within these locales, and through purposeful sampling, recruitment of SME owner/manager participants took place in two ways:

1. A number of prospective SMEs were identified and invited to participate by either an introductory email (Appendix 3) or telephone call.
2. Interviewees were recruited using snowballing (Hicks-Patrick *et al.*, 1998, p295).

Snowballing is the process whereby one contact is used to help the researcher recruit another contact, who in turn can put the researcher in touch with another participant (Valentine, 2005, p116). Accordingly, some interviewees identified potential participants during the course of the interview: *"You should speak to (BLANK) opposite Sheffield Wednesday ground. They got it bad"* (Male, Cleaning company owner, Sheffield). In addition to snowballing, a questionnaire distributed following primary interviews also assisted the selection process. At the end of the survey, respondents were asked if they would be willing to take part in a follow-up interview. If they answered yes, they were then encouraged to provide their contact details to make it possible to speak to them at a later date.

This combination of recruitment techniques proved very successful as 38 interviews were conducted lasting in duration from 50 minutes to 1 hour 40 minutes. Between 11th January 2011 and 26th July 2011, 16 interviews were carried out in Hull, and 22 in Sheffield. Of these interviews, ten participants were recruited through snowball sampling. Care was taken to ensure this sample was representative across location, industrial sector, size, turnover and owner/manager characteristics (Appendix 4) in order to obtain generalizable results.

After participant selection, it is of great importance to ensure that an interview script exists so the interview can be conducted with confidence (Gillham, 2000, p53). Semi-structured interviews combine the flexibility of unstructured, open-ended interviews with the directionality and agenda of a questionnaire producing focused, textual data (Schensul *et al.* 1999, p149). The phenomenological epistemology emphasises a need for the researcher to set aside their presuppositions about the phenomenon under investigation, known as 'bracketing' (King, 2004, pp12-13). Social constructionist interviews take the format of a loose structure, and the use of probes to follow up points of interest (King, 2004, p13). During the interview schedule construction, both of these requirements were taken into consideration. The time frame for the interview was also considered during the construction phase as this can influence the number of questions which can be asked. The interviews were developed so as to provide one hour's worth of discourse. However, it was accepted that this may have proven to be more or less, depending upon the individual. As an interview is required to have a chronological beginning, middle and end, it was believed that anything shorter than one hour would not provide enough opportunities for this to be achieved (Seidman, 2006, p20).

Interview schedule topics emerged from the research questions (Box 2.1). A well-defined research aim provides focus for the interview (Henning *et al.* 2008, p100). Furthermore, an effective and strategically generated set of questions facilitates the discovery of ways in which participants viewed their social world (Bryman, 2008, p438). When formulating the schedule, Patton's (1990, p339) typology of questions was considered (experience/behavioural, opinion/value, feelings, knowledge, sensory and background questions), and many of the principles suggested by Bryman and Bell (2007, p483) were adopted. The schedule was semi-structured in nature to allow questions to flow, yet accommodate flexibility. An additional aim of the interview technique is to ensure respondents understand the questions posed, but not be influenced towards one point of view by what is being asked (Mitchell and Jolley, 2010, p280; McNabb, 2012, p114). Therefore 'jargon', acronyms and initials were avoided unless in everyday use and

open, non-leading questions were utilised (Hauge *et al.* 2004, p113; Hargie, 2010, p141). Questions that could have caused confusion were highlighted by the use of a pilot study.

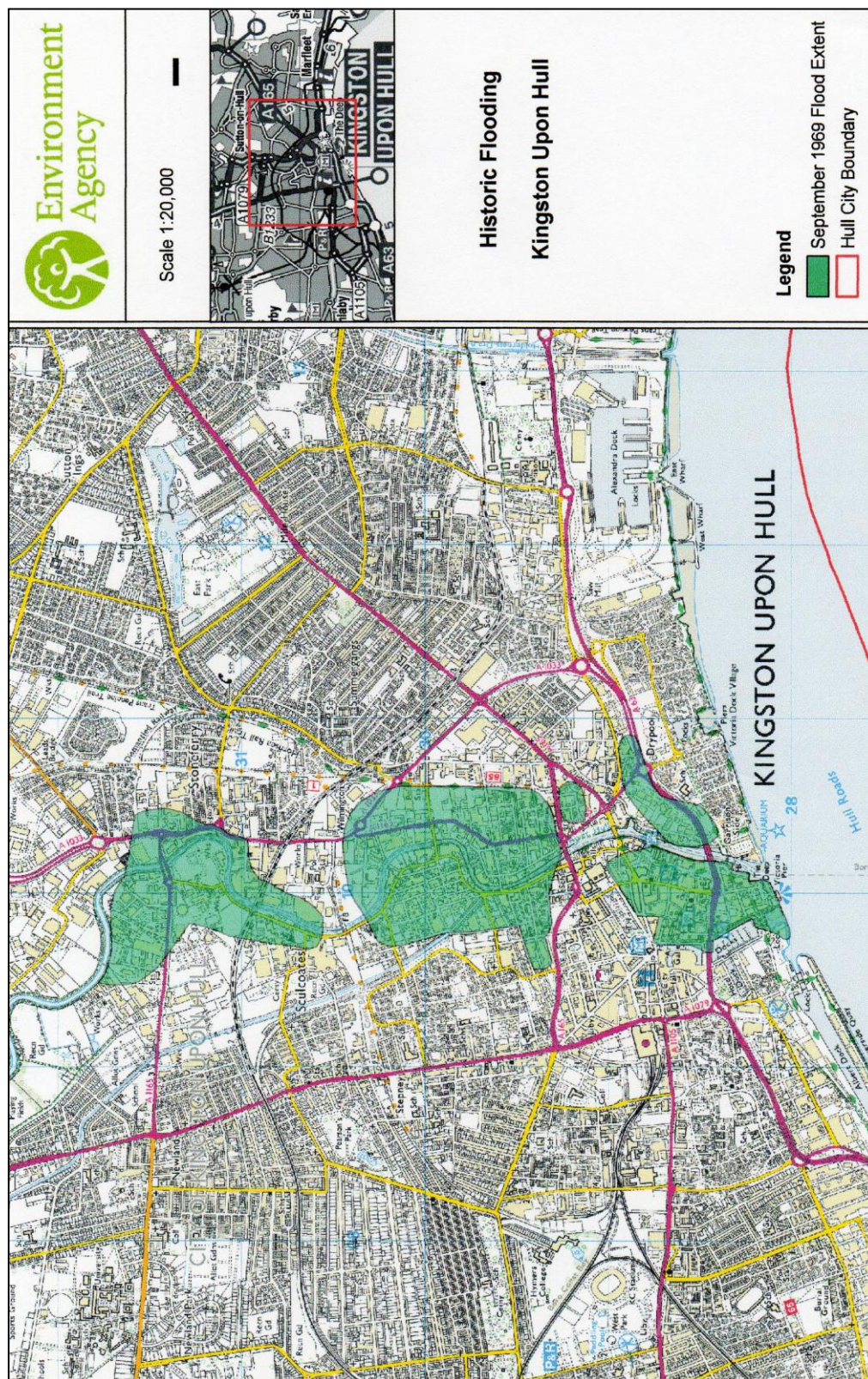


Figure 2.2: Map displaying historical flooding in Hull

Source: Environment Agency, 2008

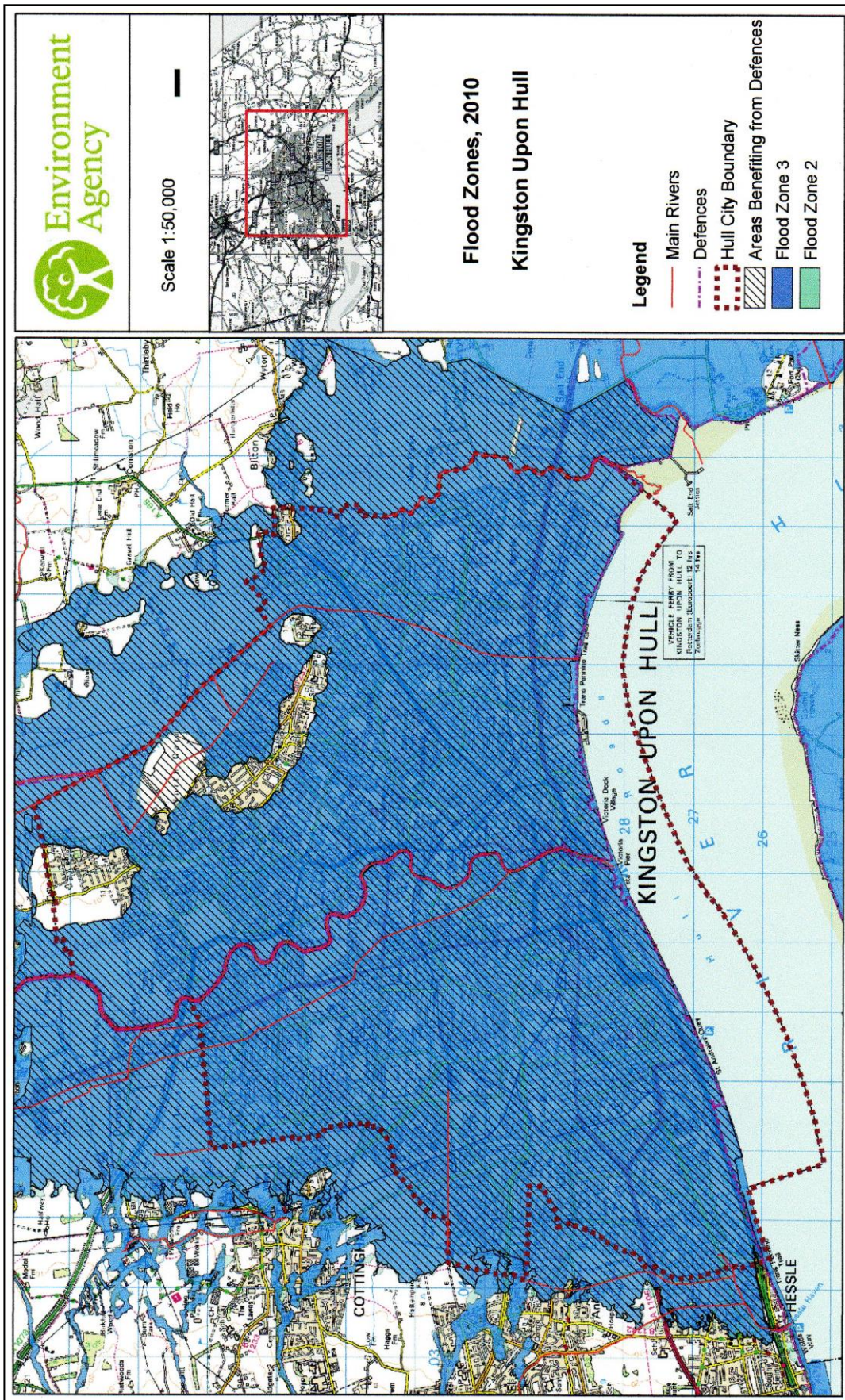


Figure 2.3: Map displaying areas in Hull currently at risk from flooding

Source: Environment Agency, 2010d

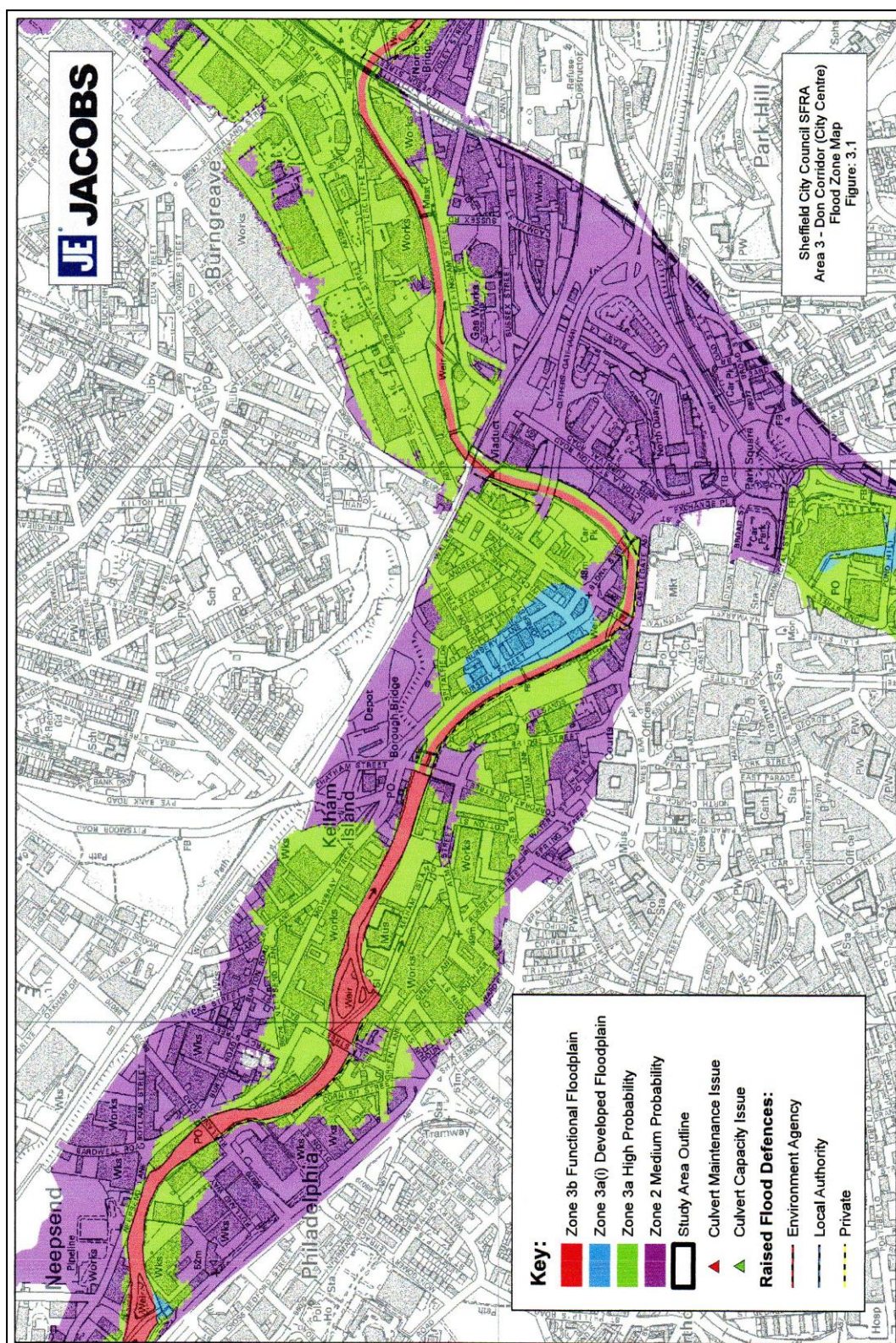


Figure 2.4: Map displaying areas in Sheffield city centre currently at risk from flooding
Source: Sheffield City Council, 2008a

2.7.3. STRUCTURE

After participant selection, it is of great importance to ensure that an interview script exists so the interview can be conducted with confidence (Gillham, 2000, p53). Semi-structured interviews combine the flexibility of unstructured, open-ended interviews with the directionality and agenda of a questionnaire producing focused, textual data (Schensul *et al.* 1999, p149). The phenomenological epistemology emphasises a need for the researcher to set aside their presuppositions about the phenomenon under investigation, known as 'bracketing' (King, 2004, pp12-13). Social constructionist interviews take the format of a loose structure, and the use of probes to follow up points of interest (King, 2004, p13). During the interview schedule construction, both of these requirements were taken into consideration. The time frame for the interview was also considered during the construction phase as this can influence the number of questions which can be asked. The interviews were developed so as to provide one hour's worth of discourse. However, it was accepted that this may have proven to be more or less, depending upon the individual. As an interview is required to have a chronological beginning, middle and end, it was believed that anything shorter than one hour would not provide enough opportunities for this to be achieved (Seidman, 2006, p20).

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2.7.4. DEVELOPMENT AND IMPLEMENTATION

Piloting work is invaluable when conducting qualitative research. Assisting in the refinement of research instruments, it also highlights gaps or wastage in data collection,

and considers broader issues such as validity, ethics, representation and health and safety (Sampson, 2004, p397). Once complete, the schedule was piloted using six randomly selected SME owner/managers, three in Hull, and three in Sheffield. Both cities were used for the pilot study in order to see if understanding of the interview questions would be affected by any 'cultural differences'. Following this trial, the interview schedule was amended accordingly (Appendix 5). For example, it was remarked by participants that in some instances, the interview questions were worded very similarly meaning it was unclear as to how the answers required would be different. Modification of the interview schedule did not end after the pilot study. Regular adjustments were made as new topics, not originally included, occurred during the interview process thus reinforcing elements of the phenomenological approach. Furthermore, analysis of one interview can inform the way in which subsequent interviews are carried out, as the researcher aims to seek to deepen their understanding of the phenomenon (King, 2004, p13).

Interviews were conducted in the participant's own choice of location, as location can be very influential upon the outcome of an interview (Elwood and Martin, 2000, pp649-657). By allowing participants to designate a venue, it was believed they would select a location where they were most comfortable, and accordingly more likely to be honest (Tracy, 2012, p164). Alongside locale, Oppenheim (1992, pp95-96) contends that impression management and appearance are critical issues in regards to data quality. Consequently, a smart/casual dress code was adopted by the researcher to maintain an air of professionalism, but not intimidate any participants. This may have made interviewees reluctant to disclose certain views. All interviews were digitally recorded with the participant's permission. This permitted a more thorough scrutiny of responses, repeated examination of answers and assistance in correcting any intuitive glosses that may have been placed upon results (Heritage, 1984, p156).

2.7.5. ETHICAL CONSIDERATIONS AND LIMITATIONS

During research, academics must observe normal ethical standards and conduct themselves morally (Barker and Smith, 2001, p142; Davey and Liefoghe, 2004, p182). Before any data was collected for this thesis, a 'Research Ethics Approval Form' was submitted to the Faculty of Arts and Social Science Ethics Committee of Hull University and subsequently approved by the chair.

When conducting business research, four main ethical areas must be taken into consideration; harm to participants and SMEs, informed consent, invasion of privacy and deception (Diener and Crandall, 1978). Within the study, stress to the participants was

minimised, the participants or the SME itself were not harmed in anyway, and care was taken to maintain the confidentiality of records and anonymity of accounts (Parker, 2000a, p238). Full consent was obtained from the participants in regards to using a recording device and any quotes or photographs they may have provided. Interviewees had the right to withdraw at any time, were entitled to privacy and were fully informed about what the research entailed on initial contact. Despite the care taken and the use of a pilot study to eliminate problems, there were still some slight limitations associated with the technique.

One limitation related to interview conduction. As interviewees were senior employees, there was a demand on their time by colleagues. On occasions, the interview was interrupted by the participant answering the telephone or speaking to another member of staff. This disrupted the flow of conversation, and, in turn, caused both the researcher and interviewee to 'lose their trail of thought'. At times there were constraints upon the time available to interview owner/managers. In some instances the interviews were limited to less than one hour. Consequently, there were occasions where not all the questions from the interview were asked due to time restraints. Additionally, the participant's seniority meant that they were accustomed to having control and authority over their employees or direct reportees (England, 2006, p289). Thus they would often guide the interview in terms of subject and what they thought was relevant. This resulted in some discussions becoming superfluous to the objectives of the research. This is not necessarily negative, as the participant's choice to steer the interview also meant that issues were raised which could be investigated which had not previously been considered.

Limitations also occurred when recruiting participants. 'Cold calling' and 'self-selection' have a number of associated limitations (Wainer, 1986, p1). There may be an over-representation of certain individuals whose views do not reflect the population at large (Creswell, 2002, p156). Those who take part and volunteer for research are more likely to be motivated by their enthusiasm, experience or interest in the topic (Rosnow and Rosenthal, 1997). There are always certain individuals or a certain group of people who researchers can trust to be more likely to take part and volunteer when asked (Lee and Abbot, 2003, p80-108). These people tend to be very opinionated. As a consequence, there is the potential for the generation of 'participant' or 'self-selecting' bias meaning that the sample does not represent the whole population fairly (Jowitt, 2008, p14; Schuenemeyer *et al.* 2011, p338).

Although a difficult problem to overcome, attempts were made to alleviate the problems with self-selection sampling bias and associated representation issues. Upon initial contact between the researcher and the interviewee, it was explained that all owner/manager opinions, regardless of prior knowledge and experience, were valued.

Many academics have investigated the benefits of controlling for selection bias (Mello *et al.* 2002; Fortney *et al.* 1998; Steiner *et al.* 2010; Lovgren *et al.* 2012). Research by Lovgren *et al.* (2012) has found that at present the merits of controlling for selection bias are inconclusive. Studies such as that conducted by Rotger *et al.* (2012) have uncovered that selection bias control has a positive effect upon results. Others scholars, including Parker and Belghitar (2006), have revealed a negative effect. As the results from these studies are not homogenous, it was decided that within this research selectivity bias could not be controlled for and all results would be included within the analysis process.

A further recruitment limitation is associated with the high refusal rate this research experienced. Preliminary investigations facilitated the discovery of many potential interviewees. Yet when contacted they either said no during a telephone conversation or did not acknowledge email communication. In addition, some of the participants who outlined they would be willing to take part in a further interview on the questionnaire, did not respond to any further form of communication. There were also three occasions when appointments for interviews were made, the researcher would turn up at the specified time, but the participant would not be there. These participants then went on to ignore any further correspondence from the researcher in regards to rescheduling appointments.

Despite the limitations above, the interviews allowed the experiences, perceptions and motivations of 38 SME owner/managers to be investigated. The interviews yielded a large amount of qualitative data, all of which was uploaded onto a computer and transcribed *verbatim* in order to facilitate analysis and allow conclusions to be drawn.

2.7.6. ANALYSIS

Kitchen and Tate (2000, p231) utilise an approach to understanding qualitative data originally advocated by Dey (1993, p48). This consists of description, classification and connections. Description of the data refers to how it is portrayed. For this research it was in the form of interview transcripts. The analytic processes used to understand this data were the notions of classification and connections. Due to researcher preference, the analytical tools of choice were data matrices owing to their flexibility (Miles and Huberman, 1994, p240). A matrix has the ability to 'cluster' or bring together large amounts of data in an easy to use format, benefiting data accessibility (Nadin and Cassell, 2004, p271; Romesberg, 2004, p11).

To classify the data, each transcript was systematically read and codes created for particular issues (Kitchen and Tate, 2000, p234). For example, if a respondent mentioned

how they viewed the risk of flooding in Sheffield, then it was given the highly specific code 'city flood risk'. If a participant spoke about the flood damage caused to their business, then a much broader code of 'impacts' was applied. The specific codes were then grouped together and placed into a much broader category with other relevant specifics. In the case of this example, 'city flood risk' was placed into the category 'perceptions'. Conversely, the broader codes were 'split' (Kitchen and Tate, 2000, p235) into smaller sub-categories which stemmed from the original code. 'Impacts' became 'short-term', 'long-term', 'direct' or 'indirect'.

This process created templates or data matrices where the data was being coded, categorised, sorted and divided with respect to issues that became prevalent as the analysis progressed. Thus it was possible to make connections, uncover frequently discussed issues, and build a picture of prevalent themes, concepts and relationships. Many of these relationships were suggestive of broader connections to scholarly literature and were supported by the data collected by a postal questionnaire (Cope, 2005, p447).

2.8. PRIMARY DATA COLLECTION: POSTAL QUESTIONNAIRE

2.8.1. JUSTIFICATION

Despite questionnaires being more frequently associated with a positivist epistemology, this link is *"far from deterministic"* (Read and Marsh (2002), p232). This was expressed by Bryman (cited in Read and Marsh, 2002, pp232-233): *"there is nothing inherent in the properties of the different methodologies which prevents their use by researchers who are operating from different epistemological positions"*. Following the interviews, a questionnaire was distributed to SME owner/managers in order to uncover supporting or refuting primary quantitative data. This sequence of techniques was chosen as Bryman (1984, p84) asserts that qualitative research is exploratory, and should be used as preparation for further research. Furthermore, as previously outlined within a case study context both quantitative and qualitative methods need to converse in a triangulating fashion in order to overcome limitations associated with related methods (Yin, 2008, p14). It has been argued that this format is unconventional, with it often looked upon unfavourably (Whyte, 1976, p211). Lofland (1971) purports *"quantitative studies serve primarily to firm up and modify knowledge first gathered in a fundamentally qualitative fashion"* (p6). As such, there are many examples of this structure being successfully executed, including Faraday and Plummer (1979, pp773-789).

A survey technique possesses a number of other research advantages. It can facilitate the delineation of fine differences between people in terms of characteristics. This technique can also provide the basis for precise estimates of the degree of relationships between emerging concepts (Bryman and Bell, 2007, p158). Due to their flexible nature, surveys permit the collection of broad data from a large sample to determine participant perceptions (McNabb, 2008, pp135-136). Most importantly, they allow the possibility of generalising findings “*to the world at large*” (Bassey, 1981, p73).

2.8.2. SAMPLING

Generalisation is paramount when using questionnaires. Therefore, it is necessary to obtain a representative sampling frame (Fowler, 2002, pp11-14). Sampling is a key issue in survey research because respondents can significantly impact results (McLafferty, 2003, p95). A larger sample generates more representative results, while smaller samples tend to lead to more extreme results (Dattalo, 2008, p16). Within this research, the sampling frame consisted of SME owner/managers located in Hull and Sheffield. As there are over 26,000 SMEs present in the two cities it was necessary to reduce this population to a more manageable sample. Due to practical constraints (time, resources and costs), it was decided 3000 business would be selected, 1000 in Hull and 2000 in Sheffield, the latter city having the larger sample due to its larger size and SME population.

When selecting respondents, a stratified sampling technique was utilised. Stratified sampling consists of dividing a study population into groups or strata that are mutually exclusive. Within each of these strata a representative sample is selected (Attwood *et al.* 2004, p12). This has the benefit of providing separate estimates in each stratum, and more accurate estimates of population parameters (Albright *et al.* 2009, p396). Within this research the stratum were postcode and industrial sector. To allow for a fair comparison between the two cities, all the postcode areas located within the city boundaries as outlined by Hull and Sheffield City Councils were selected (Figure 2.5 and 2.6 and Appendix 6). With regards to industrial sector, the categories displayed in the UK Standard Industrial Classification of Economic Activities 2007 provided by the Office for National Statistics were employed (2009) (Appendix 7). These strata were chosen to acquire a wide coverage of geography and industry. The postcodes were then overlain on Environment Agency and council flood maps (Figure 2.2-2.4) in order to select a mixture of ‘flooded’ and ‘non-flooded’ postcodes to be representative and permit generalisation.



Figure 2.5: Map displaying Hull Postcodes

Source: www.ordnancesurvey.co.uk

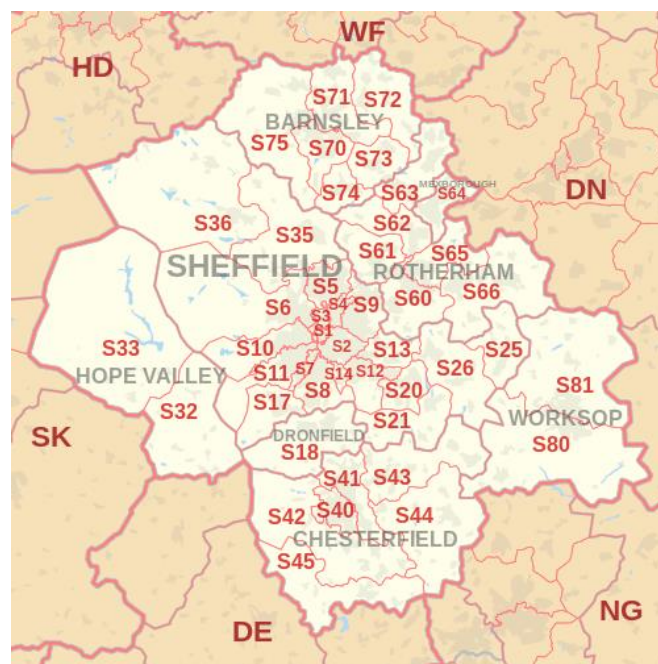


Figure 2.6: Map displaying Sheffield postcodes

Source: www.ordnancesurvey.co.uk

The names and contact details of SMEs were obtained from the FAME database (Financial Analysis Made Easy). This software contains comprehensive information about most of the companies in the UK and Ireland including addresses, industry operated within and turnover, etc. It allows the user to specify certain search criteria, and generates easy to use tables within Excel spreadsheets containing the required data. When looking for potential sample SMEs in Hull and Sheffield, it was ensured that the search parameters

were set to find SMEs with less than 250 employees and a turnover of less than €50 million to concur with the European Union SME definition. The search terms were constructed so that companies were grouped by both postcode and industrial sector. From this list it was possible to comprehend how many businesses were located in each postcode and, within that area, how many were included in each industrial sector. By using these tables the number of SMEs needed to be sampled in each postcode and sector was calculated using a stratified sampling method.

As outlined, stratified sampling occurs where the investigated population is divided into groups and then a representative sample is taken from each group depending upon the size (Singh *et al.* 1996, p103). For example, within a group with a large population a larger sample is taken. Within Hull and Sheffield, all of the SME details obtained from the FAME database were firstly categorised by postcode area and then categorised into industrial sector (Appendix 8). As 1000 SMEs were required to be sampled in Hull, the proportion of businesses in each postcode required was calculated, and then the proportion in each industrial sector was obtained (Appendix 9). This provided a representative sample. This method was then repeated using the Sheffield list of SMEs (Appendix 10). Once complete, the total number of SMEs within each postcode and industrial sector was divided by how many SMEs were required to provide a single number. This number represented the sampling interval at which an SME was selected when all of the SMEs from the database were put into alphabetical order within their postcode and industrial category. If the sampling interval was six, every sixth business with the postcode and industrial strata was selected to receive a questionnaire.

2.8.3. STRUCTURE

Once the sampling frame was established, the questionnaire practicalities were considered. It was decided that a postal questionnaire would be utilised as they are quick to administer, permit a wider geographical coverage at a low cost and avoid interviewer bias (Oppenheim, 1992, p102; Stimpson, 1996, p124; Parfitt, 2005, p103). As each research survey is developed to fit a certain project, a draft questionnaire was composed (McLafferty, 2003, p88). The way in which a survey instrument is designed has much to do with the validity and reliability of results. A thoughtful ‘architectural design’ of a questionnaire will yield well-constructed data (Azzara, 2010, p15; Lehman and Dufrene, 2010, p328). Within this research, the survey design guided respondents through five logically sequenced sections, each relating to a different, yet interrelated theme. By doing so, it was believed respondents would not become frustrated swapping from subject to subject and not lose interest before answering all the questions. The topics selected were

related to the main themes which emerged from preliminary analysis of the interviews meaning the interviews had a facilitating role in the questionnaire design (Bryman, 1992, p241). The survey took a self-completion format where respondents were required to fill in the answers themselves. It was ensured that the structure was easy-to-follow and the questions were easy-to-answer, short and to-the-point as far as possible (Gilbert, 1998, p602; Dillman, 2007, p159; McNabb, 2010, p144). The wording of every question was precise to avoid confusion, and there was freedom from bias as no leading questions were posed (Foddy, 1993, pp184-185). By employing the above outlined techniques, it was ensured that accurate, valid and reliable data was obtained.

2.8.4. DEVELOPMENT AND IMPLEMENTATION

Following construction, the draft questionnaire was piloted online (Appendix 11). Conducting a pilot study allows for the correction of problems with respect to vernacular clarity and design which ultimately leads to a better quality of answers (Lehman and Dufrene, 2010, p331). An email was sent to 300 randomly selected SMEs (100 in Hull, 200 in Sheffield). This email contained a link to the electronic survey and an explanation of what the research involved. These participants were required to answer the survey questions, and provide a written response which outlined any issues they had encountered during completion or recommendations to improve the questionnaire. Depending upon the feedback received, the questionnaire was amended accordingly to create a final version (Appendix 11). Despite experiencing a 5.0% return rate, and the advantages online surveys bring such as low costs and a faster turnaround, it was not chosen as the method of administration. As not all businesses have an email address, this could impact upon the representative nature of the sample (Kehoe and Pitkow, 1996, p81). Non-delivery can be a problem. Weible and Wallace (1998, p22) and McDonald *et al.* (2003, p91) found that the response rate for online questionnaires is much lower than postal questionnaires. Therefore, the survey was converted to paper format and, together with a letter explaining what the research entailed (Appendix 11), was distributed via post to the 3000 pre-selected SMEs. A freepost envelope was included with the survey to increase the response rate (Sharp *et al.* 2006, p753).

Following an elimination process, 261 usable questionnaires were returned, providing an 8.7% response rate. Most mail surveys “*end up with about a 5.0% to 15.0% return rate*”, with “*other business surveys experiencing between 3.0% and 16.0%*” (Reid *et al.* 2002, p248; Astrachan and Allen, 2003, p23). As such, the rate this research received was deemed acceptable and no follow-up steps were undertaken to increase the response (Kemp, 2009, p117). The returned questionnaires were also deemed representative as

they delineated a wide range of businesses, postcodes and owner/manager characteristics, as shown in Appendix 12.

2.8.5. ETHICAL CONSIDERATIONS AND LIMITATIONS

In regards to issues and limitations associated with the questionnaire and subsequent analysis, ethics was the main issue to be taken into consideration. The questionnaire was specifically designed to allow complete anonymity if the participant so wished. The returned surveys were kept in a secure location, and the digital records on a password protected computer. The four main ethical areas highlighted by Diener and Crandall (1978) as previously outlined were also acknowledged.

Although the pilot study eliminated problems, others did occur, some of which were related to the response rate. Although a response rate of 8.7% is deemed as acceptable by scholars such as Kemp (2009, p117), questions can be raised in regards to how the effectively the results represent the study areas and whether the data can be generalised to other locations. The issue surrounding low uptake and the completion of postal questionnaires was known to the researcher during the 'planning stage'. Advice was taken from Edwards *et al.* (2002) and a freepost envelope was included with the intention of increasing return rates. Despite this attempt, the response rate witnessed was still low. This could be attributable to the survey length, as 175 questions required a response. Many scholars have demonstrated a negative correlation between questionnaire length and return rate (Childers and Ferrell, 1979, p429; Fox, 1998, p468; Edwards *et al.* 2002, p474). It is also possible that the questionnaire may have been put to one side to be completed at a later date and subsequently forgotten about. If this research were to be repeated, the length of the survey would be shortened and a reminder letter might also be sent. These changes are envisaged to increase the response rate and the representativeness of the research.

A further limitation relates to the work of Foddy (1993, p184-185). Foddy states that a researcher should always expect some respondents to fail to interpret questions as they are intended to be interpreted. Although no concerns were raised over the wording of questions during the pilot study, an issue regarding ambiguity presented itself during the analysis stage of the research. It became apparent that despite a definition of a disruption being provided to participants at the beginning of the questionnaire, there may still have been some misunderstanding as to what this entailed. Hunt *et al.* (1982, p270) maintain that researchers should not rely upon respondents' reactions to indicate when there are problems with questions. Fowler and Mangione (1990) claim that pilot procedures do not

always identify whether the interviewees and survey respondents will interpret the questions as the researcher intended (p91). This limitation could not be avoided, but once discovered it was addressed during data analysis

There are other issues regarding the quantity and quality of the data collected. These include blank questionnaires being returned (some with unpleasant notes attached), or questionnaires being completed incorrectly. Furthermore, despite continuous attempts to confirm SME contact details, some surveys came back as 'return to sender'. There were also issues regarding the legibility of respondent handwriting, and missing data where the participant may have left questions blank. In some instances, it can be unclear as to who had completed the form (Bryman and Bell, 2007, pp242-243). Finally, questionnaires also lead to an inability to prompt and probe and ask follow-up questions, an issue that could have implications during the data analysis.

2.8.6. ANALYSIS

In order to analyse the responses, the quantitative data was entered into Microsoft Excel before being coded and transferred into SPSS 20. SPSS has a number of associated advantages. These include the level of control over data organisation available, the variety of statistical tests which can be applied to the data and the ease of interpreting the output of the analysis, whether a graph, chart or single number (Pallant, 2010, p14).

As the survey contained a plethora of variables, the analysis techniques had to be appropriately matched to the types of variables created (Bryman and Bell, 2007, p349). This procedure was partly composed of univariate analysis such as frequency tables, diagrams, and measures of central tendency, alongside bivariate analysis involving contingency tables, comparing means and the discovery of correlations and significant relationships through the application of three statistical tests (Kruskal-Wallis, Mann-Whitney U and Chi²). When exploring questionnaire data using statistical tests, the parameters associated with the individual variables under examination, such as the type of data concerned and its distribution, will inform which test should be used. Therefore justification as to why a Kruskal-Wallis, Mann-Whitney U and Chi² test was adopted over other forms of statistical analysis will be provided in detail through the thesis.

To conclude, the nature of the research means this study leaned towards a phenomenological epistemology and social constructivist ontology. To a certain extent, this dictated the techniques utilised. However, philosophy is *"far from deterministic"* and as a result a triangulation of techniques was employed (Read and Marsh, 2002, p232). A total of 38 qualitative, semi-structured interviews were conducted in order to gather rich,

deep data regarding SME flooding experiences, vulnerability and resilience. To complement the interviews, a quantitative self-completion postal questionnaire was distributed to 3000 SMEs. Experiencing an 8.7% response rate, the survey generated broad data on a variety of topics, and highlighted whether the results from the interviews could be applied to the wider population. Conclusions drawn were supported by secondary data from a number of historical sources.

3. FLOODING: WHAT DOES IT MEAN TO HULL AND SHEFFIELD?

Roads turned into rivers: Motorists marooned: families forced upstairs
VIOLENT FLOOD AFTER BIG STORM

Source: The Sheffield Telegraph, 2nd July 1958, p1

Heartbreak of the floods

Source: Hull Daily Mail, 5th January 1976, p1

**'FLASH' FLOODS
WREAK HAVOC**

Source: Hull Daily Mail, 4th August 1984, p1

That sinking feeling

Source: The Sheffield Star, 11th June 1993, p10

THE BIG FLOOD!

Source: Hull Daily Mail, 15th June 2007, p1

**FLOOD
CHAOS**

Source: The Sheffield Star, 15th June 2007, p1

Figure 3.1: Headlines reporting flood events in Hull and Sheffield

3.1. INTRODUCTION

Floods have always been a feature of the landscape of Britain (Evans, 2005, p1). Being frequent in nature, residents and businesses in Hull and Sheffield have witnessed a flood event in every decade since 1950 (Figure 3.1). It is asserted that 41.0% of the population, owner/managers included, are unaware of the threat of flooding within their locale (Burningham *et al.* 2008, p217). Can this figure be applied to all cities? In order to understand whether SME owner/manager perceptions of flood are close to reality or exaggerations, they must be compared to Hull and Sheffield's actual 'measured risk'. As such this chapter begins to present the findings of this thesis and has two aims:

1. To use secondary data to compare and contrast the past, present and future flood risk in Hull and Sheffield.
2. To use primary data to explore how SME owner/managers perceive flood risk in Hull and Sheffield, and analyse why they hold these perceptions.

Following the completion of these two aims, Chapter Four will outline how SME owner/managers perceive flooding as a risk to their SME, and consider its significance in comparison to other hazards. Chapter Five will outline how SME perceptions influence whether owner/managers choose to implement flood resilience measures. It will also discuss how flood perceptions can affect the type of resilience measures utilised. To provide an alternative view of flood risk, Chapter Six will present the perceptions of three regulatory bodies. These bodies are responsible for managing the risk of flood at a variety of scales. Once again, the influence of regulatory body flood risk perceptions upon flood resilience will be discussed. In Chapter Seven, the relationship between regulatory body and SME owner/manager flood risk perceptions, and their subsequent resilience measures, will be examined. The chapter will conclude by considering the implications of this relationship upon business practice and flood risk management policies. Finally, the research will be concluded in Chapter Eight: all results will be drawn together and an overall synthesis relating to the thesis aim will be provided.

3.2. HULL: PAST, PRESENT AND FUTURE FLOOD RISK

In order to provide a 'benchmark' against which Hull SME flood risk perceptions can be compared too, the following section will outline the flood risk of the city as presented by 'scientific' or 'expert' regulatory bodies such as the Environment Agency and

Hull City Council. In essence it will provide the social science perspective of flood risk in Hull.

Secondary data analysis demonstrates that Hull's history is overshadowed by flood occurrences. Extending back to 'The Great Flood' of 1265, events became so dominant in the 1950's and 1960's that Hull was nicknamed 'Kingston-UNDER-Hull' or the 'Venice of the North' (Hull Daily Mail, 2005, p13). Further analysis reveals 28 flood events since 1953 from a variety of sources (Table 3.1).

January 31st 1953 saw the materialisation of the worst natural disaster in Northern Europe for two centuries (Grieve and Sparke, 1959, p1). The North Sea Storm Surge saw the level of the North Sea rise by two metres, and waves over 4.9 metres high sweep inland. Within the United Kingdom, 307 people were killed, 60,000 acres of land was flooded and 24,000 houses were damaged, 500 being totally destroyed (Baxter, 2005, p1294). Although not extending to Hull, the surge served as a 'wake-up call' for residents, businesses and regulatory bodies by drawing attention to Hull's tidal surge exposure. Despite all best efforts to overcome, this vulnerability remains today.

Date	Flood	Date	Flood
January 1953	North Sea Storm Surge and River Humber	June 1973	Heavy rain
October 1954	River Hull (high tide)	July 1973	River Hull (high tide)
November 1954	River Hull (high tide)	January 1976	River Hull (high tide)
October 1958	River Hull (high tide)	January 1978	River Hull (high tide)
January 1960	River Hull (high tide)	June 1982	Heavy rain
February 1960	River Hull bank collapse	August 1984	Heavy rain
March 1961	River Hull (high tide)	February 1997	Barmston Drain
February 1962	River Hull (high tide)	June 1999	Heavy rain in combination with River Hull (high tide)
March 1963	River Hull (high tide)	October 2000	Heavy rain
August 1963	River Hull (high tide)	November 2000	Holderness Drain
March 1967	River Hull (high tide)	February 2001	Heavy rain
July 1969	Heavy rain	July 2004	Heavy rain
September 1969	Heavy rain	August 2004	Heavy Rain
October 1969	River Hull (high tide)	June 2007	Heavy Rain

Table 3.1: Occurrences and sources of flooding in Hull (1950 to 2010)

Sources: Hull City Council, 2007; Hull Daily Mail 1999; 2000; 2001; 2004a; 2004b; 2004c; 2007; Hull Times 1973; The Daily Mail 1954a; 1954b; 1954c; 1954d; 1954e; 1954f; 1958; 1960a; 1960b; 1960c; 1969a' 1969b; 1973; 1976a; 1976b; 1978a; 1978b; 1982; 1984

The 54 years between the 1953 flood and those of 2007 saw residents experience 28 separate flood events, a return period of 1 in 2 years. The most frequent of these occurrences were generated by tidal surges travelling up the River Hull, coinciding with high tide. In 1980 the Hull Tidal Surge barrier was constructed across the River Hull in order to reduce this threat. It was lowered to block the river every time there was a risk of a tidal surge. Since its inception, floods have not occurred from the River Hull. However, floods have materialised from other sources including the Barmston and Holderness Drains overtopping, and local sewers unable to cope with heavy rain (poor drainage). After more than half a century peppered with these smaller and arguably 'more manageable' flood occurrences, and due to the construction of the tidal barrier, it is suggested that the residents of Hull were left with a false sense of security in regards to the materialisation of 'big' flood incidents. Again, these community perceptions changed in 2007.

June 2007 saw Hull experience record-breaking precipitation. 110 mm of rain fell in just one day (Pointon, 2012, p69). This rain, alongside a reduction in the capacity of the drainage system from a 1 in 30 year storm event to a 1 in 2 year and a failure of a local pumping station, produced the hydrological conditions necessary to generate a flood (Coulthard *et al.* 2007, p4). On 25th June 2007, widespread surface water flooding occurred. It affected approximately 8,600 residential properties and 1,300 businesses on more than 600 streets. In some areas the flood water was over six foot (182cm) deep. One centimetre of water ingress can cause over £15,000 of damage to property (Coulthard *et al.* 2007, p27). The floods cost the local economy millions and one man his life. This event is now categorised as a 1 in 200 year flood (Hanna *et al.* 2008, p253).

Flood risk changes over time. Environmental and socio-economic changes also cause alterations to the risk of the economy, society and environment (Hall *et al.* 2003, p52). Within Hull, the predominant flood risk has altered from the threat of tidal surges along the River Hull to the risk of surface water flooding. Three developments are attributed to this change.

Firstly, despite a small period of decrease in the 1990s, within the city boundary Hull's population has grown on average by a total of 5.6% year upon year (Hull City Council, 2013, online). This increased the demand for housing and services, leading to the construction of a number of housing estates and areas of commerce (Lambert, 2011, online). This has resulted in a rise in anthropogenic ground sealing (impermeable areas), and increase in surface water runoff. This places extra pressure upon a low capacity, Victorian drainage network which already cannot cope with the amount of water feeding into it from properties, thus providing a catalyst of surface water flooding (Ford and

Williams, 2007, p496). Before 2007, Hull only experienced isolated incidents of surface water flooding, meaning the risk was categorised as low (Hull City Council, 2009, p7). There was also no warning programme in place for its occurrence, and no clear designation of a regulatory body responsible for its governance due to the structure of the water industry post-privatisation (Environment Agency, 2007, p5). Today, an awareness of social developments with regards to population pressures, namely urban expansion, has resulted in surface water flooding gradually becoming a recognised risk, with the Environment Agency assigned its management (DEFRA, 2011, p1).

The second development relates to global change. The earth's climate is warming (IPCC, 2007, p21). Records show that average surface temperatures have increased by 0.75°C since the mid nineteenth century; arguably exacerbated by human actions (climate change)(Andronova *et al.* 2007, p5). As climate is generally defined as 'average weather', climate change and weather are intertwined (Le Treut *et al.* 2007, p96). Scientists anticipate that long term atmospheric trends (climate) will influence short term variations in atmospheric conditions (weather)(Pielke, 1998, p463). Relating to water, climate change can entail significant consequences for the hydrological cycle, changing the characteristics of precipitation (frequency, amount, duration, type) globally, nationally and locally (Trenberth *et al.* 2003, p254). For Hull, climate change can increase the frequency, amount and duration of rainfall events. This will place pressure upon a Victorian drainage system, increase river levels and temporally increase the risk of surface water, pluvial and fluvial flooding.

The final development which contributed to Hull's changing flood risk is the Hull Tidal Barrier. As mentioned, the River Hull frequently flooded in the 1950's, 60's and 70's coinciding with high tide. This regularly left the 'old town' of Hull underwater (Table 3.1). Since the construction of the Tidal Barrier in 1980, the threat of fluvial flooding from this source has significantly reduced. Although Hull has seen a reduction in fluvial flooding along the River Hull, over the same time period it has also witnessed an increase in surface water, or pluvial flooding in certain locations of the city. This development contributes to Hull's present flood risk.

Local regulatory bodies and academics such as Coulthard *et al.* (2007) and Whittle *et al.* (2010) categorise flood to be a risk to Hull. Regionally, London has the highest number of people and properties at risk from flooding (over one million people and 542,000 properties) (Figure 3.2) (Environment Agency, 2009, p28). Yet 84.0% of those at risk in London are located in areas with a low chance of flooding (Environment Agency, 2009, p28). In regards to local authorities, Kingston-Upon-Hull experiences the highest number of properties at risk of flooding, with 125,000 premises potentially exposed to an

event (Figure 3.3) (Environment Agency, 2009, pp29-30). Of these properties, 100,000 are at risk from a flood with a 1 in 200 year probability. Furthermore, 50,000 homes and businesses are predicted to be affected by a major storm surge with an annual return period of 1 in 200. Consequently, Hull remains at risk from extreme flood events (ABI, 2006, p27; EA, 2007, p33; 2010e, p14)(Appendix 13).

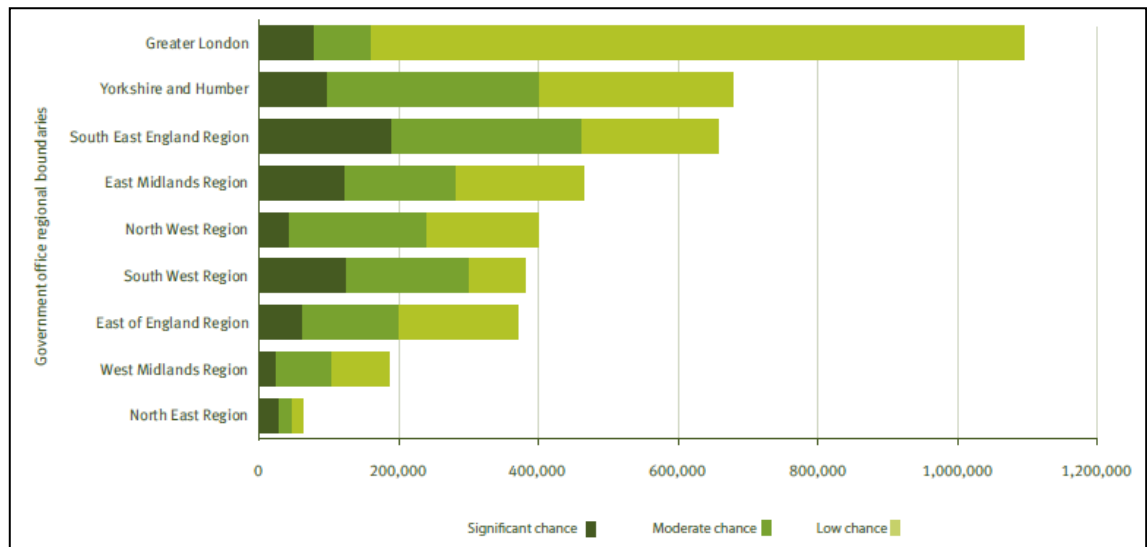


Figure 3.2: Regions ranked by the number of people living in the floodplain

Source: Environment Agency, 2009, p28

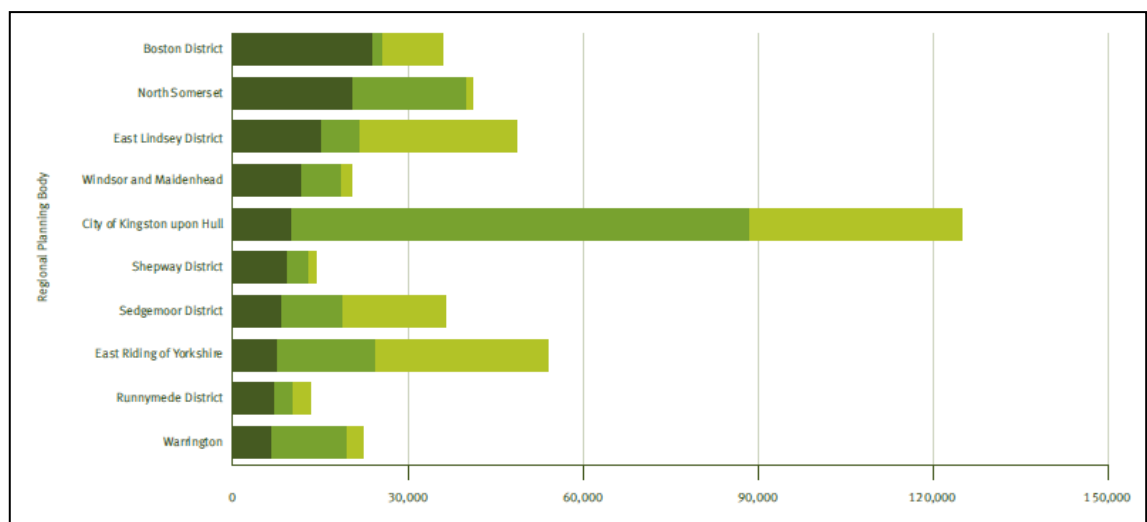


Figure 3.3: The ten local authorities with the highest number of properties in areas with a significant chance of flooding

Source: Environment Agency, 2009, p30

As Hull is at risk from tidal, fluvial, groundwater and surface water floods, it is no longer simply a question of taking further measures of flood prevention (Hull City Council, 2007, p16). It is also now a matter of learning to live with the possibility of more frequent inundations or adaptation to flooding (Coulthard *et al.* 2007, p26).

Hull's flood risk stems from its location. 95.0% of the city is built on reclaimed marshland lying below the mean high water level (Prince, 1973, p154; Smith and Petley, 2009, p326). The villages of Cottingham, Willerby and Hessle are situated to the West, draining East towards the city (Figure 3.3)(Coulthard *et al.* 2007, p224). This topography, in conjunction with the presence of five water courses, the River Humber, River Hull, Holderness Drain, Barmston Drain and Beverley Drain, results in Hull being particularly vulnerable to flooding.

Geology also contributes. The impact of geology upon flooding is determined by the permeability of rocks and soils (Wheater, 2006, p2317). Hull is the largest conurbation overlying the East Yorkshire chalk aquifer (Aldrick *et al.* 1999, p92). Being permeable, a greater proportion of rainfall can infiltrate into the ground (Waugh, 2000, p6). Maximising infiltration should reduce the amount of surface runoff which reaches rivers. This reduces peak flows by delaying the transport of water from the catchment into the watercourses (Finch *et al.* 2004a, p961). Soils affect many variables relating to the time it takes rainfall to enter the river channel, including infiltration amounts and percolation speed. Within Hull, the chalk aquifer is overlain by tills of loam, clays, sands and gravels, the most predominant being seasonally wet deep clay (Hull City Council, 2007, p25). With low permeability, clay causes much of the rainfall to run-off surfaces into the watercourses as opposed to infiltrating into the soil, contributing to the flood risk (Rycroft and Amer, 1995, p32).

Finally, inadequate drainage can enhance flood risk (Oriola, 1994, p60; Parkinson, 2003, p119). Coulthard and Frostick (2010) maintain that the Hull 2007 floods were caused by "*difficulties in water (a) entering the drainage system, (b) being conveyed through the drainage system and/or (c) being pumped from the drainage system*" (p229). Due to its low elevation, Hull has no natural drainage. It relies entirely upon a pumped system which has undergone many developments over the past 60 years, including privatisation of the water industry in 1989 (Lobina and Hall, 2001, pp1-30). Prior to 1949, the drainage system consisted of gravity-driven open drains. In the 1950's, an extensive redesign saw open drains replaced by gravity-fed combined effluent and storm water sewers. This system remained in place for more than 40 years. Due to increases in population, and the large amount of untreated sewerage pumped into the River Humber, a further redesign was conducted in 2001. A 2004 remodelling showed this system under-predicted flood

volumes by 100%. It only had the capacity to cope with between 1 in 2 and 1 in 5 year events (Coulthard and Frostick, 2010, p1), a limitation which had serious repercussions during the 2007 flood (Jha *et al.* 2012, p60).

By looking at both present day risks and past flood occurrences such as June 2007, regulatory bodies make predictions about flooding in the future. Flood risk in England is set to rise, with potentially the most significant changes happening in the latter half of the present century (Environment Agency, 2009, p6). The Environment Agency maintains development pressures and climate change as partly responsible for these alterations (EA, 2009, p7). As such, the nation's built environment is likely to become progressively more vulnerable due to increasing temperatures, increased rainfall and sea-level rise (Bosher *et al.* 2009, p7). At a local level, within Hull it is predicted that the change in climate will increase flow rates and flood volumes due to increased river water levels. Climate change could increase flood depths by between 0.3 and 1.5 metres across the city, with an average rise of 0.07 metres by 2030, and 0.62 metres by 2090 (ABI, 2006, p9). With regards to sea-level changes, a rise in levels would exacerbate the flooding costs in Hull to £1.4billion. This is an overall potential growth in flood losses of 440% from the present day, potentially placing 10,000 additional properties (both residential and commercial) at risk and raising questions over the future viability of the city in its present form.

In conclusion, all the different calibrations of Hull flood risk presented above, whether in the past, present or future, are based upon previous flood records and statistical models. They present a social science approach to flooding within the city. Looking at business practice, the questions to consider are whether SME owner/manager perceptions recognise these risks, and whether owner/managers also primarily use past flood records on which to base their judgements.

3.2.1. HULL: SME FLOOD AWARENESS

As outlined, SMEs are very important to the city of Hull. In 2011, Hull was home to 13,617 SMEs, accounting for an average of 98.9% of all commercial enterprises within the city (ONS, 2011a, online). They are key to the economic and social vitality of the local economy and community due to their large number, and the fact that they account for 78.5% of all employment within Hull (ONS, 2011a, online). With the decline of the fishing industry, a large part of the city's revenue comes from the presence of SMEs, the services they provide, and the effects their operations have upon attracting larger firms (Robinson, 1998, p76). A loss of these enterprises through the occurrence of a flood would be extremely detrimental to the economy and local communities.

Both the Environment Agency and Hull City Council deem Hull to be at extreme risk of flooding. There is a tendency for individuals living there to think “*flooding will never happen to me*” (Burningham *et al.* 2008, p216). It is important that SME owner/managers understand the risk of flooding in order for them to adequately respond and prepare for its occurrence. A misunderstanding, or denial of the risk, can cause an SME to remain more susceptible to this hazard. The consequence of this could be severe disruption to business operations and damage to their premises should a flood occur (Messner and Meyer 2005, p4). Therefore, is Hull’s ‘actual flood risk’ reflected in SME owner/manager flood understandings or perceptions?

Company A is an SME located in Hull. Situated on the banks of the River Humber, to the south of the city, it operates under the management of *Andy* (all interviewees allocated a pseudonym). Andy has been employed by the company for 35 years and has witnessed many changes throughout the company’s history. These include alterations to the services that they provided initially when they were established in 1858 due to changing customer demands. Today, Andy reports that his small-sized enterprise consists of 15 full-time employees, has a turnover of £12 million and now operates within the professional, scientific and technical industrial sector. Due to the length of time Andy has worked at the company, he has witnessed many flood events within the city. His experiences have led to the formulation of very strong flood perceptions which date back a number of years. These perceptions match the ‘actual risk’ presented by regulatory bodies (Environment Agency and Hull City Council).

“Hull is definitely at risk of flooding...When they had high tides, Charlotte Street used to flood, but it was only like an inch or so...The Environment Agency says most of Hull is at risk. I know my history well and it can show us the future...It [Hull] was built on the site of a lake...It wasn’t until the Dutch drained it in the year whatever that it became farmland. A lot of it is below sea level. There is very poor drainage and from a good understanding of maps and local history, you just have to look at one and say well that area, if it wasn’t defended at all, would be underwater...Flooding is going to be an increasing problem for the city.”

Perception of Hull’s present flood risk: Andy, Company A (Hull)

This perception is also shared by *Ben*. Ben is the owner of Company B, a medium-sized enterprise which employs 100 people within the manufacturing sector. Ben’s company is situated on the banks of the River Hull, to the east of the city. The establishment of this SME coincided with a time when surges frequently travelled up the River Hull at high tide, flooding the local areas. Ben reported that flooding was a regular issue for the previous owner, his father. Until 2007, the threat of flooding from the river

appeared to have lessened due to the Hull Tidal Barrier causing Ben little trouble. As such Ben has never physically experienced a flood in his premises. However, he “*came close*” and was “*caused some disruption*” in 2007. This leads him to perceive Hull as at risk of flooding, confirming the regulatory body’s measured flood risk.

“It’s [flooding] a massive issue...There was flooding in Hull City Centre, maybe 12 years ago...When the floods hit four years ago, we came close...But it still caused us some disruption...So yes of course I see it as a risk to us and the city...Hull is located on the Humber which is tidal so can flood...This building is right next to the main river that burst. So in short, yes, we are all at risk...It is only going to get worse.”

Perception of Hull’s present flood risk: Ben, Company B (Hull)

One final case study participant whose opinions agree with Andy and Ben is *Chris*. Chris is the director of Company C, a small-sized enterprise operating within the construction industry from a site on the River Hull. Chris’ business has been operational since 1995 and both he, and his 16 employees, generate an annual turnover of £1 million. In 2007, the grounds upon which Chris’ SME is located were flooded. Due to this experience and the length of time his business has been operational in the city, Chris has developed a perception similar to regulatory bodies in regards to flood risk.

“I am sure I remember some flooding in Hull from when I was a lad...And when you first come into Hull, the first thing you see is the tidal barrier, so you would presume, of course, that the city is at risk of flooding now and in the future because it has prepared defences.”

Perception of Hull’s present flood risk: Chris, Company C (Hull)

During conversations, Andy, Ben and Chris all demonstrated that their perceived risk of flooding within the city of Hull mirrors the ‘actual risk’ presented by the Environment Agency and Hull City Council. They outline that they are aware that flooding is a risk to the city now, that it has been in the past, and that it will continue to be so in the future. These case studies do not provide anomalous findings. Andy, Ben and Chris’ qualitative perceptions that “*Hull is definitely at risk*” are strongly supported by quantitative survey data: 33.8% of owner/managers believed Hull to be at extreme flood risk. Additionally, 72.6% agree/strongly agree that exposure to flood risk within Hull has increased over time, and 90.0% agree/strongly agree that the risk is likely to increase in the future. Not only do these statistics concur with the case study results, they also draw parallels with regulatory body measured risk.

In regards to being aware of the flood risk, Andy, Ben and Chris all understand why Hull is exposed. The role location plays in creating flood risk was regularly commented upon during interviews: Andy remarked *“you only have to look out of the window to see where we are”* (next to the Humber estuary); Ben asserted the *“geographical location of this building right next to the main river”*; and Chris maintained the River Humber to be *“one of the largest tidal rivers”*. Moreover, they all share Coulthard and Frostick’s (2010) perception that Hull’s poor drainage is a contributory factor (p5). Andy commented *“there is very poor drainage”*; Ben remarked that the *“drains couldn’t handle it”* (the excess water present in 2007); and Chris observed the lack of *“gully suckers, sucking up the drains at the side of the road”*.

For Zimbardo *et al.* (1977), Demerit *et al.* (2007), Whitmarsh (2008) and Soanne *et al.* (2010), understanding how risk occurs can assist owners/managers in constructing risk perceptions, making predictions about flooding in the future, and ultimately influence whether they choose to implement mitigation measures. The fact that Andy, Ben and Chris understand why Hull is vulnerable to flooding may encourage them to take appropriate resilience steps. But why do these three individuals have this level of understanding?

Andy, Ben and Chris all demonstrate that they are aware of how Hull’s geography and inefficient drainage can attribute to the materialisation of a flood. Moreover, Andy remarked that he knows his history well. This suggests that these owner/managers possess a certain degree of local Hull knowledge. Local knowledge is a fixed body of information acquired in a particular place (Chambers, 1997, p14). It is dynamic, evolving and includes knowledge of characteristics linked to a specific location (Healey, 1999, p191; Corburn, 2004, p177). The nature of SME owner/manager flood knowledge can encompass being aware of certain streets that often flood during periods of heavy rain, which areas have flooded previously, the location of flood defences and how high water needs to rise before action is required. As a consequence, Botzen *et al.* (2009) asserts that local flood knowledge is one variable which contributes to an individual’s perception and understanding of flood risk (p9). Therefore, its presence can help owner/managers to decide whether to implement resilience measures.

Local knowledge can often be long-lasting. It can also be unique to a certain individual (Antweiler, 2004, p12). In order for knowledge to assist SMEs in generating flood perceptions, it must be ‘passed on’ to employees, particularly to those who own/manage the business (Cruikshank, 2004, p24). Local knowledge is often referred to as tacit knowledge, information that is hard to formulate and articulate (El-Den, 2004, p272). Even if flood information is transferred, if the recipient has not experienced the events through which this local knowledge is obtained initially, it may become

meaningless, superficial and consequently not be communicated further (Käkönen and Hirsch, 2009, ebook). As such, other factors must play a role in its acquisition.

Both Healey (2007, p243) and Byg and Balslev (2004, p272) assert that there is a relationship between past experience, length of residency and the presence of knowledge. Conversations with SME owner/managers in Hull reveal that many employees have lived in the city for a considerable length of time. Both Ben and Chris have lived in Hull all their lives. This provides ample opportunity for local information about flooding to be obtained and develop (House and Sangster *et al.* 1991; pp312-16; Pickup *et al.* 2013, p362). Yet, living in an area for a long period of time does not necessarily lead to an individual obtaining local knowledge, particularly if this information is not constantly reinforced (McEwen *et al.* 2012, p261). As Burningham *et al.* (2008, p227) assert, the absence of visual clues which demonstrate that flooding is a risk to the area can lead to an individual being unaware of the presence of a local flood risk. If an individual has not experienced a flood themselves, then it is unlikely that they will gain the local long-lasting knowledge necessary to generate accurate flood awareness (Burn, 1999, p3452). As a result, despite Ben and Chris being resident in Hull for a long period of time, it is their previous experiences with floods which dominates their acquisition of local knowledge.

In summary, the Environment Agency and Hull City Council present the actual or 'measured' risk of flooding in Hull as a past, present and future threat to the city. SME owner/managers including Andy, Ben and Chris also hold this perception. This judgement has been formulated using local knowledge possessed by the respondents. Their knowledge was obtained due to their experience with local flood events and observations made during their long residency within this locale. The issue remains as to whether this perception, and the reasons lying behind its formation, is specific to Hull or whether they are more generalised. This chapter will now examine both the 'actual' and perceived risk of flooding within Sheffield.

3.3. SHEFFIELD: FLOOD RISK

As for Hull, in order to analyse SME flood risk perceptions, 'benchmarks' against which these judgements can be compared to must be provided. The next three sections will outline the past, present and future flood risk of Sheffield as presented by 'scientific' or 'expert' regulatory bodies such as the Environment Agency and Sheffield City Council. In essence, it will provide the social science perspective of flood risk in Sheffield.

Secondary sources demonstrate Sheffield experienced a history interspersed with occurrences of flooding, extending back to at least the 1864 Sheffield Flood. At midnight on the 11th March, the Dale Dyke reservoir which restricted the flow of the River Loxley burst its banks (Harrison, 1864, p16). The dam held 691 million gallons of water in order to supply water to factories and mills around Sheffield (Teasdale, 2008, p12). It collapsed during extremely stormy weather releasing a torrent of water that followed the line of the River, flowing through Sheffield and Rotherham, finally abating in Doncaster. More than 240 people died, and anything that stood in its path was completely destroyed including houses, factories and stone-built bridges (Harrison, 1864, p88). Today, the threat from reservoir failure still exists within Sheffield, and due to a rapid population increase, more individuals are at risk.

Date	Flood	Date	Flood
August 1954	Heavy rain	August 1997	Heavy rain
July 1958	Heavy rain	September 1997	Heavy rain
December 1965	River Don	June 1998	Heavy rain
August 1966	Heavy rain	October 1998	Heavy rain
July 1973	River Don and River Sheaf	July 2000	Heavy rain
July 1980	Heavy rain	November 2000	Heavy rain in combination with River Don
June 1982	Heavy rain in combination with River Sheaf	August 2002	Heavy rain
October 1990	Heavy rain	August 2003	Heavy rain
December 1991	Heavy rain in combination with River Sheaf	August 2004	Heavy rain
June 1993	Heavy rain	June 2007	Heavy rain in combination with River Don and Sheaf
December 1996	Heavy rain in combination with Carlton Brook	June 2009	Heavy rain

Table 3.2: Occurrences and sources of flooding in Sheffield (1950 to 2010)

Sources: Morning Telegraph 1973; Sheffield City Council 2008; The Star 1965; 1966; 1973; 1980; 1982; 1990; 1991; 1993; 1996; 1997; 1998; 2000; 2004; 2007; 2009; Sheffield Telegraph 1954; 1993

Between 1950 and 2010 there were 22 different floods, an average of 1 every 2.7 years (Table 3.2). This corresponds to a higher flooding rate than Hull which averaged one flood every 2 years. The majority of these events occurred due to heavy persistent rainfall generating pluvial or surface water flooding (Sheffield City Council, 2008a, p18). In some instances, these incidents also increased levels of the Rivers Don, Sheaf and Loxley resulting in fluvial flooding. In a similarity to Hull, the occurrence of these smaller, 'more

manageable' events suggests that the residents of Sheffield held a false sense of security until 2007.

As in Hull, Sheffield experienced extensive, record-breaking rainfall during June 2007, the most intense period being 13-15th June. Over three days, 135.4 mm of rain fell. This deposited almost 5.2 million gallons of water over Sheffield in one hour. This single rainfall event is estimated as having a 1 in 110 year probability (Smith, 2007, p6, Met Office, 2008, online). 95.0% of the flooding was fluvial in nature, occurring when the River Don, River Loxley and Blackburn Brook overtopped their banks (Sheffield City Council, 2008a, p21). The remaining 5.0% was attributed to surface water and sewer flooding. The flood cost Sheffield's economy £30 million, affected 2,300 properties and killed two people (Environment Agency 2012, online). Yet, it "*came as a big surprise*" (Diane, Company D, Sheffield) as the Environment Agency did not release any flood warnings until properties were two feet underwater (Sheffield Council, 2008, p13).

Along with Hull, the threat of flooding has not remained constant over this 60 year time period. Both the Environment Agency and Sheffield City Council record that flooding in the city has changed temporally. Development pressures have led to the creation of industrial zones and large developments which increase land cover, the number of houses and transport links (Winkler, 2007, p19; Creative Sheffield, 2010, p5). All these alterations can reduce the permeability of Sheffield's land, and increase run-off within the city thus increasing the flood risk (Morss *et al.* 2005, p1594). Similarly to Hull, climate change is also predicted to increase flood risk. Effects upon the weather by these changes have altered the characteristics of precipitation (Trenberth, 2011, p123). An increase in frequency, amount and duration of rainfall events causes an increase in the threat of surface water, pluvial and fluvial flooding over time (Trenberth, 1998, p667). Whereas a new type of flood risk has emerged in Hull (surface water), Sheffield has always been threatened by these floods. It is the intensity and frequency that has changed and thus contributed to Sheffield's present flood risk.

Local regulatory bodies assert that 10,000 properties in Sheffield are at risk from fluvial flooding, surface water flooding, the surcharging of sewage systems, blockages of culverts and gullies, flash floods, reservoir failure and defence failure (Sheffield City Council, 2008b, p11). The threat from ground water flooding and catastrophic dam failure is 'extremely low' (Sheffield City Council, 2008a p23-25). A flood of the same magnitude as 2007 is predicted as having a 1 in 150 or 1 in 200 year probability (Sheffield City Council, 2008b, p11). Whereas in Hull the threat to the city remains spatially equal (all locations experience the same risk levels), within Sheffield only specific areas are subject to flooding as the frequency and risk of this hazard varies throughout the city. This is primarily

related to the differences in topography between the two cities. A large proportion of residents have a 1 in 100 year chance of being flooded in any one year, whereas other low lying areas have a 1 in 20 year probability (Appendix 14 and 15).

Sheffield's flood exposure can be attributed to location. Whereas Hull is topographically flat, Sheffield nestles in a natural bowl. The city is transected by five major water sources (Rivers Don, Sheaf and Loxley, Porter Brook and Black Brook). All of these, due to the profile of the surrounding land, have a propensity to contain deep fast flowing water (Smith, 2007, p31). To the West, the steep slopes of the Peak District dominate, which fall towards the undulating catchment of the River Don before the river valley flattens and widens in the east. Accordingly, a large proportion of the district is situated on steep valley sides meaning very few properties are at risk from river flooding in this location (Hunter, 1819, p5). Nevertheless, there is a high risk of flash flooding following intense rainfall as water runs rapidly down the valley sides. This run-off arrives quickly to the flatter East resulting in the overtopping of rivers. In the East, the drainage system is heavily reliant upon its ability to drain freely into the rivers. When river levels are high, drainage systems are unable to discharge resulting in surface water flooding (Sheffield City Council, 2008b, p12). Finally, in the upper reaches of the River Don to the West of the city, there are a number of water supply reservoirs providing the potential for flooding from a reservoir failure.

The geology of the underlying rock also contributes to flooding. The composition of rock is characterised by Namurian (millstone grit) to the West, and Phalian to the East, with soils typically alluvium and peat in nature (Sheffield City Council, 2008a, p20). Usually very absorbent, once saturated these soils can absorb no more water; rainfall runs straight into localised water sources, intensifying the flood risk (Chapman *et al.* 1998, p109). It is these present day risks and past flood occurrences which allow predictions about the future of Sheffield to be calculated by regulatory bodies.

Locally, Sheffield's future flood risk is estimated to be low. Yet, a significant risk from more frequent and unexpected events exists if culverts and water courses become blocked (Sheffield City Council, 2011b, p21). As urbanisation and population increases, developments influence the risk of floods to neighbouring regions and overlapping catchment areas such as Doncaster. Sheffield City Council asserts that "*climate change is happening now; it cannot be ignored*" (2011b, p27). Accordingly, localised intense storms are likely to occur more frequently, rainfall will increase by 12.0%, and surface water flooding will materialise more often within Sheffield (Bengtsson and Hodges, 2006, p3519; Sheffield City Council, 2008b, p27; 2011b, p26). In addition, the capacity of the drainage and river systems will deteriorate in response to extreme weather systems resulting in

blockages and structural degradation. Finally, due to the steep-sided river valleys, peak river flows in typical catchment areas are likely to increase by 8.0-14.0% (Sheffield City Council, 2011b, p26). Those properties presently at risk will be more susceptible to severe flooding in future years (Sheffield City Council, 2008a, p27).

In comparison, although they share the same title as “*a city at risk*” of flooding, the sources, magnitude and frequency of floods experienced within Hull and Sheffield lead them to be categorised as ‘different’. In Hull, 125,000 properties are at risk from a 1 in 200 year flood, while in Sheffield this figure is only 10,000 properties (SCC, 2008, pp11; EA, 2009, PP29-30). Within Hull, present day flood threats come from both surface water and fluvial flooding, whereas in Sheffield the main risk is primarily fluvial in nature. This therefore raises the suggestion as to whether a flood can possess a ‘local profile’; a set of characteristics tied to a particular location which makes a flood have a distinct source and behave in a certain way. The occurrence of a flood and the risk associated with that place becomes unique. This is the premise used by Hewitt and Burton (1971) within their “*hazardousness of place*” model. They proposed that every location is unique in regards to the combination of risks it possesses. If floods do acquire a unique local profile, meaning that no two locations are the same, then this can have serious implications for national government flood policies (Chapter Seven). Furthermore, it raises questions as to whether SMEs in two different cities can share the same or a similar awareness given the divergence in their profiles.

3.3.1. SHEFFIELD: SME FLOOD AWARENESS

As with Hull, SMEs are also very important to the city of Sheffield. In 2011, Sheffield was home to 28,215 SMEs, accounting for 99.7% of all enterprises within the city (ONS, 2011a, online). These enterprises account for 80.1% of all employment within Sheffield and, due to a declining steel industry, also provide a large part of the city’s economic revenue (Mollona, 2009, p94, ONS, 2011a, online). Once again a loss of these enterprises through a flood would be detrimental.

As has been demonstrated, floods have different origins in different places. Despite the sources of flood in Hull and Sheffield being different, the Environment Agency and Sheffield City Council still deem Sheffield to be at risk from this hazard. Do Sheffield owner/managers recognise this ‘measured’ flood risk? *Diane* is the owner of Company D, a micro-sized business located in the Brightside suburb of Sheffield, close to the banks of the River Don. Diane is also the founder of this SME which has been operating within the professional, scientific and technical sector since 2005. Today, she is one of three

employees who generate an annual turnover of £85,000-100,000. In comparison to the perceptions of flood risk demonstrated by Hull case study respondents, Diane's judgements of Sheffield's flood risk are very different. Furthermore, very few similarities exist between Diane and flooding judgements held by local regulatory bodies.

"It was rain. We've had rain lots of times and no flooding...In 2007...it came as a big surprise to people at the time who lived here, me included...Does Sheffield have a history of flooding?"

Perception of Sheffield's present flood risk: Diane, Company D (Sheffield)

These comments show that, unlike Andy, Ben and Chris in Hull, Diane was unaware that the city was at risk of flooding prior to her 2007 experiences. She still remains uncertain as regards to her perception of the likelihood of risk. Diane is aware that there is a risk, however she struggles to quantify or express what the risk is. This uncertainty is displayed by her regular use of the phrase, *"I don't know"*, when asked to make comments about Sheffield's flood risk. *"I don't know"* was also a phrase consistently used by *Emma*. Emma is the manager of Company E, a micro-sized business operating within the educational sector. She has worked for the company since its inception in 1986, and is now one of four employees which helps the company generate an annual turnover of £100,000. Emma's company was originally located in the Wicker area of Sheffield. The events of 2007 saw her premises extensively flooded. This resulted in her SME moving to the suburb of Heeley. Despite this experience, Emma and her colleagues have moved from premises located on the banks of the River Don, to premises positioned on the banks of the River Sheaf. They have effectively moved from one flood prone area to another. Yet, Emma, like Diane, also holds an uninformed perception in regards to the city's flood risk.

"I don't know; I really don't know...We were badly flooded in 2007 and it showed us that we were actually at risk when I didn't think we were...I don't remember flooding when I was younger...flooding was a risk. I don't know if it still is...Maybe it has got worse."

Perception of Sheffield's present flood risk: Emma, Company E (Sheffield)

It can be suggested that Sheffield SME owner/managers hold uninformed flood perceptions and are unaware or choose to ignore the regulatory body 'measured' risk of flooding to the city. But such opinions are not unanimously felt across the Sheffield. *Fred* is the founder and owner of Company F, a micro-sized business which employs five people. He has been operating this business from premises located on the banks of the River Sheaf

in Heeley since 1972. Today, Company F generates an annual turnover of just over £1 million. In 1973, Fred's business was flooded. The following year, the landlord of his premises constructed a wall parallel to the river meaning Fred has not experienced any further flooding. Unlike Diane and Emma, Fred holds a very clear attitude in regards to recognising Sheffield's flood hazard, an attitude which more closely parallels regulatory body's perceptions of flooding.

"Flooding is a problem in many cities, including Sheffield...They've got plans in place if it ever happened again, so yes, we're still at risk and obviously we are bang next to the river...There is quite a big risk it will flood again...Whenever there is a period of heavy rain, persistent rain I am sure it will happen again."

Perception of Sheffield's present flood risk: Fred, Company F (Sheffield)

Diane, Emma and Fred display contrary views as to whether SME owner/managers recognise Sheffield's 'measured' flood risk. Similar findings were also demonstrated by the quantitative survey data. Only 22.1% of owner/managers believed that Sheffield was at extreme risk of a flood. In addition, 23.3% had no opinion as to whether the risk of flooding had increased over time, and 13.8% could not comment upon whether the flood risk was likely to increase in the future. It seems that Hull SME owner/managers have a higher recognition and understanding of flood risk than those located in Sheffield. Nevertheless, although Diane and Emma possessed uninformed flood risk perceptions and were unable to express the likelihood of the risk of flooding within the city, they, like Fred and the case studies in Hull, were aware to a certain extent as to why Sheffield is at risk. As such they draw some parallels with local regulatory bodies.

Diane, Emma and Fred all attributed Sheffield's exposure to flooding as due to the city's and their own premises' location. Diane commented that she *"hadn't realised how many rivers...meet in and around here"*, and both Emma and Fred drew attention to the fact that their premises are *"right next to the river"*. This is the extent of their understanding. None of the Sheffield case studies referred to poor drainage systems or other variables which contributed to flooding. It seems that the sample of Sheffield SME owner/manager levels of understanding are of a different order to that of Andy, Ben and Chris in Hull.

Within Hull, a large part of SME owner/manager awareness and understanding of flooding comes from the amount of local knowledge they possess. Diane and Emma's uninformed nature in regards to the likelihood of the flood risk could be attributed to their lack of local knowledge (Wohl, 2000, p451; O'Gorman, 2012, online). The amount of local knowledge obtained by owner/managers is dependable upon how much is 'inherited'

from other employees, their length of residency and also their experiences of flooding (Wholing, 2009, p5). Local knowledge can become superficial if it is not ‘passed on’ and utilised by other employees within an SME. However, it has to be acquired in the first instance. Sheffield is described as a “*creative, inventive and energetic city*” (Welcome to Sheffield, 2012, p3). It attracts numerous SMEs that chose to operate in this city due to its numerous attributes (Welcome to Sheffield, 2012, p4). Many owner/managers and employees have relocated to the city in order to work in SMEs. The fact that they originate from other locations can lead to little or no local Sheffield flood knowledge inside SMEs. If the relocation occurred individually, or with immediate family who have no past ties to the area, then they will not ‘inherit’ local knowledge, once again meaning it is not possessed and therefore cannot influence flood perceptions (Burningham *et al.* 2008, p228).

It is regularly asserted that a long residency leads to the acquisition of local knowledge (Robertson, 2005, p202; Baumwoll, 2008, p43). This conclusion is supported by Fred who, having lived in Sheffield all his life, has a vast store of local knowledge which he uses to develop his strong flood perceptions. In comparison, Diane and Emma relocated to the city and have now lived in this location for 18 and 17 years respectively. Academics would argue that this time period is adequate for them to obtain local knowledge (Robertson, 2005, p202). Their display of uniformed perceptions regarding the likelihood of flooding in Sheffield demonstrates that they do not possess this knowledge. Accordingly, another variable must be responsible for its acquisition, perhaps past experience (Kick *et al.* 2011, p514).

During the interview, Diane remarked that the 2007 floods “*came as a big surprise*” and she “*has no memory because*” she “*didn’t live here*”. Emma recalls how she used to spend time in the city with her grandparents when she was younger and doesn’t “*remember any flooding*”. As they have little experience with floods, the opportunities for them to obtain local flood knowledge have been limited. Despite living in the city for more than sixty years, Fred only recalls two flood events, the one which flooded his premises in 1973 and the 2007 floods. In fact, 18 floods have occurred in the city during his life time. It is suggested that ‘bigger’ and more ‘spectacular’ events attract the attention of residents who may have been unaware of the risk. Nevertheless, this risk is soon forgotten (Anih, 2004, p31). The consistency of smaller flood events helps local knowledge to be obtained and in turn generates more accurate and strong perceptions of a city’s flood risk (Nagle, 1999, p43; Brilly and Polic, 2005, p347).

In summary, within Hull owner/managers displayed similar perceptions to those held by local regulatory bodies in relation to their city’s ‘measured’ flood risk. In Sheffield, this was not the case. Hull owner/managers are much more assertive with regard to their

judgement of the risk in comparison to Sheffield SMEs. Local knowledge dictates whether SME owner/managers have strong or uninformed flood perceptions. Specifically, the amount of local knowledge possessed affects the level of understanding of flood risk. Many argue that length of residency is the largest influence upon the acquisition of local knowledge (Robertson, 2005, p202). It is actually a prolonged experience with flood events which allows this knowledge to be obtained meaning other factors also influence flood perceptions (O’Gorman, 2012, p218).

3.4. UNDERSTANDING SME FLOOD AWARENESS

Technologically sophisticated analysts use assessments to evaluate risk under the assumption that risk is a quantifiable entity (Helm, 1996, p47; Raaijmakers *et al.* 2008, p314). For Aven and Kristensen (2005), risk should be considered a judgement rather than a fact (p3). Lay citizens, rely upon “*intuitive risk judgements*” or ‘risk perceptions’ to analyse flooding (Slovic, 1987, p28). These judgements and associated behaviours vary between individuals and are determined culturally through interactions with a number of variables (Messner and Meyer, 2005, p7; Smith and Petley, 2009, p62). Accordingly, it is possible to attribute different levels of owner/manager flood awareness to variations in risks perception caused by a number of factors.

The largest influence upon SME owner/manager understanding of flood risk is past experience. “*While the validity and personal relevance of second-hand information is open to question, people more readily trust the evidence of their senses*” (Whitmarsh, 2008, p355). Experience of flooding creates images that are more vivid than those produced by abstract information (Keller *et al.* 2006, p633; Harries, 2012, p330). An interaction with flooding leads individuals to assume it will happen again (representativeness bias)(Nisebett and Ross, 1980, p262). Those who have directly experienced flooding are more likely to accept it poses a serious threat to them and their business (Payne and Pigram, 1981, p463; de Man and Simpson-Housley, 1988, p386; Wilson, 1990, p53; Bezuyen *et al.* 1998, p49; Polic *et al.* 1998, p86; Burningham *et al.* 2008, p228).

In Hull and Sheffield, 44.0% of SME owner/managers believe their flood risk perception was influenced by their previous flood experience. Because human behaviour is variable, it is not easy to rule out whether this influence was found coincidentally (Greene *et al.* 2006, p5). Statistical tests are therefore used to examine whether a relationship between different variables is present, what type of relationship exists and how significant the relationship is (Hinton, 2004, p2). Prior to a statistical test being conducted, a research hypothesis is required. For this variable it was proposed that a

statistically significant correlation is present between flood risk perception and previous flood experience. Once the hypothesis has been created, it is important to select the most appropriate statistical test. The Kolmogorov-Smirnov goodness-of-fit test is used to assess whether two data sets (variables) taken from a sample population display a standardised 'normal distribution'. It also tests whether these two data sets exhibit the same distribution. The results from a Kolmogorov-Smirnov test go on to inform the correct test to use when searching for a significant statistical relationship between the two variables.

When exploring the proposed relationship between flood risk perception and previous experience, the Kolmogorov-Smirnov test revealed that these two variables were not normally distributed. In regards to the type of data used, the dependent variable (flood risk perception) consisted of ranked (ordinal) data. The independent variable (flood experience) consisted of data which was divided into three or more independent categories (nominal data). When these facts were taken into consideration, a Kruskal-Wallis test was used to statically analyse the proposed relationship between flood risk perception and previous flood experience.

A Kruskal-Wallis test ranks the scores of both variables in order from smallest to largest independently. Subsequent analysis focuses upon the differences in medians of the ranked data (Rumsey, 2007, p295). At the end of this test, a *p-value* is generated as is displayed in Figure 3.4. A significant relationship exists if the *p-value* generated falls below 0.05 (Brase *et al.* 2011, p415). As the *p-value* for the relationship between flood risk perception and experience was smaller than 0.01, a significant statistical correlation exists between the two ($N=251$, $\chi^2=36.553$, $df=4$, $p<0.01$). There is only a 1% probability that this correlation occurred by chance. This finding supports the assertions made from the qualitative case studies, and is supported by the UK Climate Impacts Programme (2009, p8) and Hallet (2013, p28). Both assert that experience of a hazard can influence whether it is seen as a potential future risk.

The case studies demonstrated that it was a prolonged experience of flooding which generated the strongest perception. Gardner and Stern (1996) maintain that the majority of inhabitants living in areas where floods are frequent are prone towards an underestimation of danger (p209). Kates (1963, p218), Nagle (1999, p46) and Brilly and Polic (2005, p353) all assert that perceptions of flooding are related to the physical characteristics of flood including its frequency. Therefore, a research hypothesis was constructed. It was proposed that there is a statistically significant correlation between flood perception and number of floods experienced in Hull and Sheffield. Once again a Kolmogorov-Smirnov test did not reveal a normal distribution between the two data sets. Moreover, as the dependent variable (flood perception) consisted of only two independent

categories (nominal data), and the independent variable (number of floods) consisted of continuous data, a Mann-Whitney U test was selected.

The strategy of a Mann-Whitney U test is to determine if the values from two different samples (variables) are randomly mixed when placed in rank order, or clustered at opposite ends (Corder and Foreman, 2011, pp16-17). A random distribution indicates no difference between two samples. A cluster indicates a difference. As with a Kruskal-Wallis test, a Mann-Whitney U test also yields a *p-value* which needs to fall below 0.05 in order for a significant relationship to exist. As the test conducted between flood perception and flood frequency in Hull and Sheffield yielded a value above 0.05, this test did not show a correlation between these two variables (N=47, Mann-Whitney U=70.0, $z=-0.646$, $p=0.518$) (Figure 3.5). As this shows that within Hull and Sheffield there is no significant statistical relationship between the number of floods experienced and flood perception, other variables must be accountable.

Ranks			
	To what extent do you believe that your business is exposed to the risk of flooding?	N	Mean Rank
FloodCode	No Opinion	1	103.50
	Not Exposed	93	111.60
	Slightly Exposed	100	121.07
	Moderately Exposed	46	155.34
	Extremely Exposed	11	171.95
	Total	251	
Test Statistics ^{a,b}			

	FloodCode
Chi-Square	36.553
df	4
P. Value.	.000

a. Kruskal Wallis Test

Figure 3.4: Output from a Kruskal Wallis Test demonstrating a correlation between flood perception and whether an SME owner/manager has experienced flooding

Ranks				
	morethano ncecode	N	Mean Rank	Sum of Ranks
To what extent do you believe that your business is exposed to the risk of flooding?	Yes	4	28.00	112.00
	No	43	23.63	1016.00
	Total	47		
Test Statistics ^a				
	To what extent do you believe that your business is exposed to the risk of flooding?			
Mann-Whitney U		70.000		
Wilcoxon W		1016.000		
Z		-.646		
P. Value. (2-tailed)		.518		
Exact Sig. [2*(1-tailed Sig.)]		.568 ^b		

Figure 3.5: Output from a Mann-Whitney U demonstrating no correlation between flood perception and the number of floods experienced by an SME owner/manager

Numerous academics state that length of residency can influence the awareness of hazards such as flooding both in the UK and further afield (Saarinen, 1966; Oliver, 1975; Irish and Falconer, 1979; McDonald, 1979; Gardner *et al.* 1987; Scanlon, 1990; Baker, 1991; Bruen and Gebre, 2001; Cutter *et al.* 2003; UKCIP, 2009; Hallet, 2013). Zhai *et al.* (1979) purports that individuals who have lived in a flood risk area for more than 40 years will know where the risks are located in their locale (p84). Furthermore, Burningham *et al.* (2008) maintains residents who live in an area more than one year are nearly three times more likely to be aware of their flood risk than those who have lived there less than a year (p221).

A research hypothesis was devised to test these studies. It was proposed that there is a significant statistical relationship between SME owner/managers length of residence and flood risk perception. A Kolmogorov-Smirnov test once again failed to reveal a normal distribution between these two variables. Furthermore, the use of ranked and categorical data meant that a Kruskal-Wallis test was applied. This test yielded a *p-value* larger than

0.05 ($N=246$, $\chi^2=3.14$, $df=8$, $p=0.913$) meaning a correlation was not found. In the case of these two cities, this result supports conclusions drawn from the qualitative case studies. Both Diane and Emma had lived in Sheffield for nearly 20 years but displayed an uninformed flood risk perception. Their judgement could be attributed to the fact that they experienced only one flood each during their residency. For strong flood perceptions to develop, a prolonged exposure to floods is required (Nagle, 1999, p11; Brilly and Polic, 2005, p354). A lack of a statistical relationship between duration and perception, and number of floods and perceptions demonstrates that just living in an area for a long time does not necessarily equate to obtaining strong flood perceptions. It is long residency, in conjunction with prolonged flood experience, which allows local knowledge to be obtained: local knowledge which ultimately influences flood risk perceptions.

"Knowledge is and should be important in risk perception" (Johnson, 1993, p189). For Andy, Ben and Chris in Hull, it was their possession of local knowledge that assisted them in generating strong flood risk perceptions in line with those published by local regulatory bodies. In Hull and Sheffield, 35.7% of owner/managers stated that awareness of historical, local flooding determined their views of flood risk a great deal. As a Kolmogorov-Smirnov test did not reveal a normal distribution and ranked data was considered alongside a categorical variable, a Kruskal-Wallis test was administered. A research hypothesis was composed. It was proposed that there is a statically significant correlation between historical knowledge and flood perception. As the *p-value* yielded fell below 0.05, a statistically significant correlation between the two variables was discovered ($N=253$, $\chi^2=8.763$, $df=3$, $p<0.05$). This relationship was weaker than that discovered between flood perceptions and past experience.

This statistical significance is supported by the work of Brown, (1993b, p18), Irwin *et al.* (1996, p47, 2003, p34) and Hallett (2013, p64) who all outline that the benefits of local knowledge have become increasingly recognised academically. It also lends support to the conclusions drawn from the qualitative Hull and Sheffield case studies. Local knowledge is not automatically acquired; it requires construction over time. Both Hull and Sheffield have a relatively high immigration rate. As such many owner/managers who are new to the area may not have the local knowledge present to form accurate flood risk perceptions. A large immigration rate has also lead to extremely ethnically diverse populations within the study cities. As a result, ethnicity can also become a driver or barrier as to whether accurate flood risk perceptions are possessed by SME owner/managers.

A total of 89.2% of Sheffield's population categorise themselves as White British. The remaining 10.8% is composed of other ethnic backgrounds including Black, Hispanic,

Chinese, Japanese and Pakistani (Sheffield City Council, 2011c, online). With UK cities being home to large ethnic minorities, Fothergill *et al.* (1999, p156) paints a picture of increased vulnerability to risk and disasters such as floods. In regards to the influence of ethnicity upon risk perceptions, secondary data presents conflicting findings (Vaughan and Nordenstam, 1991, p31). Ives and Furseth's (1983) study of flooding in Charlotte, South Carolina shows no significant difference in hazard perception along ethnic lines. Lindell *et al.* (1980) found that Mexican-Americans tended to define a risk as high much less often than Whites. Turner *et al.* (1980), Palm (1996) and Blanchard-Boehm (1997) discovered that White men were the least concerned about flood risk.

A Kruskal-Wallis test was adopted to explore the relationship between ethnicity and flood risk perception. This test was chosen as the two data sets were not normally distributed and both ordinal and nominal data was used. A research hypothesis proposed that there is a significant statistical relationship between ethnicity and risk perception in Hull and Sheffield. Yielding a *p-value* of 0.05 ($N=239$, $\chi^2=6.011$, $df=2$, $p=0.05$), this relationship is statistically significant with a correlation present. This correlation was not as strong as the correlation which exists between previous experience and flood perception. The relationship between perception and ethnicity can be attributed to differences in prior experience with flood exposure and general beliefs and uncertainty (Vaughan and Nordenstam, 1991, p30). Poor command of the English language, the concentration of minority ethnic groups in particularly 'at risk of flood' areas, difficulties accessing appropriate information, services, support and the presence or awareness of state resilience measures can also play a role (Tunstall and Parker, 1999).

According to Chris (Company C, Hull): *"you would presume...that the city is at risk of flooding because it has prepared defences"*. In support, 20.9% of Hull and Sheffield owner/managers stated that the presence of regulatory body flood initiatives and protection measures affected their perception of flooding a great deal. People living in flood areas assume that flood hazards can be solved through technology (Gough, 2000, p1174; Hayes, 2004, p16). Under the *"levée effect"*, structural flood protection measures increase perceived safety from the hazard of a flood (Tobin, 1995, pp359-367). Further support for Chris's viewpoint comes from a Kruskal-Wallis test. Again this test was selected as ordinal and nominal variables were considered and a normal distribution was not present. The Kruskal-Wallis test examined the research hypothesis: there is a statistically significant correlation between flood perception and the presence of state resilience measures. A *p-value* of less than 0.01 ($N=253$, $\chi^2=14.822$, $df=3$, $p<0.01$) revealed that these two variables are very strongly correlated. The use of visible,

structural flood solutions in Hull and Sheffield increases SME owner/managers realisation of flood risk, and thus they perceive that area to be exposed to flooding.

In summary, quantitative and qualitative data uncovered that:

- A.** Hull owner/managers hold extremely strong flood perceptions which agree with the state 'measured' risk.
- B.** In Sheffield, awareness of the city's 'actual' flood risk was uncertain and uninformed drawing few similarities with local regulatory bodies.
- C.** Within the two cities many drivers and barriers are responsible for the formulation of accurate flood risk perceptions.
- D.** Statistical testing shows the variables which exude the largest influence are previous flood experience, the possession of local flood knowledge, ethnicity and the presence of state resilience measures.

3.5. A GENERALISABLE PERCEPTION?

Individuals fail to perceive and underestimate the likelihood of low frequency events including flooding (Kunreuther and Pauly, 2004, p13). As such, many residents located on UK floodplains are unaware of the flood risk (Wheater, 2006, p2142). Many UK studies have examined public perceptions of flood risk at a variety of locations yielding various results.

Burningham *et al.* (2008, p217) outlines that 41.0% of the population are unaware of the flood risk in England. Myatt *et al.* (2003, p572) maintains that 65.0% of respondents to a UK survey believe past flood to be a freak event and unlikely to happen again. Kaiser and Witzki (2004, p105) propose that 66.0% of UK residents believe the risk of coastal flood is low or very low. The "*Know Your Own Risk*" (2010) campaign discovered that although 25.0% of British homes are at risk, 83.0% of those people do not consider themselves to be exposed, 65.0% believe the UK is more at risk than ten years ago, and 43.0% have not investigated whether they are at risk (online). In Chichester, Hampshire, 86.7% of residents believe there is a risk of flooding in their area, 86.4% believe flood risk has increased and 50.0% are not concerned about the levels of flooding indicated by Environment Agency maps (Shackleton *et al.* 2011, p5). Within London, flooding and flood risk is not regarded as a serious problem despite just two of the 32 London boroughs having no homes at risk of flooding (Mann, 2014, online). Finally, rural populations often have a better perception of flood risk than those in urban areas (Blyth *et al.* 2001, p23).

These studies support the following arguments put forward in this chapter:

- A.** Flood risk varies between locations meaning flood can be described as have a unique nature and 'local profile'.
- B.** Flood perceptions are not all the same. They are extremely varied due to the influence of a large number of factors.
- C.** In Hull and Sheffield, the largest influences upon flood perception are past flood experiences, local knowledge, ethnicity and the presence of state resilience measures.

Given the large amount of variation, it may not be possible to apply the findings from this thesis to other locations. The next chapter also looks at SME perceptions. However, it considers how Hull and Sheffield SME owner/managers perceive flooding as a risk to their SME in terms of impacts, significance and business practice.

4. FLOOD: WHAT DOES IT MEAN TO SMEs?

4.1. INTRODUCTION

Some scholars suggest that “*most readers have a reasonable idea of what constitutes a flood*” (Evans, 2005, p1). However, for Strang (2004, p49) and Walker *et al.* (2011, p2304) flood is an ambiguous term which takes on and evokes meaning as an acculturated artefact. It is proposed that SME owner/managers have their own unique understanding of the term flood. As such, this chapter aims to:

1. Outline how SME owner/managers in the cities of Hull and Sheffield perceive flooding as a risk to their SME.
2. Outline how SME owner/managers perceive the risk of flooding in comparison to other risks an SME faces.

4.2. SME PERCEPTIONS OF FLOOD

The most common definition of flood is one which includes technical dimensions such as “*hydrous events characterised by high discharges and/or water levels leading to inundation of land adjacent to streams, rivers, lakes and other water bodies*” (Petts and Amorous, 1996, p2). To Hull and Sheffield SME owner/managers, and from the business practice perspective, a flood is not that simple. It is perceived in two ways:

1. A hazard that has characteristics which set it apart from other hazards.
2. An entity that can cause disruption to the ‘order of business’ preventing efficient trade.

4.3. THE PARTICULARITIES OF FLOOD

SMEs face a plethora of risks which can interrupt operational procedures. These interruptions can be termed ‘disruptions’ (Sterling, 2011, p128). Due to the ‘particularities’ or characteristics of flooding, SME owner/managers view this hazard as distinct from other disruptions such as IT loss and transport issues (Herbane, 2013, p88).

Flooding is essentially caused by water. Yet water is not constant. It moves readily between oppositional extremes and takes on a multitude of meanings (Strang, 2004, p49). Water flows into and out of floods, progressing from an ‘innocent’ state to become a flood, a hazard and finally an event (Marks, 2005, p274). It is this change from the ‘innocent’ occurrence of water on a road when it rains, to raging torrents of water flowing through or standing static within SME premises which makes flooding stand apart from the other disruptions owner/managers face. To classify when water ceases to be innocent and turns into something more severe, this chapter will analyse the results taken from the qualitative SME case studies. The results from eight interviews are presented within this chapter. An in-depth examination of a small number of case studies allows the provision of high quality conclusions. This is in comparison to any assertions that would be drawn from a shallow investigation of all 38 case studies. The profiles of the eight case studies in question are presented in Tables 4.1 and 4.2.

Company	G	H	J	K
Interviewee	Gillian	Harry	John	Kevin
Position	Owner	Owner	Owner	Owner
Established	1991	1930	2005	1980
Location	Hillsborough (On banks of the River Don)	Fulwood (On tributary of the River Sheaf)	Neepsend (On banks of the River Don)	Owlerton (On banks of the River Don)
Sector	Arts and humanities	Amenities	Professional, technical and scientific	Construction
Number of Employees	4	9	2	8
Turnover	£220,000	£500,000	£100,000	£600,000
Size	Micro	Micro	Micro	Micro
Flood Experience	Flooded in 2007 and again in 2009	Flooded in 2007	Flooded in 2007	Flooded in 2007

Table 4.1: Company Profiles of SME owner/managers interviewed in Sheffield

Company	L	M	N	P
Interviewee	Lee	Mike	Neil	Paul
Position	Owner	Manager	Manager	Owner
Established	2006	1930s	2001	1993
Location	Willerby (West Hull)	Willerby (West Hull)	Wincomlee (East Hull on banks of River Hull)	Cottingham (East Hull)
Sector	Food services	Entertainment and recreation	Manufacturing	Profession, technical and scientific
Number of Employees	3	10	40	3
Turnover	Did not wish to disclose	Did not wish to disclose	£10 million	£250,000
Size	Micro	Small	Medium	Micro
Flood Experience	Flooded in 2007 due to surface water floods	Flooded on a number of occasions including 2007	Flooded in 2007	Flooded in 2007

Table 4.2: Company Profiles of SME owner/managers interviewed in Hull

Kaika (2005) states that flooding is a phenomenon which comes into being through the spaces that ‘bad water’ occupies (p64-66). Within this context, the bad water which constitutes a flood is classified as ‘dirty’ water which comes from natural and external sources including rivers, lakes, sewers and rainwater (Kaika, 2005, p64). This stands in comparison to the ‘purified’ good water which is constrained and supplied through pipe networks (Kaika, 2005, p64). For SME owner/managers, the type of water involved does not dictate whether an event is categorised as a flood. For example, Gillian of Company G outlined that she has *“been flooded from a burst pipe before”*. Kevin from Company K remarked that they were flooded *“when the river level rose up”*. For the SMEs of Hull and Sheffield the source of the water is irrelevant, it is the location of water which determines whether the flood label is applied.

Further analysis of the eight research case studies demonstrate that SME owner/manager perceptions lean more towards Arnell’s (2002) succinct definition of a flood: *“an excess of water in an area that is usually dry”* (p89). For SME owner/managers, if a large amount of water is in an area where it should not be, then it is *“out of place”* and a

flood has occurred (Douglas, 1996, p44). As these locations are primarily dry, it is the 'wetting' of their premises and its contents which also contributes to owner/manager definitions of the term flood. This conclusion is illustrated by the comments of Gillian, Harry and Neil below. When describing where water was located during 2007, the comments these individuals made suggested that this water was not usually present and therefore, out of place.

"The cellar was full of water."

Location of water during the summer 2007 floods: Gillian, Company G (Sheffield)

"Water was running through the garages and into the builder's yard."

As above: Harry, Company H (Sheffield)

"Parts of the warehouse were two feet underwater."

As above: Neil, Company N (Hull)

It is this interaction with water, and the damage caused, which makes flooding a unique hazard. Water damage can lead to the unsalvageable disruption of contents. Aside from fire which can totally consume a building leaving an owner/manager with nothing, very few risks cause damage in the same way as a flood. Accordingly, SME owner/managers see it as separate to the other disruptions they face and in essence, view flooding as a unique hazard. Although, just because floods are seen as unique, this does not necessarily mean that they are perceived to be a significant risk by owner/managers.

4.4. THE SIGNIFICANCE OF FLOODING

'Disruption' is defined as *"an interruption to an event, activity or process by causing a disturbance or problem"* (Soannes and Stevenson, 2005, p503). An SME's, activities are primarily focused around achieving an objective i.e. generating profit through the provision of a service or good. The occurrence of a disruption or crisis interferes with the 'smooth-running' of processes. It halts operations and causes discontinuity to business operations (Elliot *et al.* 2002, p201). Anthropogenic, economic and natural environments are becoming increasingly exposed to disruptions. This leaves SME owner/managers increasingly concerned with the materialisation of risks which interfere with daily procedures and constrains them from obtaining their overarching objective.

4.4.1. LEVELS OF DISCONTINUITY

Many individuals categorise risks using a Risk Assessment Matrix (Elliot *et al.* 2010, p127). This matrix assigns a priority to a risk, ranging from low to extreme, based upon the consequences it would bring about and its likelihood of occurrence. When speaking about the priority of flooding as risk to their SME, the owner/managers of Companies G to P regularly referred to the consequences of the flooding. Phrases such as *“it stopped us”* (Harry, Company H) and *“we couldn’t”* (Neil Company N) were often expressed. This suggests SME owner/managers are extremely concerned about discontinuity to the order of business. This is in comparison to a preoccupation with the specific consequences and particularities associated with flooding.

Business Continuity (BC) refers to the *“ability of a business to maintain continuous operations in the face of disaster”* (Rittinghouse *et al.* 2005, p3). Floods are seen as both a unique hazard and an ‘agent of discontinuity’ which prohibits or limits full business operations. However, what one owner/manager classifies as continuity to business operations may not apply to another. For some, being able to provide a product or service to a customer, no matter what disruptions may be taking place, is their notion of continuity; even if tasks have been completed differently. For others, continuity is having everything within their business operating ‘as normal’, with no deviations from regular procedures.

Why does flooding cause business discontinuity? It is widely reported that SMEs are extremely vulnerable to the events associated with climate change as owner/managers are ignorant of the increasing threat (Messner and Meyer, 2005, p149). The flood events of 2007 served as a ‘wake-up’ call and made a lasting impression upon case study owner/managers. Flooding has a variety of consequences or impacts upon SMEs. These consequences lead to variations in the disruption to operations, from damage to stock, carpets or external premises to the obstruction of staff and deliveries.

Flood impacts are regularly categorised into direct and indirect, tangible and intangible or primary, secondary and tertiary (Penning-Roswell and Chatterton, 1977, p119; Smith and Ward, 1998, p38; Gautam and van der Hoek, 2003, p13). Direct impacts include damage to premises, loss of stock, inconvenience to staff and a lack of amenities (Ekos Consulting Ltd, 2008 cited in Wedawatta *et al.* 2012, p4). These were consequences felt by many owner/managers including Neil (Company N, Hull): *“some members of staff couldn’t get in”*, and Harry (Company H, Sheffield): *“we lost £5000 in stock”*. The primary indirect impact experienced by owner/managers is disruption to the supply chain (Berkhout *et al.* 2004, p15; Metcalf *et al.* 2009, p7; Wedawatta *et al.* 2010c, p362-375). Lee

(Company L, Hull) noted that *“my suppliers couldn’t deliver to me”* and Kevin (Company K, Hull) remarked that *“suppliers couldn’t get down here”*. With monetary value, there is a difference between the value of damage caused and insurance claims repaid (Priest *et al.* 2005, p296). As Gillian (Company G, Sheffield) asserted, *“we were insured for £60,000 wholesale, but we actually had £120,000 worth of stock”*. In terms of the intangible effects (those things that do not have a physical presence), flood events can provoke a negative emotional response, anxiety and feelings of grief amongst owner/managers and employees (Shepherd, 2003, p318; Carroll *et al.* 2010, p1045). Finally, an area that has been flooded can take on negative connotations (Alesch *et al.* 2001). This effect was highlighted by Gillian (Company G, Sheffield): *“you had articles in the press like ‘Road to Hells-borough’”*. The adoption of a poor reputation can have subsequent after effects upon custom (Honey, 2009, p22). A number of flooding consequences are highly ambiguous. Attributable to any disruption, many impacts revolve around the notion of an ‘inability to conduct business effectively’ and provide support for the hypothesis that owner/managers are more concerned with maintaining continuity than distinct flood impacts.

“The biggest problem was that the guys had nothing they could do for a while.”

Impact of the 2007 floods: Harry, Company H (Sheffield)

“It stopped us working for half a day...We were not as badly affected as a lot of people.”

Impact of the 2007 floods: John, Company J (Sheffield)

“It was a sea of water for weeks... We rely on members to come and play and then come into the club afterwards and keep it going...But they couldn’t.”

Impact of the 2007 floods: Mike, Company M (Hull)

“We didn’t really have any major loss.”

Perception of the sources of flooding: Lee, Company L (Hull)

The ambiguity of flood impacts means that the same flood event can cause a variation in the flood consequences experienced by SMEs. Despite experiencing the same flood in 2007, the disruption experienced by those owner/managers above ranged from a negligible impact which didn’t stop operations, to employees being unable to work. The amount of discontinuity an SME claims a flood has caused their business can be a subjective notion. It relates to how they perceive their initial level of continuity and to

what extent a flood affects this level. Accordingly, discontinuity varies from SME to SME. Nevertheless, individuals can have a tendency to over or under-exaggerate an event, or the extent of disruption caused which can thus impact upon levels of discontinuity reported by owner/managers (Schmidt-Thomé, 2006, p6).

4.4.2. IMPACTS ON LEVELS OF DISCONTINUITY

To highlight the variation in discontinuity experienced by business, Elliot *et al.* (2010) developed the *Incident Severity Assessment Matrix* (p237). This matrix can be implemented by any business to qualitatively assess the severity of a risk's occurrence. It uses three scenarios, which act as a standard benchmark, to allocate a rating to the occurrence of a risk based upon its severity (Elliot *et al.* 2010, p237):

1. The impact a risk has upon finance and deadlines.
2. The amount of time the business takes to get 'back to normal' following the occurrence.
3. The type of predetermined response required to overcome the risk.

System Rating	Interruption	Incident	Major Incident
	Tier 3	Tier 2	Tier 1
Regulatory Impact	No Regulatory Issues	Minimal Regulatory Issues	Significant Regulatory Matter
Recovery timeline	Up to 2 hours	Between 2 and 24 Hours	1 day or more
Invocation Expense	£10k	£100k	£1m
Financial Impact	Potential loss of £	Potential loss of £x2	Potential loss of £ ²
Deadline Impact	Routine	Regular milestone approaching	Key deadline approaching
Appropriate Recovery Mechanism	Normal Procedures	Normal Procedures	Major Incident Plan

Figure 4.1: Example incident severity assessment matrix designed for a large financial company

Source: Elliot et al. 2010, p237

Figure 4.1 provides an example of how the matrix can be used by a large financial company. However, as a flexible tool the Incident Severity Assessment Matrix can be adapted to meet the needs and priorities of any organisation and applied to any risk including SMEs and flooding. It highlights that for an owner/manager, a flood can be categorised as either an interruption, an incident or major incident depending upon the level of discontinuity the flood causes. This consequently raises the question as to how the 2007 flood caused SMEs in the same locale to experience different levels of discontinuity.

Not all floods are the same. Different flood events possess different characteristics (e.g. frequency, magnitude, depth)(Gomi *et al.* 2002, p905). These attributes may also vary within the same flood event (Gabriele and Arnell, 1991, p1283). While parts of Hull and Sheffield were six foot underwater, others were only submerged by three inches. This divergence in the physicality of flooding leads to a disparity in flood impacts and levels of discontinuity (SCARM, 1999, p43; King, 2000, p226; Green, 2004, p324). An SME that has come into contact with a wall of flood water six feet deep may experience a much higher level of damage in comparison to an SME where the water only reached the skirting boards. The significance of the damage caused also dictates the extent to which an SME experiences discontinuity and the length of the recovery period. In some instances, a lesser impact results in a quicker recovery (Mitchell, 1989, p410).

The level of discontinuity experienced following interaction with a flood can also be linked to individual SME characteristics, including the level of flood awareness held by owner/managers. Owner/manager ignorance of the increasing flood threat leaves an SME susceptible to or unprepared for flooding. This action may lead to a high level of disruption and damage should a flood occur (Gissing, 2003, p4). The level of discontinuity caused will also influence how significant the risk is deemed to be to an SME, and ultimately the resilience strategy chosen by the owner/manager. An owner/manager with high flood risk recognition may implement more resilience measures than one who is unaware of this threat, an issue demonstrated by Gillian (Company G, Sheffield): *It had never occurred to me that Sheffield would flood...we didn't have flood protection before [2007]*".

One factor which influences an SME owner/manger's flood awareness and ultimately discontinuity is location. For DEFRA (2006, p1), SMEs, residents, towns and cities etc. are communities at risk which are located in certain flooding 'pathways', with a pathway an area which would be inundated with water during a flood. Their exposure depends upon the physical characteristics of the flood pathway (Lindley *et al.* 2006, p544). If an SME is located on low, impermeable ground next to an extraneous water source which is prone to flooding, it has a high level of exposure and flooding is a significant risk

which would cause severe discontinuity should it occur: *“Where we are now, we are right next to the river”* (Kevin, Company K, Sheffield). This is in comparison to an SME situated away from an at risk area, on an area of higher and more permeable ground, where the significance of flooding as a disruption to their business operations would be minimal: *“We’re up on a hill”* (Harry, Company H, Sheffield).

An SME’s size can also influence how significant a flood is to an owner/manager in what is known as the “liability of smallness” (Aldrich and Auster, 1986, p165; Sullivan-Taylor and Branicki, 2011, p5565). Despite being directly and indirectly impacted by the very same flood hazards faced by large companies, SMEs tend to have fewer resources than their larger counterparts with which to plan, respond and recover resulting in a higher level of exposure and discontinuity (Ingirige *et al.* 2008, p583). SMEs have special characteristics that differentiate them from larger organisations. This means their business development management processes are very different (Box 1.1, p6)(Jennings and Beaver, 1997, p64; Burns, 2001, p14). It is the variation in these characteristics which causes the disparity in discontinuity between business sizes.

In regards to finance and resources, the vulnerability of SMEs relates to their low cash reserves and/or resources and the difficulty this presents when undertaking mitigation measures (Alesch *et al.* 2001, p97; Themistocleous and Chen, 2004, p210). Smaller businesses that are in financial trouble prior to an event taking place have extremely difficult times recovering due a shortage in revenue in comparison to financially stable larger companies (Durkin, 1984, p4). When examining the decisions taken in regards to how an SME should operate, positioning a company in a single market and relying on a small customer base can render an SME vulnerable during a flood (Beaver, 2002, p6). Restricting their product or service offering means owner/managers may find it difficult to diversify and cater for another market should their chosen one collapse (Porter, 1985, p8). This decision also constrains the resilience measures that can be adopted to mitigate against the risk of flooding (National Round Table, 2012, p18). Consequently, a flood may in fact be a much more significant disruption to SMEs when contrasted to the effects of floods upon a larger firm.

Current research fails to firmly agree upon whether the correlation between business size and level of disruption is positive or negative i.e. which firm size has the largest effect (McMahon, 1994, p251; Dahlhamer and D’Souza, 1997, p257; Webb *et al.* 2000, p86; Yoshida and Deyle, 2005, p7). For Tierney (1994b, p14), periods of business closure were much longer for larger firms after a flood than smaller businesses: 45.0% of larger businesses sampled were forced to close for an average of 96 hours in comparison to 40.2% of small firms who closed for 72 hours. On the other hand, both Crichton (2006,

p20) and BMG Research (2011, p40) assert that SMEs are often affected disproportionately hard by disruptions such as floods and are less prepared to manage the consequences. Kroll *et al.* (1991, p5) shows how, in the aftermath of the 1989 Loma Prieta earthquake, smaller firms suffered proportionately greater losses than larger businesses.

In contrast, Hull and Sheffield SME owner/managers demonstrated no apparent correlation between the level of discontinuity caused to SMEs and their corresponding size. Neil (Company N, Hull), the manager of a medium-sized firm, experienced no discontinuity to his business operations: *"The water wasn't a problem...Some parts of the factory were two feet deep in water, but you know, that really wasn't an issue...We still managed to produce the exact same amount as usual"*. For Quadesha and Company Q (a medium-sized health firm to be introduced in detail in section 4.3), parts of her business could not operate or open to the public: *"The mobility shop was shut for about ten days, just because people couldn't get in really. It was stinky, full of mud and you know if we've got vulnerable customers and you're pushing a wheelchair, you can't do something like that"*.

With small-sized companies, Kevin (Company K, Sheffield) had a *"couple of days cleaning up"* then they were *"back to normal"*. On the other hand, Mike (Company M, Hull) from a similar sized company, was *"probably three weeks before we got rid of the surplus water and were able to run the business again"*. For micro-sized businesses, Neil (Company P, Hull) reported that his company was *"closed for half a day, the flood day, and that was even though the water came into the office...Because we reacted pretty quickly we were ok"*. In comparison, Lee (Company L, Sheffield) from a corresponding sized SME commented that the floods *"closed us down for the week"*.

It is concluded that in Hull and Sheffield, SME variations in levels of flood discontinuity cannot be attributed to SME size. All the examples outlined demonstrate different levels of disruption, with the period of recovery diverging amongst and between business sizes. Yet, there is another variable which may influence the level of disruption caused by a flood, the industrial sector businesses operate in.

As floods have a disparate rather than uniform effect on businesses, a difference in the impacts and responses to flooding amongst industrial sectors has been noted (Tierney, 1995, p26-27). For Kroll *et al.* (1991, p5), businesses in the trade and services sector are the most vulnerable to disruption. For Wedewatta *et al.* (2010, p362), the construction industry is often hit disproportionately hard by floods as 99.0% of construction businesses are SMEs. SMEs within the construction sector also play an important role in the wider recovery of a community following a flood (Wedawatta *et al.* 2010c, p369). For Gordon and Richardson (1992, p90), losses are felt the most by the retail trade, health services,

finance, insurance and property services. Within Hull and Sheffield, a single industrial sector did not emerge as the 'hardest hit'. Nevertheless, industry played a role in levels of disruption and ultimately flood significance.

For Neil (Company N, Hull), the 2007 floods had very little effect upon his company due to the nature of his business: *"we can work with water a foot deep, it doesn't make any difference. We are a tannery. We work in a wet environment..."*. On the other hand, Mike (Company M, Hull) remarked how the nature of his SME means that they cannot cope with the presence of excessive amounts of water: *"getting back to normal came back to when the surplus water went. We need the course to be free of water so people can play it [golf] and then come and spend money in the bar afterwards...Takings?...They probably went down at least a third"*. Similar findings emerged from Sheffield. Company J is office based and requires very little equipment. Therefore John could move anything of value above the level of the water: *"I just organised all of my equipment to go up high...it flooded a little bit but things weren't washed away...We just threw some stuff away...which wasn't much"*. However, for Kevin (Company K) the heavy equipment stored on the ground floor of his warehouse could not be moved meaning it was damaged: *"we had about 18 inches downstairs so we lost...a fair bit of gear; it's heavy stuff so we couldn't move it higher up"*.

From the business practice approach, the significance of flooding in Hull and Sheffield depends upon levels of discontinuity caused. Levels of discontinuity are influenced by SME size, location, industry and operational procedures, all factors which can be included under the umbrella term the 'nature of business'. It is the nature of business which results in an SME being susceptible or exposed to the discontinuity associated with a flood (Tierney, 1997, p88). These qualities and decisions construct exposure to flooding, thus leaving an SME vulnerable to the flood risk (Burnham, 2006, p7). According to Christopolos *et al.* (2001, p185), the vulnerability of a system to a hazard has geographical, environmental, social, political, institutional and cultural dimensions and can be included within the notions of exposure and susceptibility indicators (Alexander, 1993, p258). The nature of the indicators (e.g. location, flood awareness, size and industrial sector) often relate to the amount of flood damage and inconvenience caused during an event, and ultimately contribute to its vulnerability (Mitchell, 1989, p410; Cutter, 1996, p532; Metcalf and Jenkinson, 2005, p10). The more vulnerable an SME is to the occurrence of a flood, the higher the level of discontinuity experienced. This relationship ultimately influences flooding's level of significance to SME owner/managers. However, the significance of flooding in this context relates to flooding as a risk in isolation: SMEs are actually exposed to a plethora of hazards on a daily basis (Lim, 2010, p4).

4.5. THE 'HAZARDOUSNESS' OF SMEs

"Organisations in every corner of the globe face the virtual certainty of experiencing a hazard in their history" (Kash and Darling, 1998, p179; Mitroff *et al.* 1996, p44). Within business practice, flooding is just one in a package of risks an SME must contend with. What constitutes a disruption is a matter of judgement, not fact (McConnell, 2003, p393). Accordingly, for SMEs a disruption only occurs if the owner/manager perceives it to cause discontinuation to the order of business. Companies G to P are vulnerable to a plethora of strategic, compliance, financial and operational disruptions (Table 1.2. p20). These range from small scale, internal organisational issues to larger external factors (Coombs, 1999, p3). According to Parsons (1996, p26-27), there are three types of disruption:

1. Immediate: those disruptions that occur instantly with little or no warning.
2. Emerging: disruptions that develop over time.
3. Sustained: disruptions whose effects are prolonged.

Each of these disruptions can be further broken down into four stages (Fink, 1986, p20; Richie, 2004, p67):

1. Prodromal: when it becomes apparent that the disruption is inevitable.
2. Acute: the point of no return when the disruption has hit and damage limitation is the main objective.
3. Chronic: cleaning up, self-analysis and healing.
4. Resolution: when routine is restored or there is a new improved state.

"Within a small business there are all sorts of things that can impact upon you...illness...a power outage...stopped deliveries. We've got to keep going to make money...I think we are aware of most of the things that could impact on us and stop us working."

Risks faced by an SME: Paul, Company P (Hull)

"We did have the flooding but we've also had vandalism with the telephone lines. They were stolen so nobody on the road had any telephone or internet...Things like the weather impact upon the business...You can't get to jobs...staffing problems...It does impact upon your business when you don't employ a lot of people you know...the snow...If

the lads aren't out there working, then they're not earning money, so all disruptions can have the potential to stop us working, not just flooding."

Risks face by an SME: Kevin, Company K (Sheffield)

Owner/managers are concerned with any occurrence that can obstruct business continuity. For example, 75.9% of Hull and Sheffield owner/managers are concerned about the impacts a disruption has upon their company. Despite its unique nature, in Hull and Sheffield, only 45.7% of owner/managers were anxious about the impacts of a flood: 30.2% of owner/managers seem more disturbed about events other than flood that cause discontinuity to the order of business. The case studies of Companies G to P highlighted a number of disruptions that have impacted upon SMEs including the weather, staff illness, telecommunications/IT issues, vandalism, road works and transportation issues. These qualitative findings are supported by secondary quantitative data from a nationwide survey conducted by Pearson and Woodman, (2012, p10). This survey purports that an SME has the potential to be impacted by 21 different disruptions including political unrest, school closures and industrial incidents. All of these events have the potential to hinder or stop SME working procedures in some form.

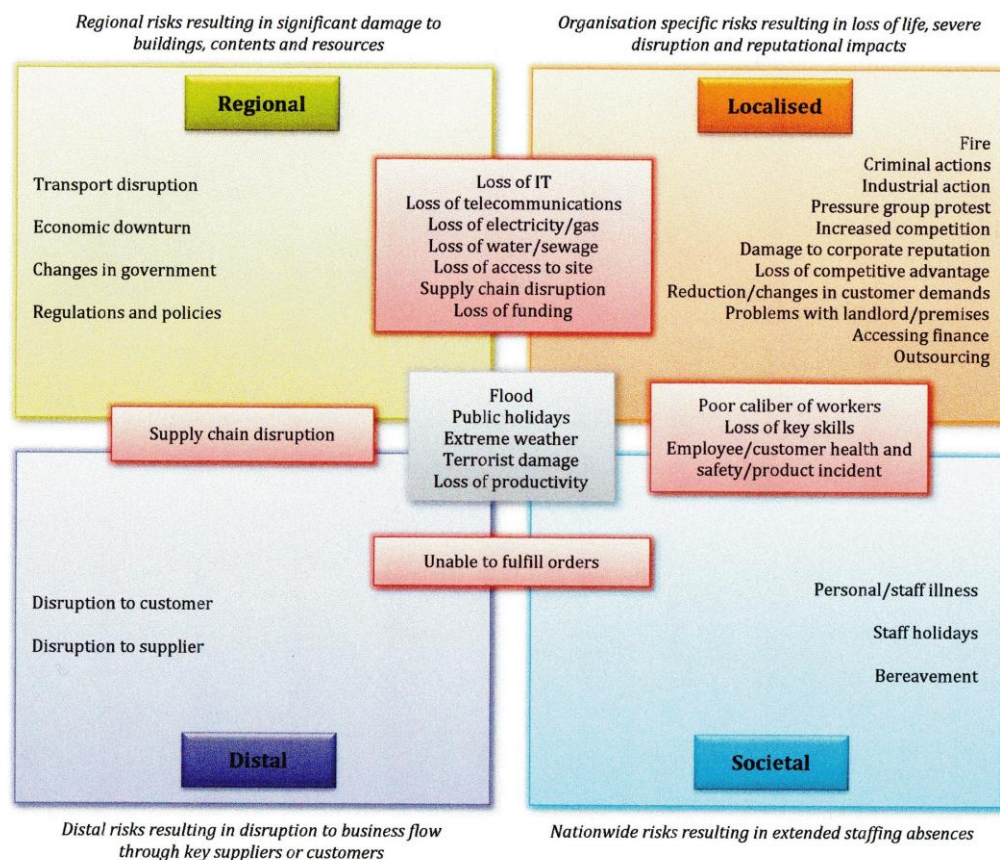


Figure 4.2: Diagram of the regional, localised, societal and distal risks SMEs face developed from both quantitative and qualitative data

Obstructions to the day-to-day running of an SME are not just classified as disruptions (Dalziell, 2005, p131). SMEs face a variety of regional, localised, distal and societal risks. Developed using data from the Hull and Sheffield qualitative interviews and quantitative survey, Figure 4.2 displays some of the risks an SME can face on a daily basis. It also demonstrates how some disruptions overlap and do not fit neatly into one category. The occurrence of one disruption can become the catalyst for other disruptions to take place. This can make implementing effective resilience measures a difficult task for SME owner/managers as procedures need to be in place which can respond to all these risks. Regardless of their category, all the risks outlined in Figure 4.2 disrupt the continuity of an SME. As such, for SMEs flooding is not a unique risk. It is just one in a 'package of disruptions' to affect the continuity of an SME.

In some cases, the occurrence of a disruption is necessary for a business to proceed to the next stage of growth: for example to effect a change in customer demand (Churchill *et al.* 1987, p47). However, to an SME the majority of disruptions are included within the notion of causing discontinuation to business operations. It is therefore possible to question whether all disruptions are given the same level of significance by SMEs, or whether certain disruptions are seen as more important than others. It is the investigation of this query which leads to 'significance' being examined in three ways:

1. The level of discontinuity caused by a risk.
2. The actual number of occurrences of a disruption.
3. The perception of occurrence.

4.5.1. RISK SIGNIFICANCE: LEVEL OF DISCONTINUITY

As outlined, the significance of flooding as a risk to an SME relates to level of discontinuity caused. The higher the level of discontinuity experienced, influenced by level of vulnerability, the more significant flood is as a risk to an SME. This principle can also be applied to the additional risks an SME faces on a daily basis. Those disruptions outlined in Figure 4.2 have a variety of impacts upon an SME. If a risk does not prohibit working procedures in some way, then it is not seen as significant by an owner/manager. For example school closures, which may entail members of staff staying at home to childmind does not cause as much discontinuity as a fire which could destroy the whole company.

Despite these observations, and available evidence, it is not possible to decide which risk is the most significant within Hull and Sheffield. Level of disruption experienced by an SME is a subjective notion, founded upon an SME owner/managers own

perceptions. Within business studies, discontinuity is defined as something that disturbs the basic continuity of business operations – the regular flow of profit making activities (Tracy and Barrow, 2012, p104). As of yet, there is no nationwide standardisation in regards to quantifying or qualifying the significance of discontinuity. Furthermore, the amount of disruption caused is a cumulative issue. Consequently size of an SME must be taken into consideration. Due to issues of generalisability, this research will not draw conclusions from the qualitative studies and apply them to other SMEs. Yet, quantifying the significance of disruptions allows some tentative representative conclusions to be reached.

4.5.2. RISK SIGNIFICANCE: OCCURRENCE

To quantitatively uncover the most significant disruption, number of occurrences must be examined. In the survey, SME owner/managers were provided with a list of 18 disruptions and asked to specify on how many occasions each disturbance had impacted upon their organisation since its establishment (Table 4.3). The disruptions included were taken from the Chartered Management Institutes 2011 *Business Continuity Management (BCM) Survey* (Woodman and Hutchings, 2011). As with the BCM survey, flooding was combined with the disruption Extreme Weather Events (EWE) which also encompasses snow, ice, heatwaves, strong winds, etc. Nevertheless, it is not possible to determine what percentage of EWEs floods constitute. The BCM survey was conducted in 2011 at a similar time to when the questionnaire for this research was being completed and returned. By using the same disruption categories as this survey, the figures obtained for the occurrence and perception of disruptions in Hull and Sheffield can be compared to the figures for the UK in a fair, standardised and representative way. This increases the robustness and validity of the conclusions reached.

Table 4.3 outlines the total number of disruptions experienced by SMEs in both cities. In both Hull and Sheffield, a total of 4,491 disruptions were recorded with an average of 17.6 per SME. The most frequent disruptions were a loss of telecommunications/IT (26.7% of all recorded disruptions), EWEs (14.1%) and reduction or change in customer demand (8.8%). Within Hull specifically, 1,140 disruptions were recorded (an average of 13.6 per SME). The top three disruptions differed from the combined scores with loss of telecommunications/IT the most frequent (25.0%), followed by staffing issues and loss of electricity and gas (both 12.4%). Due to their frequency, these disruptions are deemed to be the most significant to a Hull SME. EWEs were the fourth most significant disruption to SMEs within Hull. In Sheffield, SMEs recorded a total of 3,351 disruptions with an average of 19.6 disruptions per SME. The top three most

frequent disruptions mirrored the combined scores: loss of telecommunications/IT accounted for 28.7% of all recorded disruptions, EWEs for 15.2% and reduction or change in customer demand, 10.1%. Once again, as these disruptions were the most frequent, they are deemed the most significant to a Sheffield SME.

	Combined		Hull		Sheffield	
	Total	Rank	Total	Rank	Total	Rank
Loss of Telecommunications/IT	1197	1	235	1	962	1
Extreme Weather Event	634	2	125	4	509	2
Reduction or Change in Customer Demand	393	3	56	8	337	3
Economic Downturn	376	4	84	7	292	4
Staffing Issues	335	5	141	2	194	7
Criminal Actions	329	6	111	6	218	5
Transport Disruption	324	7	121	5	203	6
Loss of Electricity/Gas	305	8	141	2	164	9
Supply Chain Disruption	226	9	54	9	172	8
Loss of Access to Site	102	10	22	10	80	10
Accessing Finance	64	11	8	13	56	11
Loss of Water/Sewage	55	12	7	14	48	12
Loss of Competitive Advantage	45	13	13	11	32	13
Health and Safety	40	14	11	12	29	15
Fire	35	15	5	15	30	14
Damage to Reputation	16	16	0	18	16	16
Industrial Action/Pressure Group	8	17	5	15	3	18
Terrorist Damage	7	18	1	17	6	17

Table 4.3: Total number of disruptions experienced by SMEs (Hull and Sheffield)

Note: Order of disruptions dictated by ranks present in the second column

When considering disruption occurrence, Sheffield SMEs seem more vulnerable to disruptions as the average number experienced is higher and the risk significance varies given the disparity in rankings. This may be due to the fact that Sheffield is a more hazardous place in regards to potential risks (SYLRF, 2011). Alternatively, Sheffield has more SMEs than Hull meaning there is a larger number which can be impacted by a disruption. In both cities, owner/managers experience different disruptions more frequently than EWEs. This suggests EWEs are not the most significant risk to an SME in regards to occurrence.

With Sheffield housing a larger number of SMEs, the figures presented in Table 4.3 may not be entirely representative or allow for a fair comparison between both study cities. Table 4.4 records and ranks the percentage of SME owner/managers affected by each disruption. There is a difference between number of disruptions experienced and percentage of SMEs affected. Although a disruption can occur frequently, its impacts may

not necessarily be far reaching meaning only a small number of SMEs are affected. Alternatively, a disruption may be rare, but its effects can be felt on a large scale.

	Hull		Sheffield	
	% of SMEs	Rank	% of SMEs	Rank
Extreme Weather Event	77.5	1	72.5	1
Economic Downturn	55.0	2	52.1	2
Loss of Telecommunications/IT	54.4	3	52.9	3
Criminal Actions	40.0	4	29.2	5
Reduction or Change in Customer Demands	33.8	5	22.2	8
Loss of Electricity/Gas	31.3	6	30.9	4
Staffing Issues	30.0	7	29.2	5
Transport Disruption	25.0	8	21.6	9
Supply Chain Disruption	22.5	9	19.9	10
Loss of Access to Site	21.3	10	23.4	7
Accessing Finance	15.0	11	16.4	11
Loss of Water/Sewage	15.0	11	14.6	12
Health and Safety	15.0	11	12.9	13
Loss of Competitive Advantage	11.3	14	6.4	14
Fire	10.0	15	5.3	15
Industrial Action/Pressure Group	8.8	16	1.2	16
Damage to Reputation	5.0	17	3.5	17
Terrorist Damage	1.3	18	0.6	18

Table 4.4: Percentage of SMEs impacted by each disruption (Hull and Sheffield)

Note: Order of disruptions dictated by ranks present in the second column

In both Hull and Sheffield, EWEs and economic downturn were assigned ranks one and two in regards to number of SMEs affected. In Hull, 77.5% of SMEs have been impacted by an EWE, and 55.0% by an economic downturn. In Sheffield these figures are 72.5% and 52.1% respectively. A loss of telecommunications/IT ranked in third place with 54.3% of Hull SMEs impacted and 52.9% of Sheffield SMEs effected. These disruptions, including flood, are viewed as the most significant as they affect the largest percentage of SMEs. They occur as large scale events, rather than smaller ‘in-house’ issues. When comparing Hull and Sheffield, there was very little variation in percentage of SMEs who experienced a disruption. In order to explore whether these findings are representative, they were compared with data taken for the UK (Table 4.5). The first two columns of Table 4.5 present data from the 2011 BCM survey (Woodman and Hutchings, 2011, pp10-11). They reflect the number of UK SMEs impacted by each disruption and are displayed in rank order. The remaining four columns present the number of SMEs affected by each disruption in Hull and Sheffield. Their order is dictated by the ranks presented in the second column.

	UK	Rank	Hull	Rank	Sheffield	Rank
Extreme Weather Event	64.0	1	77.5	1	72.5	1
Loss of Telecommunications/IT	34.0	2	54.4	2	52.9	2
Staffing Issues	34.0	2	30.0	5	29.2	4
Transport Disruption	30.0	4	25.0	6	21.64	7
Loss of Access to Site	26.0	5	21.3	8	23.4	6
Supply Chain Disruption	19.0	7	22.5	7	19.9	8
Loss of Electricity/Gas	16.0	8	31.3	4	30.9	3
Damage to Reputation	11.0	9	5.0	1	3.5	13
Health and Safety	11.0	9	15.0	9	12.9	10
Loss of Competitive Advantage	10.0	11	11.3	11	6.4	11
Loss of Water/Sewage	9.0	12	15.0	9	14.6	9
Industrial Action/ Pressure Group	6.0	13	8.75	13	1.2	14
Fire	4.0	14	10.0	12	5.3	12
Criminal Actions	4.0	14	40.0	3	29.2	4
Terrorist Damage	2.0	16	1.3	15	0.6	14

Table 4.5: Percentage of SMEs impacted by each disruption (Comparative)

Source: Woodman and Hutchings, 2011 in combination with Original Research Data

Note: Order of disruptions dictated by ranks present in the second column

As with Hull and Sheffield, nationwide the two disruptions to affect the largest number of businesses were EWEs (64.0%) and loss of telecommunications/IT (34.0%). There were disparities with the other variables. Ranked joint second, staffing issues was a significant disruption to SMEs throughout the country. In Hull and Sheffield, this disruption ranked fifth and fourth respectively. The fourth most significant disruption to the UK was transport issues. In Hull and Sheffield, criminal actions held this position. Although EWE and loss of telecommunication/IT recorded the same rank, the variation in the significance of other disruptions raises questions in regards to the generalizability of the Hull and Sheffield findings to other locations. In the same way in which flooding adopts a local profile, different types of risk may also be more prevalent in certain locations. The misrepresentation of ‘national’ surveys must also be considered. In order to gain a holistic picture of the UK as a whole, large scale data collection methods are used in a variety of locations. This data is often amalgamated together so only the national, or generalised, statistics are presented. As a result, any regional differences which would be apparent if a smaller scale of analysis were used become lost, or are not highlighted within the national data. This can become an issue in regards to risk resilience, especially if some risks are localised to certain areas.

As with flooding, disruptions can change over time. During interview, Paul (Company P, Sheffield) commented that *“they are probably more aware of the risks to IT than we are in other areas”*. Today, there is a heavy reliance upon computers, backing-up electronic data, mobile phones, the internet and emails to allow instantaneous

correspondence and ensure business continuity. 20 years ago, continuity required keeping physical paperwork safe, using landlines or fax machines and relying upon the postal system. Technological advances have changed the way in which SMEs conduct business and has seen the emergence of new sectors including the IT sector (Koh *et al.* 2007, p321). It has also resulted in alterations to the types of disruptions experienced and their effects. 20 years ago, the loss of IT may not have caused a major issue for owner/managers due to a lack of use of computers and the internet. Today a postal strike will impact less upon business continuity due to the use of electronic correspondence. Disruptions which are seen as significant today may not have been so in the past and vice versa. Is this change in the occurrence of disruptions reflected in SME owner/manager perceptions of disruptions?

4.5.3. RISK SIGNIFICANCE: PERCEPTION

	Hull		Sheffield	
	% of SMEs	Rank	% of SMEs	Rank
Extreme Weather Event	50.0	1	43.0	2
Economic Downturn	46.3	2	33.3	3
Loss of Telecommunications/IT	45.0	3	52.0	1
Loss of Electricity/Gas	15.0	4	11.1	6
Staffing Issues	13.8	5	11.7	5
Accessing Finance	11.3	6	12.3	4
Transport Disruption	10.0	7	5.9	11
Reduction or Change in Customer Demands	7.5	8	7.0	9
Criminal Actions	7.5	8	7.0	9
Loss of Competitive Advantage	6.3	10	8.2	7
Supply Chain Disruption	5.0	11	7.6	8
Fire	5.0	11	4.7	12
Health and Safety	3.8	13	0.0	16
Industrial Action/Pressure Group	2.5	14	0.6	15
Loss of Access to Site	2.5	14	3.5	13
Loss of Water/Sewage	1.3	16	2.3	14
Damage to Reputation	1.3	16	0.0	16
Terrorist Damage	0.0	18	0.0	16

Table 4.6: Percentage of SME owner/managers who believe that each disruption above would impact upon their business (Hull and Sheffield)

Note: Order of disruptions dictated by ranks present in the second column

Table 4.6 presents those disruptions to continuity which Hull and Sheffield owner/managers perceive to be the most significant to their SME. In Hull, these disruptions consisted of EWEs (50.0% of owner/managers), economic downturn (46.3%) and loss of telecommunications/IT (45.0%). In Sheffield, the most significant disruptions

were believed to be loss of telecommunications/IT (52.0%), EWEs (43.0%) and economic downturn (33.3%). These results show that for Sheffield SME owner/managers, there is another risk that is perceived to be more significant than flooding, loss of telecommunications/IT. The higher ranking of EWEs (including flooding) also means the threat of flood to SMEs is believed to be more significant in Hull than in Sheffield.

One broad strategy used to explain and understand perceived risk is to develop a “*taxonomy for hazards*” (Gärling and Golledge, 1993, p225; Marsch *et al.* 2007, p195-203). The most common approach to developing a taxonomy employs the “*psychometric paradigm*” (Slovic, 1987, p6). Within this approach, people make judgements about the current and desired ‘riskiness’ of different hazards (Hassan, 2004, p13). Accordingly, risk is seen as inherently subjective relating to individual and personalised perspectives. Some owner/managers are averse to some hazards and indifferent to others. Yet, both Fischhoff *et al.* (1978, p128) and Slovic *et al.* (1980, p75) argue that a number of factors influence idiosyncratic perceptions.

People use the ease with which examples of a hazard such as those in Figure 4.2 can be brought to mind as cues for estimating the probability of risk (Tversky and Kahneman, 1982, p176). Past experiences can impact upon the perception of potential disruption (Halpern *et al.* 2001, p121). A continued preoccupation with an outcome, perhaps due to a previous event, may increase its perceived likelihood (Tversky and Kahneman, 1982, p178). In regards to the significance of flooding, Siegrist *et al.* (2006, p977) state that people who can remember flood events perceive the risk as great. Furthermore, flood risk must be reinforced otherwise people’s perception of the likelihood of an adverse event is reduced (Tversky and Kahneman, 1982, p229). Within Hull and Sheffield, it can be suggested that those disruptions perceived to pose the largest threat to SMEs are those that occur more frequently or are recent events.

In order to examine whether past experience influences SME owner/manager risk perceptions, the 18 disruptions were ranked in regards to percentage of SMEs who experienced each one. These ranks were then compared with the ranks of the percentage of SMEs who perceive that each disruption experienced would impact upon their business (Table 4.7). Given previous evidence, it is unsurprising to find that those disruptions which are experienced the most are perceived to cause the biggest threat. This finding supports claims made by Greening *et al.* (1996, p28), Siegrist and Gutscher (2006, p942) and Ho *et al.* (2008, p640): perception is influenced by actual events. It also suggests that the perceived threat of flood is more significant amongst Hull SME owner/managers as they are more preoccupied with the risk and experience it more frequently (Table 3.1,

p60). Yet, some people may be more afraid of flooding than is justified by the facts and so overstate the risk of flooding and other disruptions (Siegrist and Gutscher, 2006, p977).

	Hull		Sheffield	
	Impacted % of SMEs (Rank)	Perception % of SMEs (Rank)	Impacted: % of SMEs (Rank)	Perception % of SMEs (Rank)
Extreme Weather Event	1	1	1	1
Economic Downturn	2	2	2	2
Loss of Telecommunications/IT	3	3	3	3
Criminal Actions	4	6	5	4
Reduction or Change in Customer Demands	5	7	8	5
Loss of Electricity/Gas	6	11	4	11
Staffing Issues	7	8	5	9
Transport Disruption	8	5	9	8
Supply Chain Disruption	9	4	10	5
Loss of Access to Site	10	14	7	14
Accessing Finance	11	9	11	10
Loss of Water/Sewage	11	15	12	15
Health and Safety	11	11	13	13
Loss of Competitive Advantage	14	16	14	16
Fire	15	10	15	7
Industrial Action/Pressure Group	16	11	16	12
Damage to Reputation	17	17	17	17
Terrorist Damage	18	18	18	18

Table 4.7: Percentage of SMEs impacted by each disruption compared with percentage of SME owner/managers who believe that each disruption above would impact upon their business (Ranked)

Note: Order of disruptions dictated by ranks present in the first column

The BCM survey also looked at perceptions by asking respondents which disruptions they believe would impact their organisation (Woodman and Hutchinson, 2011, p10)(Table 4.8). For the UK, loss of telecommunications/IT (67.0% of owner/managers), access to site (56.0%) and staffing issues (53.0%) were viewed to be the top three disruptions. In Hull and Sheffield, EWEs were seen as having the largest and second largest potential risk. This disruption ranked eighth for the UK. Other disparities were also recorded. Loss of access to site, the second highest perceived risk for the UK, ranked only eleventh in Hull and tenth in Sheffield. And fire, the fourth highest perceived risk in the UK, ranked eighth in Hull and ninth in Sheffield.

	UK	Rank	Hull	Rank	Sheffield	Rank
Loss of Telecommunications/IT	67.0	1	45.0	2	52.0	1
Loss of Access to Site	56.0	2	2.5	11	3.5	10
Staffing Issues	53.0	3	13.8	4	11.7	3
Loss of Electricity/Gas	51.0	4	15.0	3	11.1	4
Fire	51.0	4	5.0	8	4.7	9
Damage to Reputation	51.0	4	1.3	13	0.0	13
Extreme Weather Event	45.0	7	50.0	1	43.0	2
Terrorist Damage	43.0	8	0.0	15	0.0	13
Criminal Actions	42.0	9	7.5	6	7.0	7
Loss of Competitive Advantage	42.0	9	6.3	7	8.2	5
Loss of Water/Sewage	36.0	11	1.3	13	2.3	11
Transport Disruption	35.0	12	10.0	5	5.9	8
Supply Chain Disruption	34.0	13	5.0	8	7.6	6
Health and Safety	31.0	14	3.8	10	0.0	13
Industrial Action/Pressure Group	27.0	15	2.5	11	0.6	12

Table 4.8: Percentage of SME owner/managers who believe each disruption would impact upon their business (Comparative)

Source: Woodman and Hutchings, 2011 in combination with Original Research Data

Note: Order of disruptions dictated by ranks presented in the second column

In order to conduct a fairer comparison and see if these findings are representative, these ranks should be compared with the same variables when measured in Yorkshire. Statistics representing regional risk perceptions are currently not available. Therefore comparisons cannot be made. However, if this data were available, issues would surround the applicability of these regional findings to local circumstances. Nevertheless, the disparity in findings between the UK, Hull and Sheffield can have serious implications for individual and regulatory body resilience as shall be explored in Chapters Six and Seven. It is also important to bear in mind that how an owner/manager views a flood can change over time. This chapter will now use a further case study to briefly explore the stages of a flood disaster, SME responses and how perception changes after an experience.

4.6. DISRUPTION TO CONTINUITY: A CASE STUDY

Quadesha is the manager of Company Q. Established in 1952, Quadesha's SME was created in response to the opening of a large chain store pharmacy in Sheffield. Due to the perceived competition this would generate between chemists, and perhaps the demise of micro-sized chemists who could not actively compete, all the independent pharmacists from the Wicker suburb chose to amalgamate and create one medium-sized SME. Today, Quadesha manages 75 members of staff who work within one the most prosperous health sector enterprises in the city. Company Q's premises are situated next to the River Don in

an area categorised by the Environment Agency as being at high risk of flooding. As such, Quadesha revealed that her company was severely disrupted during the 2007 flood.

Prior to these events, flooding was not perceived by Quadesha to be a significant risk: *“Before 2007 we didn’t expect to flood. I probably would have said it wasn’t a risk. We’d been told we were in a flood area but we didn’t believe it...it had never flooded”*. Floods were also not seen as a risk to the city: *“I didn’t think the whole of the city centre would be underwater”*. Such views led Quadesha to have no real mitigation measures in place to cope with the occurrence of a flood: *“I’d put our names down for the early warning of a flood, but that was it”*. Naturally, when the floods occurred they caused a large impact.

Quadesha spoke at length about the effects the flood had upon her businesses. In support of the previous findings, they related to business operations being interrupted or halted in some form. For Quadesha, the 2007 flood meant discontinuity to the order of business.

“The disruption was massive...Staff were stuck here and had to be rescued...We had an inch of water in the buildings which when it receded left stinky mud in the shop...it was shut for ten days because it is not safe for our vulnerable customers. The other part of the business was closed when we were underwater, so [closed for] seven hours...We had no power for five days...Customers couldn’t get to us...We couldn’t receive deliveries.”

2007 flood impacts: Quadesha, Company Q (Sheffield)

A lack of prior mitigation measures resulted in Quadesha’s management of the flood being very reactive. With no standard procedure to follow, and as *“there wasn’t even any warning of the flood”*, decisions were made ‘in the heat of the moment’ as and when an issue arose.

“We got wheelchair users who work in the mobility shop sent home immediately...They [the rest of the staff] sorted out our computer system...They switched off the electricity where we could...They lifted chairs up on desks...Unbelievably we managed to use incontinence pads to protect a lot of areas...we arranged for staff who couldn’t get home...to either stay at the Inn or stay at other staff members homes...”

Perception of the sources of flooding: Quadesha, Company Q (Sheffield)

Following the initial management of the situation, and once the waters had receded, the immediate recovery focused upon resuming some form of continuity to the order of business as quickly as possible, by any means. The pharmacy was cleaned to an

acceptable standard where they could *“serve customers through one little clean area”* the day after the flood. The other part of the business re-opened ten days later. This demonstrates the flexibility and ‘personalised’ touch of SMEs: they will do anything in order to provide a service to their customers. Longer term, recovery related to ‘getting back to normal’; normal being when the business experienced continuity and was running as it should: *“It took a really long time...It took four weeks just to get the loss adjusters in...You couldn’t get anybody [builders] in because everybody was flooded so they were busy...It probably took us about six to eight months to totally recover”*.

During and after the flood, Quadesha remarked that the relief and assistance available was highly variable. *“The firemen, unbelievable, fantastic, brilliant, and the policemen. But once that emergency help stopped, advice was absolutely non-existent”*. In regards to financial assistance, Quadesha stated: *“Yorkshire Forward had some grants and we claimed everything we could on that...You could also reclaim business rates for the time that you were closed but I only found out accidentally months afterwards...But what we got on the insurance wasn’t even close to how much it actually cost us”*.

Following the above experience, Quadesha’s perception of flooding today is very different to that held before 2007. Not only does she think *“it is a serious risk”*, following this and other instances of flooding from a variety of sources, Quadesha’s perception now conforms to some of the conclusions drawn in section 4.2:

- A. Flooding is primarily viewed as causing discontinuity to the order of business: *“the disruption was massive”*.
- B. Flooding is defined as the presence of water from any anthropogenic or natural source, wetting contents/premises in an area that is usually dry: *“There’s several problems here for flooding...burst water mains...river flooding...flash flood...heavy down pours and drains not being large enough...the cellar was completely flooded, we had an inch of water in the buildings”*.
- C. Flooding is now perceived to be a significant risk to her SME: *“flood and fire are our two biggest risks”*.

In conclusion, Quadesha and Company Q demonstrates that an SME experiences a number of stages during a flood event. Before the flood occurs, there is a period in which individuals are forming their flood perceptions. These can be influenced by a number of different variables including previous experience, local knowledge and ethnicity (Vaughan and Nordenstam, 1991, p31; Kevinson, 1993, p189; Burningham *et al.* 2008, p228). These

perceptions largely determine whether mitigation measures are installed before a flood occurs (Soanne *et al.* 2010, p4).

As a flood materialises, Company Q highlighted that for some SMEs the way in which an owner/manager responds to whatever problems are occurring is highly reactive. Owner/managers do all that they can to continue to provide a service and reduce the impacts and damage a flood causes their SME. The level of discontinuity caused will ultimately relate to their level of preparedness beforehand and the type of industry they operate in (Gordon and Richardson, 1992, p90). As the water recedes, attention turns to recovery, continuity and 'getting back to normal'. Once recovered an owner/managers definition of 'normal' may not be the same as it was before the flood. Experiencing a flood event can drastically alter an individual's flood perception, usually for the better; they will recognise the risk (Harries, 2012, p330). Accordingly, SME owner/managers may be inclined to implement flood mitigation measures following their experience. This results in an SME being less vulnerable or more resilient to any future floods. This finding supports the work of Roberts (1994), Henderson (2003) and Ritchie (2004), who all propose a "*model of disaster lifecycle*". This cycle consists of two phases occurring prior to the disaster and four after. These stages are: (1) Pre-event, (2) Prodormal, (3) Emergency, (4) Intermediate, (5) Long-term (recovery) and (6) Resolution (Beeton, 2006, p166). Primarily designed for the occurrence of a disaster within the tourist industry, all of these stages were demonstrated by Company Q, and promotes that for SMEs a flood can lead to a positive outcome: anti-flood mitigation measures.

4.7. AN SME DEFINITION OF FLOOD

This chapter demonstrates that SME owner/managers in Hull and Sheffield define flooding in two main ways:

1. Flooding is a risk that possesses unique characteristics: the presence of water in an area that is usually dry, wetting contents.
2. Flooding is an agent of discontinuity. It is just one in a package of risks that causes disruption to the order of business. Therefore owner/managers are concerned with any event that interferes with the fulfilment of their primary aim: to make a profit and provide a service.

Chapter Three demonstrated that from the social science perspective the regulatory bodies of Hull and Sheffield 'measure' the risk of flooding in these cities to be significant. On the contrary, within the business practice approach SMEs are impacted by

and view different risks to be more significant than flooding. Significance can be calculated using four variables:

1. Level of disruption caused: The higher the level of discontinuity, the higher the significance of the hazard. If a flood causes an SME a large amount of disruption, it will be seen as an important risk. If an alternative hazard causes a larger amount of discontinuity, that risk will be seen as more significant. Level of discontinuity experienced is not constant. It is affected by the characteristics or vulnerability of an SME. For flooding, it was industrial sector which had the largest influence upon level of disruption caused during a flood.
2. Number of occurrences: SME owner/managers are primarily concerned with those hazards that occur the most often (the most significant). As floods do not regularly occur, different risks are seen as more significant by Hull and Sheffield owner/managers.
3. Percentage of SMEs impacted: The higher the number affected by a hazard, the more significant the risk. In this instance, as floods have widespread and far reaching impacts, they can be seen as a significant hazard to an SME.
4. Reflected in perceptions: Owner/managers are concerned about some risks, yet indifferent to others due to the influence of past experience, local knowledge and other variables. In terms of perception, flooding was not seen as the most significant risk to threaten an SME.

The significance of flooding to an SME owner/manager can influence how it is responded to and the mitigation measures employed. This will affect the overall resilience of an SME, the continuity of their business to the occurrence of any disruption and regulatory body flood risk management policies. As such, the next chapter outlines how SME owner/manager perceptions of flooding influence SME flood resilience measures.

5. SME FLOOD RISK PERCEPTION: WHAT DOES IT MEAN FOR FLOOD RESILIENCE?

5.1. INTRODUCTION

The ability of an SME to sustain key business procedures during a flood is fundamental to their own and community resilience (Paton and Hill, 2006, p256). As a result, resilience is an important aspect of business continuity. Responsibility for resilience lies partly with SME owner/managers. Perception of risk influences how it is responded to (Paton and Johnston, 2001, p274). Therefore, this chapter aims to:

- A. Outline how perceptions of flooding influence an SME owner/manager's choice to make their SME resilient to flooding.
- B. Understand how perception of flood influences the type of resilience measures implemented.

These aims were chosen with a view to comparing SME owner/manager and regulatory body perceptions, resilience measures and their implications in Chapters Six and Seven.

5.2. SME FLOOD RESILIENCE

Within business practice, resilience is defined as “*an organisation's ability to successfully adjust to the compounded impact of internal and external events over a significant time period*” (Sundström and Hollnagel, 2007, p235). Owner/managers look towards adopting measures that will protect their business, and procedures which will ensure continuity to the ‘order of business’. They can address flood through generic business continuity measures and property-level protective strategies, using both structural and non-structural methods (Dawson *et al.* 2011, p628; Wedawatta and Ingirige, 2012, p5). In Hull and Sheffield, a relationship exists between risk perception and the type or level of preparedness: how an owner/manager views the risk of flooding influences whether they approach this risk through business continuity measures alone,

or a synthesis of continuity measures and property-level protective strategies. This chapter will now explore each of these options in turn. It will:

- A. Provide a brief outline as to what both business continuity and property protection measures entail.
- B. Provide case study examples of Hull and Sheffield owner/managers who have implemented either continuity or protection.
- C. Investigate the variables which influence whether the option being discussed is utilised.

5.3. BUSINESS CONTINUITY

An SME's primary goal is maintaining operations during a disruption. Organisational continuity is an important quality of SMEs as it is critical for survival (Lee and Harrauld, 1999, p184). Demand has emerged for 'all-inclusive' integrated risk management strategies that aid continuity rather than risk-specific property-level measures (Shaw *et al.* 2004, p1; Crichton, 2006, p29; Wedawatta *et al.* 2011, p6). The adoption of an 'all-hazards' approach greatly increases the overall resilience of an SME, especially when compared to an SME being resistant to some risks, yet susceptible to others (Paton and Hill, 2006, p277; Jüttner, 2005, p128).

For business of all sizes, planning for a risk is as important as planning for growth and success (Herbane, 2010, p44). Business Continuity Management (BCM) is the *"planning and resourcing of discontinuity prevention and management activities within an organisation"* (Herbane *et al.* 2004, p437). Business Continuity Plans (BCP)(Herbane *et al.* 2004, p435), Disaster Recovery Plans (Smith and Elliot, 2007, p519), Risk Analysis (Swartz *et al.* 1995, p16) and Crisis Management (Pearson and Clair, 1998, p59) are just some of the titles given to BCM strategies. However, they all operate under the same principle: to document a collection of procedures which *"ensure the recovery in an acceptable time frame of the business as a whole following an incident which causes major disruption to business operations"* (Smith and Sherwood, 1995, p15). To be effective, a comprehensive BCP must embrace a wide range of risks (Savage, 2002, p255). Therefore integrating flooding into contingency planning is a new challenge facing many SMEs (Jones and Ingirige, 2008, p440).

Anticipating the occurrence of any discontinuity can make it less traumatic and costly if it occurs (Spillan and Hough, 2003, p398). Organisations that have a BCP can recover twice as quickly as those SMEs without predetermined procedures, as the longer

an SME is shut, the less likely it will be to reopen (Fink, 1986, p98; Cerullo and Cerullo, 2004, p70). An effective BCP can also influence social resilience by contributing to the economic vitality of an area and maintaining employment levels (Paton and Hill, 2006, p256). Disruptions are often devastating to SMEs and lead to negative outcomes (Carmeli and Schaubroeck, 2008, p178). The execution of a well-developed BCP can even turn a crisis into an advantage (Burnett, 1998, p479; Faulkner, 2001, pp137-138). For example, if all competitors are closed due to an event, the SME that remains open can maintain or gain competitive advantage: the use of BCP leads to a quicker recovery time. Customers unable to purchase goods or services from a company that previously had a distinct competitive advantage will often turn to any available substitute or even choose inferior goods (Vitez, 2013, online). The potentialities of this situation can only be achieved if BCPs are regularly tested, updated and not *“left on the shelf”* (Lam, 2002, p19; Savage, 2002, p254). Moreover, the changing nature of disruptions means flexibility and continual monitoring is required to design and implement effective strategies to deal with change (Ritchie, 2004, p673).

It is not possible for owner/managers to anticipate all problems in advance (Weick *et al.* 1999, p32; Weick and Sutcliffe, 2001, p98). A BCP may not include every discontinuity that has the potential to befall an SME. This can leave them exposed to certain risks. A BCP's usage can lead to a *“healthy self-image, positive self-regard and over confidence leading to a false sense of security”* (Kohut, 1971, p192; 1977, p239; Howlin and Ezingard, 2005, p3). Some owner/managers do not understand what it means to have an effective plan in place, leaving some SMEs better able to respond to a disruption than others. Furthermore, there is ‘no one-size fits all’ in regards to BCP due to variations in business size and industry. In addition, BCPs do not address the fact that no disaster ever happens how it was planned for (Mitroff and Kilmann, 1984, p97; Fink, 1986, p70). Scholars such as Elliot *et al.* (2010, p123) maintain that if a BCP is effectively written, then it will be non-specific in regards to responses. This will allow a BCP to be used by any SME during the occurrence of any disruption, even if it occurs in a way that was not previously considered. Given this advantage, Hull and Sheffield demonstrate that continuity measures are a popular way for SMEs to respond to the risk of flooding.

Sam has been the owner and manager of Company S since its inception in 1995. With 38 employees, this medium-sized health sector business generates an annual profit of £900,000. Sam's company is located in Nether Edge, Sheffield. Located on a hill, he believes his company *“will never be flooded”*, and has decided not to install flood resistance and resilience measures (those measures specifically designed to protect a property against flooding). However, Sam revealed that he had *“the biggest fright with the floods”*. If a nearby dam had breached, *“it would have had a massive impact”*. The company would

have lost their heating and electricity. As a result, Sam is concerned about the indirect discontinuity a flood may cause to his operation, and what would happen *“if something occurred outside of our control”*. He is anxious about the thought of any interruption to his SME’s operations. Consequently he has chosen to include his response to flooding alongside procedures designed to respond to other risks within a BCP. Sam is going to ensure that he is not *“beholden to anything that is beyond control”*.

“I try to consider all the things that would impact upon the business, not just flooding...We are responsible for the welfare of vulnerable adults who call this building a home...We really have to plan to make sure we could carry on running our business in the face of any adversity...So we have a disaster recovery plan...We have disaster recovery for all types of risk...We have to have ways of getting round problems...including hiring a generator...an evacuation plan and an arrangement with another home.”

Business Continuity: Sam, Company S (Sheffield)

Sam is not alone in employing BCPs to tackle flooding. *Tom* is the manager of Company T, a successful supplier of amenity services located in Sutton, Hull. Established in 1975, today Company T employs 27 people. Tom’s SME has experienced flooding on a number of occasions, including 2007. The nature of their business, which entails driving across the city, and the physical design of their property, an outside storage yard for large vehicles, means that flood-specific resistance and resilience is not a practical option. Tom believes *“there is always a risk that something could happen out of the blue”* to cause a disruption. Accordingly, his SME has *“systems in place should anything happen”* to ensure continuity, including during a flood.

5.3.1. UNDERSTANDING SME RESILIENCE: BUSINESS CONTINUITY

A worldwide survey discovered that 82.0% of businesses had a BCP in place, and 36.0% had made business continuity a top funding priority (Ernst and Young, 2011, p39). BCPs are a popular response to disruptions across the globe (Castillo, 2005, p14), but are they a common response to flooding for the SMEs of Hull and Sheffield?

Within the study cities:

- 12.0% of owner/managers stated that they were extremely prepared to cope with the occurrence of a disruption.

- 60.8% were moderately prepared.
- 72.6% claimed they had an effective BCP in place.

In Hull, 75.0% claimed to have a BCP in place. In Sheffield this figure was 69.8%. A comparison with other regions shows these figures as remarkably high, perhaps due to the 'hazardousness' of Hull and Sheffield. Ingirige and Wedawatta (2012, p274) found that within London only 10.0% of SMEs had a BCP in place. For Aviva (2011), this figure rose to 37.0% for London. On a nationwide scale, Aviva (2011, online) maintain that the number of SMEs with a BCP is 28.0%. Yet Woodman and Hutchins (2011, p4) purport that nationally 58.0% of SMEs have a BCP. This range in findings raises issues over the applicability of nationwide figures. In some instances, the sample size is unknown or the context of the questioning unclear. This can lead to the generation of results that are inaccurate, not valid and misrepresentative. Any anomalous results experienced at a national scale can skew overall averages, again affecting the validity of findings. These limitations raise questions over how representative national surveys are of regional variations, and whether they can be applied to other locations.

Many national surveys and scholars make assertions as to why owner/managers choose to implement BCPs. For Williams and Geddis (2010, p17), owner/managers will only implement BCPs if they feel their SME is at risk. As already outlined, risk perception refers to the intuitive risk judgements of individuals and social groups in the context of limited information (Slovic, 1987, p2). These judgements vary due to different levels of uncertainty, information gathered and intuitive behaviours (Messner and Meyer, 2005, p156). SME owner/managers assess the risk of a disruption occurring differently, and risk perception is viewed as a process of transforming input (disruption knowledge) into output (mitigation measures) (Wilson, 1990, p59; Burn, 1999, p3451). If disruption perception is low amongst SME owner/managers, they are unlikely to implement protection as opposed to those who are well aware of the threat (Baan and Klijn, 2004, p114).

On a national scale, 84.0% of owner/managers believe they need a BCP and 82.0% assert that BCPs are very important (Aviva, 2011, online; Woodman and Hutchins, 2011, p8). In Hull and Sheffield, 75.9% of owner/managers were concerned with the occurrence of a disruption, and 36.2% judged their SME as exposed. To be specific, the owner/managers of Hull and Sheffield showed little difference in their level of concern. In Hull, 71.6% of owner/managers were concerned with the occurrence of a disruption, and 33.8% believed their SME was exposed. In Sheffield, these figures were 77.4% and 38.8%. Given the large percentage of concern over the materialisation of a disruption, and with

three in four owner/managers utilising BCPs, it seems likely that the implementation of a BCP can be attributed to owner/manager disruption concern.

A research hypothesis was proposed that there is a significant statistical correlation between disruption concern and having a BCP in place. As both the dependent variable (the presence of a BCP) and the independent variable (disruption concern) were categorical or nominal in nature, a Chi² test of independence was adopted to explore the hypothesis. A Chi² test is used to compare the distribution of data which has been obtained, with how the data is expected to be distributed according to a theoretical situation (Peat *et al.* 2008, p32). The larger the difference between the observed and expected distributions, the more likely the relationship is to be statistically significant (Peat *et al.* 2008, p33). As with the Kruskal-Wallis test and Mann-Whitney U tests, a Chi² test also yields a *p-value*. This value needs to fall below 0.05 in order for a significant relationship to exist. The Chi² test conducted between disruption concern and having a written BCP generated a *p-value* below the significance level of 0.05 (n=227, df=2, p=0.039). Thus a statistically significant relationship exists: if an owner/manager is concerned, they will implement a BCP. However, Jüttner *et al.* (2003, p13) assert that perception of risk does not always lead to mitigation.

Many academics assert that concern for disruption is generated by experience (Dahlhamer and D'Souza, 1997, p4; Berkes *et al.* 2003, p158). While the validity and personal relevance of second-hand information is open to question, people more readily trust the evidence of their senses (Whitmarsh, 2008, p5). The presence of this "*availability heuristic*" means the perceived likelihood of a risk increases if it has been experienced or can be readily imagined (Keller *et al.* 2006, p631). Disaster awareness peaks during and immediately after a disaster, but rapidly dissipates between disasters (Stefanovic, 2003, p230). For Spillan and Hough (2003, p399), experience of potential failure is required for SME owner/managers to take steps to increase their resilience. Fink (1986, p67) discovered only 42.0% of SMEs that had suffered a disruption in the past had BCPs. Woodman and Hutchins (2011, p19) found that 38.0% of SMEs who have a BCP actually network with other/owner managers who have previous discontinuity experience.

In Hull/Sheffield, 50.4% of owner/managers believe experiencing a disruption stimulated them to put back-up plans in place. A further, 45.0% stated that disruption experience led them to change existing plans. A Kolmogorov-Smirnov test failed to find a normal distribution between disruption experience and BCP implementation. Therefore, due to the presence of nominal and ordinal data, a Kruskal-Wallis test was applied. This test found no statistical relationship between SME disruption experience and BCP implementation (n=234, $\chi^2=0.13$, df=5, p=0.13). These figures and the lack of statistical

relationship means a certain amount of doubt can be raised over the influence of personal experience as a driver for BCPs in regards to simply witnessing an event. Despite the acknowledgement by scholars such as Dahlhamer and D'Souza (1997, p7), other variables must contribute to an owner/managers decision to implement BCP. For Yoshida and Deyle (2005), Ingirige *et al.* (2008) and Pal *et al.* (2012), these variables relate to the individual characteristics of an SME such as access to finance, size and industrial sector.

For some owner/managers, encompassing the risk of flood within a BCP is a 'cheaper' option due to the expense of flood resistance and resilience measures. SME owner/managers like Sam still need to approach a BCP *"from a financial point of view"*. Finance influences BCP implementation. As non-revenue projects, BCPs do not qualify as high priority for some SMEs (Weems, 1999, online). In addition, some continuity solutions may prove expensive to an SME (Hurwicz, 2000, p44). Given the limited annual income of SMEs and available finance, a BCP must be in line with an organisations budget and *"plans must be cost effective"* (De Luca, 1996, p21; Beckmeyer, 2001, online). Nationally, 7.0% of SMEs choose not to implement BCPs due to their price (Woodman and Hutchins, 2011, p16). Once again, these two variables were not normally distributed as discovered by a Kolmogorov-Smirnov test. Moreover the use of categorical and ranked data meant a Kruskal-Wallis test was applied. However, in Hull and Sheffield this test found no statistical relationship between annual turnover and those SMEs that have a written BCP as the *p-value* yielded is above 0.05 ($n=172$, $\chi^2=11.642$ $df=11$, $p=0.391$). This suggests that, although asserted by reports such as AXA International (2011, p25), a relationship between BCP usage and SME turnover is not applicable to the case studies. The amount of finance available for an SME to spend on continuity can be dependent upon the company's size (Deakin and Hughes, 1997, p152). As such, AXA International (2011, p25) and Spellman (2011, p103) purport that the size of an SME can also influence an owner/managers decision to utilise BCPs.

For many, SME size will always be a deciding factor in regards to BCP implementation (Edwards, 1994, p40; Dolten, 1996, p1xiv; Wold and Vick, 2000, p32). Nationwide, larger organisations are three times more likely to have a BCP than micro-sized businesses (Woodman and Hutchins, 2011, p6). This is a perception shared by some owner/managers including Sam: *"smaller companies wouldn't probably have them in place"*. The use of BCPs amongst micro-sized and small-sized enterprises can be more important and advantageous than implementation in larger organisations (Beckmeyer, 2001, online). Due to their characteristics, such as a lack of resources, SMEs are deemed to be more vulnerable to disruptions than larger organisations (Levy *et al.* 2005, p19). However, smaller organisations promote individual resourcefulness and their staff

expertise maybe far more wide ranging than the workforce of a larger organisation (Barrow, 1993, p98). This allows the performance of a wide variety of tasks, including the formulation of BCPs (Johnson, 2002, p1xiv).

Given these advantages, it is unsurprising to find that in Hull and Sheffield an inverse relationship exists between BCP usage and SME size (Table 5.1):

- Micro-sized businesses (0-9 employees) were four times more likely to implement BCPs than medium-sized enterprises (50-250 employees).
- Of all the SMEs using a continuity plan, 53.6% were categorised as micro-sized. This is in contrast to the 13.4% of medium-sized companies with continuity plans.

Very similar results were found when Hull and Sheffield were looked at in isolation (Table 5.1). As both variables consisted of categorical data, a Chi² test was used to examine whether this relationship was statistically significant. Despite its academic recognition, and the visible trend in Table 5.1, the *p-value* yielded was above the significance level of 0.05. A statistical relationship between SME size and BCP implementation therefore does not exist in Hull and Sheffield (n=246, df=2, p=0.36). An SME's size is not the only characteristic possessed which can affect resilience to disruption. Academics such as Herbane *et al.* (2004, p442) and Yoshida and Deyle (2005, p1) maintain that the industry in which an enterprise chooses to operate can also influence BCP implementation.

		Percentage of all SMEs with BCPs		
Size	Turnover	Combined	Hull	Sheffield
Micro (0-9 employees)	≤ €2 million	53.6	50.0	55.5
Small (10-49 employees)	≤ € 10 million	33.0	33.3	32.8
Medium (50-250 employees)	≤ € 50 million	13.4	16.7	11.7

Note: Questionnaires returned with no number of employee data were omitted from calculations

Table 5.1: Influence of size variable upon BCP implementation (Hull and Sheffield)

Source: Original data

During interview, Sam commented that as they *“are responsible for the welfare of vulnerable adults...they have a small window of opportunity to put things right”*. The nature

of their SME dictates their need for a BCP; with BCPs more abundant in certain industries. The UK is characterised by zones of specific types of industry which are tied to certain locations. The M4 corridor is home to a large number of 'high-tech' business parks, Grimsby is famous for its fishing industry and London is known as the 'financial capital'. The economies of Hull and Sheffield are predominantly fuelled by the production and manufacturing sector. Therefore, it is unsurprising to find that the highest number of SMEs who reported to have a BCP fell within this category (12.5%)(Table 5.2).

Industrial Sector	Percentage of All SMEs with BCPs		
	Combined	Hull	Sheffield
Production/Manufacturing	12.5	10.0	13.8
Professional, scientific and technical	10.8	10.	11.2
Construction	9.7	10.0	9.5
Education	8.5	13.3	6.0
Public administration and defence	7.4	6.7	7.8
Finance and insurance	6.8	1.7	9.5
Wholesale	6.3	5.0	6.9
Arts, entertainment, recreation and other services	5.7	6.7	5.17
Property	5.7	5.0	6.0
Retail	5.7	6.7	5.2
Information and communication	4.5	10.0	1.7
Accommodation and food services	3.4	3.3	3.4
Amenities	3.4	3.3	3.4
Transport and storage (including post)	2.8	3.3	2.
Health	2.3	1.7	2.6
Business administration support and services	1.7	1.7	1.7
Charity	1.7	1.7	1.7
Motor Trades	1.1	0.0	1.7
Agriculture, forestry and fishing	0.0	0.0	0.0

Note: Questionnaires returned with no industrial sector data were omitted from calculations

Table 5.2: Influence of industrial sector upon BCP implementation (Hull and Sheffield)

Source: Original data

Note: Order of industry dictated by percentages present in the second column

This finding was also present in Sheffield. Of all the SMEs who have a BCP, 13.8% were included within the production and manufacturing sector. In Hull, 13.3% of all the SMEs with a BCP fell within the educational sector. In fact, Hull and Sheffield demonstrate a number of differences in the percentages of SMEs with a BCP present in each industrial sector:

- In Hull, 10.0% of those SMEs with a BCP fell within the information and communication sector. In Sheffield this figure was only 1.7%.
- In Sheffield, 9.5% of SMEs with a BCP were categorised as finance and insurance. In Hull this figure was 1.7%.

The predominant explanation for these findings links to an over-representation of these particular sectors in the study cities. A large number of information and communication SMEs are located in Hull, and a large number of finance and insurance SMEs are located in Sheffield (ONS, 2011b). It is consequently unsurprising to find these sectors representing a large proportion of all SMEs who implement BCPs within the cities. The variation between Hull and Sheffield can also account for why a Chi² test implemented to examine the relationship between industry (categorical data) and BCP usage (categorical data) in Hull and Sheffield showed no correlation ($n=237$, $df=17$, $p=0.575$). The p -value was higher than the significance threshold of 0.05. Again, due to the fact that certain sectors are over-represented in different locations, it is unfair to compare Hull and Sheffield to other cities in order to explore the generalizability of the results.

A further reason as to why a variation in industrial BCP usage exists between Hull and Sheffield is related to external bodies. Whether an owner/manager is required to implement a BCP by bodies external to their SME, such as customers or 'regulators', can be dependent upon their industrial sector (Gaddum, 2004, online; Woodman and Hutchings, 2007, p16). Tom remarks that *"unfortunately it has got a track record, our industry, of a lot of accidents...so it's part of the contractual requirements, they are asking the question what happens if?"*. Nationally, 12.0% of SMEs who did not have a BCP blamed a lack of an external driver for their predicament (Woodman and Hutchins, 2011, p16). In Hull and Sheffield, 37.7% of SME owner/managers stated that their suppliers, customers and/or partners require their company to have BCPs in place (42.3% in Hull and 35.1% in Sheffield). Yet until the implementation of a BCP becomes a legal requirement, some owner/managers will still 'take a chance' when faced with discontinuity.

For Webb *et al.* (2000, p5), activities that are less costly, uncomplicated and provide protection against a range of different disruptions are preferred over technically difficult and more expensive, time consuming efforts focusing specifically upon flood

resistance and resilience. An SME will survive only to the extent that it has a repertoire of responses at least equal to the array of challenges it experiences (Ashby, 1956, p250). A BCP can maintain business continuity following a flood, but it can only ever curtail adverse consequences and aid recovery processes. It only prevents or limits damage to a certain extent and does not stop water from physically entering premises: SME owner/managers must still implement flood-specific measures in addition to their BCPs.

5.4. PROPERTY-LEVEL PROTECTION

Floods possess unique characteristics; the presence of water ‘wetting’ contents or premises in usually dry areas. A BCP may incorporate protection schemes and processes to keep water at bay. Such protective strategies can reduce the impact and costs associated with floods (Wingfield *et al.* 2005, p8).

Temporary Resistance Measures	<i>Designed to increase the ability of a property to resist the entry of flood water</i> Sandbags, manually installed purpose built door guards/flood guards and air brick covers, sump/pump and remedial works to seal water entry points.
Permanent Resistance Measures	<i>Designed to increase the ability of a property to resist the entry of flood water</i> Raise door thresholds, raise damp-proof brick courses, permanent flood proof external doors, flood walls, automatic air brick and external flood render/facing, tanking/sealing floors, non-return valves, sump/pump and relocate.
Resilience Measures	<i>Designed to minimise the impact of flood water contact</i> Concrete/sealed floors, suspended floors, raise floor level, resilience tiles, dry line/resilient plaster, special draining system for cavity walls, lightweight synthetic internal doors, flood proof tanks, water sealed ventilation, resistant skirting boards, resilient windows and frames, resilient fixtures and fittings, raise electrics, place electrical appliances on plinths, locate stock, paper work and other valuable or irreplaceable items on shelves/upper levels.

Table 5.3: Packages of flood resistant and resilience measures employed by SMEs

Source: Adapted from ODPM 2003; Crichton, 2006; Kreibich et al. 2007a; Kenna, 2008; Thurston et al. 2008 and Whittle et al. 2010 in combination with Original Data

There are a variety of measures designed to prevent physical contact with flood water (Table 5.3):

- Resistance measures increase the ability of a property or area to resist the entry of flood water (Wingfield *et al.* 2005, p6; Ebi *et al.* 2006, p967). These measures can be both temporary and permanent in nature.
- Resilience measures minimise the impact of flood water contact, and allow an SME to recover easily from flooding impacts (De Bruijn, 2004, p53; Bowker *et al.* 2007, p9). The efficiency of these measures is realised when the inundation of flood water becomes unavoidable (Escameia *et al.* 2007, p249).

Ideally, in order for an SME to be able to cope with the occurrence of a flood, an owner/manager should install a combination of property-level flood-specific protection measures. SMEs require measures which will try to stop the inundation of their property with flood water (resistance). Should this fail, they need measures in place which will minimise the damage caused by the floods, and allow a quick recovery (resilience). The cost of these measures can become a barrier to their implementation (Table 5.4).

Annual Chance of Flooding (%)	Return Frequency (Years)	Resistance Measures		Resilience Measures	Resilient Repair
		Temporary	Permanent		
20	5	7.2	9.0	3.9	4.5
10	10	3.9	4.7	2.1	2.4
4	25	1.8	2.1	1.0	1.1
2	50	0.7	0.9	0.4	0.5
1	100	0.2	0.2	0.1	0.1

Note: A benefit ratio exceeding 1 represents a measure with overall benefit

Table 5.4: Economic benefit-costs ratios for the use of different mitigation measures – enterprises (adapted from Thurston *et al.* 2008, p8)

An SME's expenditure protecting a property against flooding may range from £2,000 to £40,000 (ABI, 2007, p5). Reducing the damage inflicted means less costly repairs and less time in which an SME is not providing a service or product. By employing a cost benefit analysis (Table 5.4), Thurston *et al.* (2008, p5) suggest that temporary measures are only economically worthwhile when protecting SMEs against a 1 in 25 year or more frequent flood return period. These measures can reduce total damage costs by between 47-53%. In areas frequently flooded, the benefits outweigh the costs by one to two. Permanent resistance measures reduce total damage costs by between 65-84%. Due to their expense, they are less cost-beneficial than temporary measures. With resilience, more permanent measures are less cost beneficial than resistance due to the higher installation costs.

The largest step an owner/manager can take to make themselves resistant and resilient to a flood is to move premises. To make this a cost effective measure, an SME must relocate to an area that is not exposed. In many countries, relocation is a common option (Chan, 1995, pp22-29). In Charleville Australia, 18.0% of SMEs have moved to higher elevations due to concerns about future flooding (Keogh *et al.* 2011, p17). In New Orleans, there are plans to relocate up to 120,000 inhabitants from areas that are only marginally protected from floods (Carbonelli and Meffert, 2009, p33). Relocation is based upon the voluntary actions of residents (Carbonelli and Meffert, 2009, p13): no government agency has the authority to force people to move (Warner, 2010, p410). SMEs are often situated in certain locales due to the presence of a number of factors including access to transport, staff and raw materials (Galbraith *et al.* 2008. P183-202). Relocation can affect an SME's ability to serve customers, receive deliveries or even operate in an identical manner (Keogh *et al.* 2011, p13). Resultantly, some owner/managers will not consider relocation as a practical option and will be required to adopt another form of defence.

Some owner/managers are active in utilising mitigation options while others are not depending upon personal preference (Wedawatta *et al.* 2011, p5). This section now presents two case studies demonstrating the resistance and resilience measures owner/managers have chosen to utilise, and their reasons for this choice.

Rachel is the director of Company R, a medium-sized enterprise employing eleven workers. Rachel's business has operated within the property sector since 1993. It is responsible for the management of an enterprise park in Chapeltown, a suburb located to the North of Sheffield. Situated in a valley to the South of Westwood Dam, Company R is sited on the floodplain of the Blackburn Brook. Rachel's SME was impacted in 2007 when they "*were flooded twice*" in two weeks. For Rachel, these experiences were "*very*

frightening as it all happened so fast". Her employees, *"just did what they could"* in order to prevent the floods causing too much damage. For Rachel, *"there is only so much you can do"*. Due to their lack of preparedness beforehand, and the little warning they received, they experienced widespread damage with consequences felt across the 16 acre site (Figure 5.1).



Figure 5.1: Flooding of the 16 acre business enterprise park owned by Company R

Source: *Rachel*, Director of Company R

"It was a very sad time...The gate house flooded so there was no security...The management office flooded; It just came in every door and was up to the top of the skirting boards...It flooded these buildings [points out the window]...Number Four Park Square, which is a managed building, suffered something dreadful. The water burst through those doors, swept away a big reception desk, swept away a big plant, brought in a grit bin and ended up to the top of those windows [two metres in depth]...The ground floor was uninhabitable for two months...It was a massive insurance claim."

Impacts of the 2007 floods: Rachel, Company R (Sheffield)

Company R owns all of the buildings within their site. These buildings are rented by other companies. Following the floods, Company R was required to respond in two ways:

1. Rachel and her colleagues needed to recover themselves as flood water had entered their offices premises.
2. They were responsible for the repairs and refurbishment of the other business premises they own. This was in order for the companies who occupied these premises to resume operations as quickly as possible.

Following the 2007 events, Rachel revealed that *“the fear of it happening again was unbelievable”*. Accordingly, steps were taken using resistance and resilience measures to ensure that *“the nightmare was never repeated”*.

“What we did was to clear all the trees and build a drain where the water goes under a tunnel and then there are three tiers...So if we have torrential rain the water is controlled...Not being content with that...we had a lot of spare land...So, what we’ve done is to clear and dig a big pond to collect all the rain water...Now we’ve got this massive drain down here, where the water will go into if it ever got bad again. We’ve got a trash screen which is cleaned weekly and hydro break unit within it so we should never ever flood again.

Property-level protection measures: Rachel, Company R (Sheffield)

When speaking of the flood, Rachel stated that *“the brook couldn’t manage the excess water so it came over the road...it flooded these buildings”*. The measures described above are designed to ensure the water from Blackburn Brook does not inundate dry areas in the future. Using their own finances, supplemented alongside *“money subsidised [provided] by the Environment Agency”*, large-scale alterations were made to a flood water storage pond which proved inadequate during 2007 (Rachel was not willing to divulge how much money had been spent on these measures). The pond was extended into adjacent land so that it now holds 27,000m³ of water (Figure 5.2). The concrete dam which overtopped was demolished and replaced with a pair of hydrobreaks which limit discharge to 6m/s⁻¹. Should this be exceeded, the pond will fill reducing the volume of flood water downstream. For the industrial estate, this scheme has achieved an increased level of flood protection. As the Environment Agency contributed, this work also enhances the quality of living for the wider community by providing a new fishing location alongside protecting residential housing. Additionally, although they have not contributed economically, now that the threat of flooding has decreased local residents will benefit financially as the value of their property will theoretically increase.

Rachel’s experiences in 2007 turned flooding into an identifiable hazard for Company R. The sheer scale of the damage caused to her premises, and the frequency of

the flooding (twice in two weeks), led her to realise that flooding was a significant threat to her company. These events have allowed Rachel to gain the awareness of the potential for flooding in the future. As such, her understanding aided her decision to take business continuity further and install the flood-specific resilience measures shown in Figure 5.2.



Figure 5.2: Company R's flood mitigation measures

Source: Own Photograph

Sheffield was not the only location where experience has resulted in SMEs implementing large-scale flood-specific resistance and resilience measures. Within Hull, *Mike* is the manager of Company M, introduced in Chapter Four. Holding this position since its establishment in 1993, Mike is responsible for ensuring the smooth operation of this small-sized business. His SME employs ten workers and serves the entertainment and recreation sector. It also occupies a large piece of land in Willerby. Despite being situated away from extraneous flood sources, Company M is vulnerable to pluvial, ground and surface water flood events. This is due to the SME being sited on an aquifer within the River Humber floodplain. As such, Mike revealed that they repeatedly *“had a problem with water on the course”*, meaning resistance and resilience was required.

"There have been areas where sumps have been fitted...We've dug drains to alleviate drainage problems...What happened before the flood was that our main dyke used to go straight through the middle of the course, under the houses and then come out in a small drain at the other side, but it was such a small drain. It was like draining a bath through a straw. So what we did was to divert the dyke into this lagoon here. So we've extended, deepened the dyke and the lagoon so that they both hold more water"

Property-level protection measures: Mike, Company M (Hull)

As noted previously, Mike's perception reflected the notion of floods possessing unique characteristics. A large drain *"overtopped"* meaning dry areas became like a *"sea of water"*. The permanent resistance measures implemented were designed to stop water accumulating within the grounds of their premises. Sump pumps were fitted, drainage systems were improved, a large dyke and pond have been extended in order to hold more water before overflowing and a flood containment mound has been proposed. Mike asserts: *"the chances of being flooded again is certainly a lot less than if we hadn't made these changes"*. As with Company R, these measures provide indirect protection for other commercial and residential properties by *"controlling the water and letting it go without flooding all the houses"*.

Mike's prolonged experiences with flooding led him to believe that the presence of water on his premises will continue to be an issue into the future. He perceives the risk as extremely significant. He therefore took his business continuity plan further by implementing flood-specific mitigation measures. Regardless of the benefits, not all SMEs have the option to implement large-scale resistance or resilience measures (Bosher *et al.* 2009, p16). Nor are all owner/managers as active as Rachel and Mike in using mitigation options (Wedawatta *et al.* 2011, p5).

5.4.1. UNDERSTANDING SME RESILIENCE: PROPERTY-LEVEL PROTECTION

Due to an underestimation of flood risk, most residential and commercial property owners do not take steps to protect themselves (Correia *et al.* 1998, p212). This leads to pictures of individuals battling against rising flood waters with sandbags (Bramley and Bowker, 2002, p49; Dhonau and Lamond, 2012, p292). Flood-specific mitigation measures can also be implemented in conjunction with BCPs if the risk is deemed great enough. Risk perception is only one of the drivers or Table barriers behind the implementation of flood protection measures. The question remains as to how many owner/managers choose to

take further, more specific flood mitigation measures other than a generic BCP and what are the drivers behind this decision.

In Hull and Sheffield:

- 7.5% of owner/managers report being extremely prepared to cope with the occurrence of a flood. 33.0% are moderately prepared.
- 37.6% stated that they have measures installed to help prepare or respond to a floods occurrence. There were no significant difference in percentage implementation between Hull and Sheffield; 35.9% and 38.4% respectively.

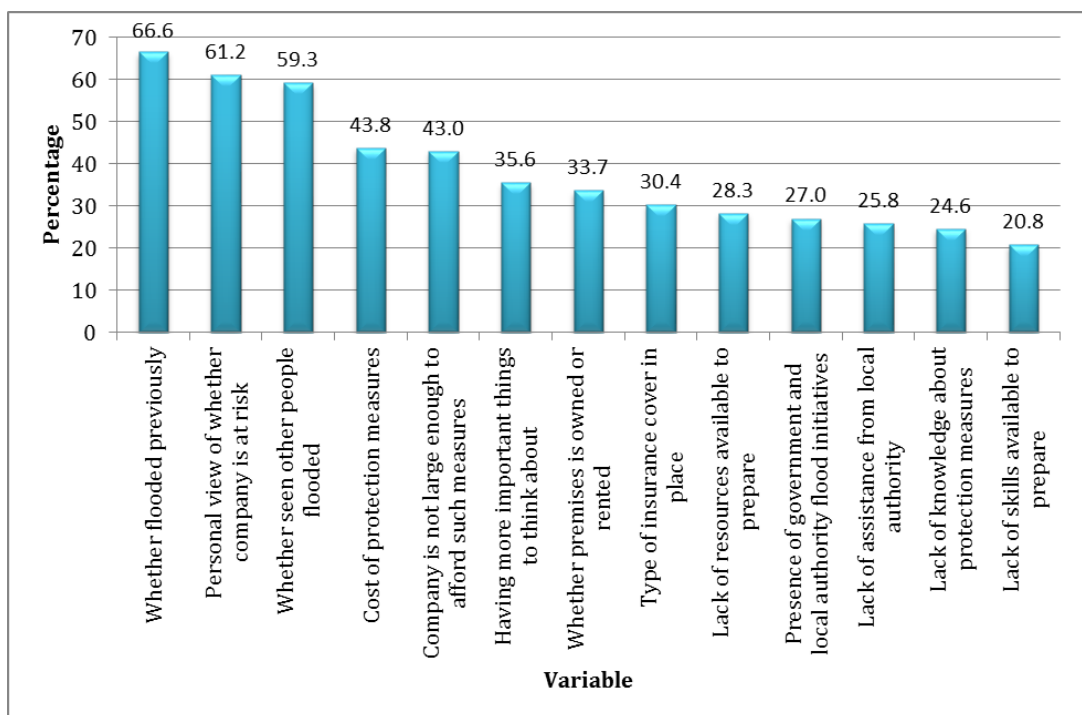


Figure 5.3: Hull and Sheffield SME owner/manager response: To what extent do you believe that the following factors affect whether your company implements flood protection measures?

Source: Postal Questionnaire

In comparison, Ingirige and Wedawatta (2012, p274) maintain that 42.1% of Greater London SMEs have taken steps against flooding. Nationwide, 39.2% of SMEs have installed measures (Thurston *et al.* 2008, p11). Given these findings, Hull and Sheffield are vaguely in line with the national average and London in relation to the number of SMEs who utilise flood protection. For the Environment Agency, Hull experiences the largest number of properties at risk outside London (EA, 2009, pp29-30). Within London, 542,000 properties or one million people are located on a floodplain. In Hull, this figure is just over

120,000 properties. This accounts for why more SME owner/managers implement protection measures in London than in Hull; London has the greater risk. Alongside exposure levels, there are a number of other drivers and barriers responsible for either the implementation or non-implementation of protection measures in Hull and Sheffield (Harries, 2012, p337). In order to discover what these are, owner/managers were asked to score to what extent a number of variables influenced whether they implemented flood-specific mitigation. The results are shown in Figure 5.3.

The knowledge that perceptions influence flood mitigation has been accepted for many decades (Grothmann and Patt, 2005, p202). As a result, 61.2% of owner/managers in Hull and Sheffield assert that perception of the flood risk drives them to implement flood-specific mitigation measures. Within the study cities:

- Both Rachel and Mike remarked about *“the fear of it happening again”*.
- 52.7% of owner/managers reported being concerned about the impacts of flood upon their SME.
- Only 22.7% believe that their company in particular was exposed to the risk of flooding.

Within Hull, 61.0% of SME owner/managers were concerned about the impacts of a flood, while 31.3% believe their company in particular was exposed. In Sheffield, these figures were 48.5% and 17.8% respectively. This shows that for owner/managers, flooding is perceived to be a larger risk in Hull than in Sheffield. This data also suggests that owner/managers in Hull and Sheffield are underestimating the risk of flood, a judgement which can have severe repercussions (Tierney, 1994a; p8; Pivot and Martin, 2002, p21; Gissing *et al.* 2005, p7; Kreibich *et al.* 2007a, p6).

As both variables were nominal in nature, a Chi² test examined the research hypothesis that there is a statistically significant relationship between the implementation of flood-specific measures and flood perception. Surprisingly, a statistical correlation between those owner/managers who are concerned about flooding and those who have property-level protection was not found (n=207, df=1, p=0.52). The *p-value* yielded fell above the significance threshold of 0.05. This is despite the above findings, and overwhelming academic support from scholars such as Baan and Klijn (2004, p114) and Messner and Meyer (2005, p157).

To compare these findings to the implementation of BCPs, the number of Hull and Sheffield SME owner/managers concerned about the impact of flood (52.7%) is much lower than those who are concerned about the impact of different disruptions (75.9%).

Furthermore, while 22.7% of owner/managers believe they are exposed to the occurrence of a flood, 36.2% believe they are exposed to additional disruptions. It can be suggested that these statistics show an increased anxiety towards other disruptions in comparison to those who are concerned about flooding. It also provides an explanation as to why 78.2% of SMEs have BCPs in place, while only 37.6% of owner/managers implement flood-specific protection: flood is not considered a significant risk.

Perception of flood risk can also be related to an SME's location. An SME situated next to a river with a 1 in 200 year flood probability is more vulnerable than one located away from a water body on a hill (Kundzewicz and Takeuchi, 1999, p559). Location, in terms of exposure, can be an important driver and barrier towards implementing resistance and resilience protection measures: more flood susceptible SMEs will have flood protection. If a flood is not a recognised risk to their SME, then an owner/manager in a less vulnerable location may not implement flood mitigation. When this is the case, it takes experience of a flood to be the driving force behind property-level protection.

In Hull and Sheffield, 66.0% of respondents stated that whether they had been flooded previously affected whether they implement flood-specific protection measures. This was the largest influence reported by respondents. Those who have directly experienced flooding, or those who have witnessed someone else being flooded, are more likely to accept it poses a risk and implement protection measures (Kates, 1962, p46; Payne and Pigram, 1981, p461; de Man and Simpson-Housley, 1988, p385; Molino and Gissing, 2005, p4). Immediately after a (near) flood, individuals and communities overestimate the risk. With time, concern for the hazard begins to decrease. Eventually the flood risk is once again underestimated (Penning-Rowsell, 2003, p3). In total, 53.1% of Hull and Sheffield SMEs who have experienced flooding have implemented property-level flood protection. This is opposed to 32.2% who implement but have not been flooded. Rachel (Company R) explained that following the 2007 floods in Sheffield, she wanted to ensure the *"nightmare was never repeated"*.

Once again, as categorical data was being used, a Chi² test was administered to examine the research hypothesis that there is a statistically significant relationship between those owner/managers who have been flooded and those who implement resilience measures. As the *p-value* yielded fell below the significance value of 0.05 (n=254, df=1, p<0.005), a strong, significant correlation exists between the two variables meaning past experience is highly influential upon flood-specific resilience.

Location	Percentage of SMEs Flooded Who Implement Property-Level Protection Measures	Percentage of SMEs Not Flooded Who Implement Property-Level Protection Measures
Study	53.1	32.2
Hull	42.9	33.3
Sheffield	58.8	30.7
London	71.1	52.0
United Kingdom	49.9	21.9

Table 5.5: SMEs flooded/not flooded who implement property-level flood measures

***Source: Postal Questionnaire; Ingirige and Wedawatta, 2012, p174;
Thurston et al. 2008, p11***

Berkhout *et al.* (2004) identified that SME owner/managers find it difficult to assess the advantages and disadvantages of adaptation strategies unless they have experienced severe disruption. Molino and Gissing (2005), Kreibich *et al.* (2007) and a study conducted on behalf of Yorkshire Forward (EKOS, 2008) have all identified an increase in flood preparedness activities by businesses affected by flooding. Moreover, Table 5.5 demonstrates that for Ingirige and Wedawatta (2012, p9) and Thurston *et al.* (2008, p17), the relationship between flood experience and flood protection measures is also present in London and on a nationwide scale. The findings from Hull and Sheffield are therefore generalizable.

The percentages of those SMEs in London who had implemented protection (whether flooded or not) were higher than the national average and the study cities. Supported by the work of Zhai (2009, p28) and Pelling (2003, p48), the suggestion is made that the relationship between exposure to flooding and investment in flood-specific protection is influenced by city. Accordingly, the largest number of SMEs implementing flood-specific protection measures will be located in the city with largest exposure, in this case London. The finding is the same regardless of whether the SMEs have or have not experienced a flood. Yet, SMEs in Hull and Sheffield are different. Publications by the Environment Agency (2009), Hull City Council (2007) and Sheffield City Council (2008) demonstrate that Hull is more exposed to flooding than Sheffield in terms of number of properties at risk. However, a higher percentage of owner/managers who have been flooded in Sheffield have invested in flood-specific resilience in comparison to those flooded in Hull. The reverse is true for those who have not been flooded. This suggests that other variables are responsible for the disparities between the cities. The implementation of flood protection in locations other than Hull and Sheffield will not be explored further

due to the context of this research. However it does provide scope for further research at a later date.

To compare the installation of flood-specific measures with the use of BCP in Hull and Sheffield:

- Past flood experience affects whether flood-specific protection measures are implemented.
- Perception of the flood risk does not influence whether flood-specific protection measures are implemented.

Flooding is one of the most costly hazards to affect an SME (EA, 2010c, pvi). The damage and implications associated with a flood event is much greater than most other disruptions, including loss of IT (Brown and Damery, 2002, p412; Jonkman *et al.* 2003, p20). Because of their infrequent nature, they are not seen as a significant risk compared to others such as those outlined in Table 4.3 (Coult, 2001, p36).

In contrast:

- Disruption experience does not influence whether an owner/manager has a BCP.
- Perception of the risk of disruption does affect whether a BCP is adopted by an owner/manager.

Business Impact Analysis (BIA) looks at an SME's critical business functions (Cunningham *et al.* 2007, p734). It allows an owner/manager to understand which processes are vital to ongoing operations, and understand the impacts a disruption of these processes would have upon their business (Cunningham *et al.* 2007, p734). Some hazards can take place and cause very little disruption to an SME, whilst others can have widespread impacts (Cannon, 1993, p92-105). The knowledge of these effects allows owner/managers to pinpoint which disruptions pose the highest threat to them and thus respond accordingly. Experience of these disruptions is not necessary to stimulate owner/managers into adopting BCPs. In Hull and Sheffield, a BIA does not reveal flooding to be a significant risk to SME owner/managers. Therefore, in order for flood-specific protection measures to be implemented in the study cities, physical experience of a flood event is required.

Experience does not necessarily translate into practical preparedness (Molino and Gissing, 2005, p3). Wedawatta *et al.* (2012a) examined the reinstatement and reconstruction experiences of those SMEs affected by the 2009 floods in Cockermouth.

They found that, following the event, many SMEs opted for traditional reinstatement rather than resilience reinstatement. By returning their SME back to how it was before the flood (traditional reinstatement), owner/managers were reinstating their exposure to this hazard. This is in comparison to installing resilience measures (resilience reinstatement), thus reducing their vulnerability. A lack of property-level protection adoption amongst owner/managers following experience with a flood suggests that another variable must influence this decision. For Thurston *et al.* (2008, p8), this variable is the availability of finance and cost of protection measures.

Financial resources impact upon resilience (EA, 2006, p42; Lamond and Proverbs, 2009, p64; Bichard and Kazmierczak, 2010, *piv*). Structural solutions are expensive. This often leads SME owner/managers to 'opt out' of responsibility for property-level protection, using their finances for other 'more important' investments (McPherson and Saarinen, 1977, p27). In a national survey, 45.0% of SMEs said they were deterred from implementing flood resilience and resistance as they believe such measures to be "too expensive" (Thurston *et al.* 2008, p14). In Salford, 47.8% are not willing to pay to install protection measures, nationwide this figure is 38.1% (Bichard and Kazmierczak, 2010, p57). As an incentive for installation, many schemes are tax deductible meaning an owner/manager will pay less tax at the end of the year. Yet, there is still the issue of the initial outlay costs meaning finance will still hinder the adoption of flood resilience and resistance.

In Hull and Sheffield, 44.1% of owner/managers stated that the cost of protection measures influenced whether they had implemented resilience. Only 7.0% of owner/managers in the UK are deterred from using a BCP due to cost (Woodman and Hutchings, 2011, p16). In Hull and Sheffield, 44.1% of owner/managers do not implement flood-specific protection due to the cost. This evidence suggests that finance has a larger influence upon the adoption of flood mitigation in comparison to its influence upon the implementation of a BCP. This could be attributed to the lower expense of BCPs.

A Kruskal-Wallis test was employed to test the research hypothesis that a statistically significant relationship exists between turnover and the implementation of flood-specific protection measures. This test was utilised as a Komogorov-Smirnov test did not discover a normal distribution. Moreover nominal data was being considered alongside ordinal data. As the *p-value* generated was above the significance threshold of 0.05, a statistical correlation between the two variables was not found in Hull and Sheffield ($n=172$, $\chi^2=11.64$, $df=11$, $p=0.391$). This suggests that the barrier is not whether SMEs can afford the measures. It relates to the cost of schemes and whether an owner/manager can justify paying these prices given the perceived risk of flooding. Is the

cost/benefit worth it? The amount of finance available to an SME can be related to its size, a further driver or barrier to flood-specific protection (Crichton, 2006, p18).

It is commonly asserted that larger organisations tend to adopt more protection measures than their smaller counterparts (Brenniman, 1994, p73; Grothmann and Reusswig, 2006, p103; Sadiq, 2011, p3). A matter of resources, larger SMEs are more likely to have dedicated resilience staff and better access to finance and resources (Dahlhamer and Reshaur, 1996, p22; Dahlhamer and D'souza, 1997, p4; Webb *et al.* 2000, p6). In Hull and Sheffield:

- Micro-sized businesses were nearly three times more likely to implement flood-specific protection measures than medium-sized enterprises (Table 5.6).
- Of all the SMEs using a flood-specific protection measures, 52.4% were categorised as micro-sized. This is in contrast to the 19.7% of medium-sized companies with continuity plans. This relationship was also replicated when Hull and Sheffield were examined in isolation.

Size	Turnover	Percentage of all SMEs with Protection		
		Combined	Hull	Sheffield
Micro (0-9 employees)	≤ €2 million	50.0	44.4	52.4
Small (10-49 employees)	≤ € 10 million	30.68	37.0	27.9
Medium (50-250 employees)	≤ € 50 million	19.32	18.6	19.7

Note: Questionnaires returned with no number of employee data were omitted from calculations

Table 5.6: Influence of size variable upon SME flood protection measures

Source: Postal Questionnaire

This finding can be linked to perception: micro-sized businesses fear flooding the most and so take steps against it. It may also be attributed to the fact that micro-sized businesses are deemed the most vulnerable to flood due to the characteristics of their operations (Crichton, 2006, p9). As micro-sized enterprise premises are generally smaller in size, practically they may be easier to make resilient. With the relationship between SME size and BCPs usage, the correlation between SME size (categorical data) and flood-specific protection (categorical data) is not statistically significant. A Chi² test revealed no statistical relationship between the two variables as the *p-value* generated was larger than

the significance threshold of 0.05 ($n=250$, $df=2$, $p=0.121$). However, there is a statistical relationship between industrial sector and those SMEs who implement flood-specific protection.

A similar level of flood property-level protection may not be desirable across all SMEs in all industries (Wedawatta and Ingirige, 2012, p8). Kreibich *et al.* (2008) and BMG Research (2011) have noted differences in flood preparedness based upon industrial sector. This is due to certain sectors being naturally ‘immune’ or less susceptible to flood effects by the nature of their operations. For Mendelsohn (2000), those enterprises operating in the forestry and farming industry are more likely to install flood resilience measures (p584). Alternatively, the UK “*construction sector is currently ill-prepared to build-in resilience to flooding*” (Bosher *et al.* 2009, p20).

In Hull, Mike commented upon the difficulty he had in protecting his SME due to its nature: “*how do you make grass resilient?*” The largest industrial sector operating in Hull and Sheffield is the production and manufacturing sector. Consequently, the largest number of SMEs who implement flood-specific protection measures were included within this category (15.9%)(Table 5.7). This finding was replicated in Sheffield (18.8%). In Hull, the majority of SMEs with flood-specific resilience were categorised as educational enterprises (18.5%). Further disparities exist between the two cities:

- In Hull, 14.8% of those SMEs with flood mitigation measures fell within the information and communication sector. In Sheffield this figure was only 3.3%.
- In Sheffield, 8.2% of SMEs with flood mitigation were categorised as finance and insurance. In Hull this figure was 0.0%.

Once more these differences can be attributed to the varying levels of discontinuity a flood can cause these industries. It is also suggested that certain industries are more easily protected than others, or are over-represented in Hull and Sheffield. When the research hypothesis stating that there is no statistically significant relationship between industrial sector and flood protection measures was examined, a Chi² test yielded a *p-value* lower than 0.05 ($n=233$, $df=17$, $p<0.05$). Once more this test was selected as both variables were categorical in nature. Unlike the relationship between BCP usage and industrial sector, the correlation between the implementation of flood protection measures and industrial sector is statistically significant. Within Hull and Sheffield, industrial sector has a large influence upon whether owner/managers implement flood-specific resilience. This agrees with other statistical studies including Van Der Veen *et al.* (2005). Nevertheless, the relationship between experience and flood resilience is much stronger than that between industrial sector and flood resilience due to a lower *p-value*.

Industrial Sector	Percentage of All SMEs with Protection		
	Combined	Hull	Sheffield
Production/Manufacturing	15.9	11.1	18.8
Professional, scientific and technical	14.8	14.8	14.8
Arts, entertainment, recreation and other services	10.2	11.1	9.8
Construction	9.1	11.1	8.2
Education	9.1	18.5	4.9
Public administration and defences	8.0	3.7	9.8
Information and communication	6.8	14.8	3.3
Finance and insurance	5.7	0.0	8.2
Charity	3.4	3.7	3.3
Retail	3.4	0.0	4.9
Transport and storage (including post)	3.4	3.7	3.3
Accommodation and food services	2.3	0.0	3.3
Amenities	2.3	3.7	9.8
Business administration support and services	2.3	3.7	1.6
Wholesale	2.3	0.0	3.7
Property	1.1	0.0	1.6
Agriculture, forestry and fishing	0.0	0.0	0.0
Health	0.0	0.0	0.0
Motor Trades	0.0	0.0	0.0

Note: Questionnaires returned with no industrial sector data were omitted from calculations

Table 5.7: Influence of industrial sector SME flood protection measures

Source: Postal Questionnaire

Despite the advantages property-level mitigation measures bring, these schemes do not guarantee complete protection (Kundewicz and Takeuchi, 1999, p417). It is not possible to protect against every conceivable flood eventuality and there is always the residual risk that strategies will fail (Bronstert *et al.* 1999, p11; Plate, 2002, p3). The question remains as to whether owner/managers are aware of any limitations. Do the limitations associated with flood protection measures influence an owner/managers decision to implement this form of resilience? Regardless of the answers, the limitations associated with flood resilience measures can be overcome by using protection and

continuity methods together harmoniously. A flood is seen as an agent of discontinuity with unique characteristics. In order for SMEs to be in the best position possible to respond to this threat and its attributes, a synthesis of flood-specific property-level protection measures and continuity plans are required.

5.5. BUSINESS CONTINUITY AND PROPERTY-LEVEL PROTECTION

Ulrich is the owner of Company U. Company U is a family business having being established in 1912 by Ulrich's grandfather. Over the years, it has grown in size and changed in regards to the services it provides having being passed to Ulrich's father before finally coming under Ulrich's control in the 1970's. Today, Company U is a medium-sized enterprise operating in the production and manufacturing sector. It employs 36 people and generates a turnover of £7.2 million. In 1935, the business relocated and since that time Company U has been situated in Heeley, to the South-West of Sheffield. This area has a more than 1 in 20 year probability of flooding (Sheffield City Council, 2008, p16). *"Because of the location, right next to the River Sheaf", Ulrich has "experienced serious flooding on four or five occasions"* causing various levels of disruption. It is these experiences which have led Ulrich to implement both temporary and permanent flood resistance and resilience protection measures in order to prevent future flooding impacts.

"We do have sand bags...We built a ramp up to the warehouse...It's got a slight hump in it so water can actually go above the door and still not come in...We have everything at a lower level on pallets...The extension involved putting in a tank under the foundations of the main warehouse in a huge one metre diameter tube which would take any sort of flash flooding from the roof and then it would be discharged at this rate of three litres per second into the main drainage systems....What I had the builders do in addition was to put in three or four large drains on the warehouse floor...We also put aco-drainage [a trench system which drains water away from the building] across the thresholds..."

Flood resilience measures: Ulrich, Company U (Sheffield)

The measures implemented by Ulrich range from low cost decisions to place lower-level stock on pallets, to spending £5,000 updating their drainage system. As the flood risk of Company U is greater than a 1 in 25 return period, the installation costs and measures are economically viable (Thurston *et al.* 2008, p10). Additionally, they are tax-deductible providing a further incentive for implementation. As Company U is a *"cash rich*

company”, finance acts as the primary driving force behind their application: *“It is so much easier to protect yourself when you’ve got money”*. Ulrich’s belief that floods are going to *“become a more likely event”* also influenced the decision to implement flood-specific protection measures.

Alongside Ulrich’s awareness of the unique characteristics of floods, he also believes it to be an ‘agent of discontinuity’: *“it was a few days before we managed to get straight enough to carry on as normal”*. Furthermore, it is just one of a ‘package of discontinuities’ to affect his SME: *“it is important to be aware of any particular problems that may occur”*. Therefore, he *“plan[s] very carefully”* for the occurrence of any disruption.

“We are working on BS25999 which is Business Continuity Management Systems...We upgraded all our electrical systems recently...We have sufficient number of heating units throughout the place...If one fails, there is enough heat coming out the others...When we install new systems we consider the impact of breakdowns and failures...We never work on a just in time basis...We have the best security system.”

Business Continuity: Ulrich, Company U (Sheffield)

In order to respond to the threat of flooding, Ulrich has turned to the notions of protection and continuity. Both property-level protection measures and business continuity plans have their disadvantages. Some of these can be offset or compensated by the presence of the other (Wedawatta and Ingirige, 2012, p8). Property-level adaptation options that concur with continuity strategies can significantly contribute towards long-term SME resilience (Wedawatta and Ingirige, 2012, p8). Following an incident which causes major disruption to business operations, both protection and continuity measures can ensure an SME’s recovery in an acceptable time frame (Smith and Sherwood, 1995, p15). AXA Insurance (2006) has even produced a guide designed to help with the consequences of climate change, such as flooding, including how to ensure that businesses are resilient through property-level measures, and information designed to encourage the adoption of BCPs. Even with the availability of this advice, whether an SME owner/manager takes this on board and acts upon it is not guaranteed. Some SMEs remain vulnerable to the occurrence of a disruption, and this could result in them paying the ultimate price: the permanent closure of their SME.

5.6. CONCLUSION

In Hull and Sheffield:

- 36.2% of owner/managers believe their company is exposed to disruptions.
- 22.7% perceive themselves as exposed to flooding.
- A flood is seen as one in a package of discontinuities with the potential to obstruct business operations.
- A flood possesses unique characteristics which set them apart from other disruptions.

These opinions dictate the type of flood protection measures an SME adopts, meaning flood resilience is influenced by flood perception (Terpstra, 2011, p1658). The most effective way an owner/manager can make themselves resilient to a flood is to move to an area not at risk. For some SMEs, moving is not a viable option. Alternatively, they can prepare for a flood by using a BCP only, or a BCP in conjunction with flood resilience and resistance protection measures. By having a BCP in place, owner/managers can identify their exposure to discontinuity and implement responses or procedures which ensure continuity should any disruption occur. BCPs vary depending upon the size of the SME and the industry operated within (Botha, 2002, p1xiii). The 'all-inclusive' nature of a BCP, means it is extremely popular to use this resilience mode to address the risk of flooding. BCPs include activities that protect against a range of different disruptions, and are less complicated and expensive to implement than flood-specific resilience measures. Some SMEs prefer BCPs over technically difficult, more expensive and time consuming efforts which focus specifically upon flood protection (Webb *et al.* 2000. p5). In Hull/Sheffield:

- 72.8% of owner/managers have a BCP in place.
- 37.6% of owner/managers have installed property-level flood protection.

Nevertheless, SME owner/managers also perceive flooding to be a unique hazard with particular characteristics which set it apart from other risks. And for some, flooding is a very "*real risk*" which they wish to protect against. For those who are extremely concerned about flood risk, there is the option to turn to resistance and resilience. Although included within a BCP, these measures go beyond generic continuity procedures such as backing up data and provide a specified response to flooding, for example installing flood doors. Nevertheless, in some areas of Hull and Sheffield, the flood potential

is not high enough and property-level protection measures may not be ‘economically worthwhile’ (Thurston *et al.* 2008, p10).

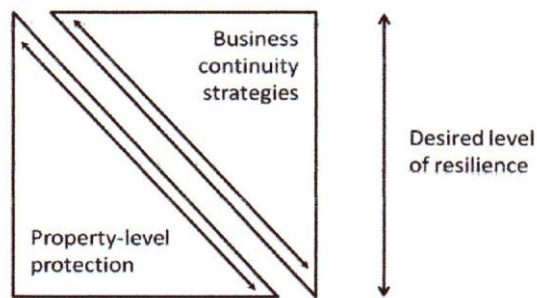


Figure 5.4: Achieving a balance between property-level protection and business continuity strategies

Source: Wedawatta and Ingirigie, 2011, p8

The key is to find a balance between continuity and protection (Frost, 1994, p10). A business is required to opt for a mixture of resistance and resilience schemes and generic business continuity strategies to effectively manage flood risk (Wedawatta and Ingirigie, 2011, p8)(Figure 5.4). This is owing to the limitations associated with both protection and continuity being offset by the presence of the other (Wedawatta and Ingirigie, 2012, p8). For some, the first line of defence against the threat of flooding is provided by regulatory bodies in the form of flood management. As a result, protection and continuity measures are simply seen as contingency plans should state-resilience strategies fail. As with owner/managers, the strategies implemented by regulatory bodies are influenced by their perception of a flood. Accordingly, if regulatory body and owner/manager judgements diverge, state measures may not complement those utilised by SMEs, which could have serious consequences. To explore whether this is an issue for Hull and Sheffield, this thesis will now present regulatory body perceptions of flood and how these perceptions influence their responses.

6. FLOOD: WHAT DOES IT MEAN TO REGULATORY BODIES AND THEIR FLOOD RESILIENCE?

6.1. INTRODUCTION

There are differences between expert and public assessments of risk. This leads to an expert-lay public knowledge/perception divide (Cole and Whitley, 1981, p151; Sandman *et al.* 1987, p94; Wright and Bolger, 1992, p4; Flynn *et al.* 1993, p643; Gutteling and Kuttschreuter, 1999, p489; Lazo *et al.* 2000, p180; Wright *et al.* 2000, p681). Disparities between experts and lay people are often observed in terms of the relative significance of risks, their magnitude, their possible impacts and the most appropriate response (Burningham *et al.* 2008, p218). As with SME owner/managers, the flood mitigation measures ‘experts’ implement are influenced by their perception of flooding (Slovic, 1999, p659). This chapter therefore aims to:

1. Discuss how regulatory bodies (social science approach) perceive the risk of flooding in comparison to Hull and Sheffield SME owner/managers (business practice approach).
2. Explore how regulatory body perceptions influence regulatory body flood resilience measures.

These aims were selected with a view to examining the implications of flood perceptions on both SME business practice and regulatory body flood management policies.

Regulatory bodies, in the context of this thesis, are groups of scientific experts and administrators with the power to regulate, control and manage water. These bodies exist in a wide variety of contexts, including the regulation of SMEs. In England and Wales, DEFRA has overall policy control for flood defences (Bruen and Gebre, 2001, p14). Often considered the first line of defence against the hazard of flooding, DEFRA provides financial support for protection measures, publishes advice and examines techniques for the design and implementation of defences. Due to its authoritative nature, DEFRA and its associated national and local counterparts are all deemed to be ‘experts’ by SMEs. They are relied upon by owner/managers to provide full flood protection at all times (Harries and Penning-Rowsell, 2011, 193). This research concentrates upon the perceptions of

three bodies responsible for flood management and resilience in Yorkshire, Hull and Sheffield. An interview was conducted with one employee from the Environment Agency, Hull City Council and Sheffield City Council. It is the results of these three interviews, substantiated with supplementary secondary data in the form of official documents and press releases for example, which form the basis of this chapter. The findings of each interview will be presented in turn, commencing at the regional level with the Environment Agency.

6.2. REGIONAL LEVEL: YORKSHIRE AND THE ENVIRONMENT AGENCY

Established in 1996, the Environment Agency (EA) is responsible for helping to make *“a healthy, rich and diverse environment in England and Wales for future generations”* (Cullingworth and Nadin, 2002, p265; EA, 2012a, p4). To attain this vision, the EA has *“to act to reduce climate change and its consequences”* which includes tackling the UK’s predicted increase in flooding (EA, 2010f, p5). The EA has statutory responsibility for flood management and defence. It is accountable for creating a greater understanding of flood risk, reducing flood probability, reducing the consequences of flooding, and ensuring flood management programmes have environmental benefits (DCLG, 2010, p41; EA, 2010f, p17). For the EA to manage and implement its responsibilities, it has to perceive flooding as a potential threat.

6.2.1. ENVIRONMENT AGENCY: FLOOD PERCEPTION

An interview was conducted with *Kate*. Kate is a long serving employee of the EA and is part of an authoritative team responsible for *“warning, prevention and protection against...fluvial...tidal flooding, and...ground water [flooding]”* across the county of Yorkshire. The views presented in this section are the opinions of Kate alone. However, her perceptions have been supplemented with other documents, leaflets and press releases taken from the EA website and other sources. As such, the conclusions drawn using Kate’s opinions and the secondary data are reliable and valid.

For ‘experts’, or social scientists, flood risk judgements relate to statistically generated risk estimates (Siegrist and Gutscher, 2006, p972). Quoting the EA’s National Assessment of flood risk (2009), Kate asserts that residents of Yorkshire are located in *“quite a large area, with quite a lot of flood risk”*. In fact, she believes that *“most of the regions’ towns are at flood risk”*, with Hull and Sheffield *“at a real risk of flooding”*. A

similarity between owner/managers and the EA is that both stakeholders view flood as possessing unique qualities which set it apart from other risks. The EA primarily perceives flood risk as one of the defining characteristics of a location (House and Fordham, 1997, p26). It also shares the opinion that a flood is the presence of water in areas that are usually dry. Kate alluded to this definition: *“the water is getting into your house”*. Yet as for SME owner/managers, and the business practice approach the EA perceives the source of the water present as irrelevant. If it is in an area where it should not be, then it is ‘out of place’ and a flood has occurred. Again, this issue was described by Kate: *“water is water, it doesn’t matter where it comes from. If it’s in your property, it’s devastating”*. Nevertheless, there are also important differences between SME and EA perspectives.

Owner/managers see flood as one in a ‘package of discontinuities’ with the potential to obstruct business operations. It is also not seen as a significant risk in comparison to other threats faced. In comparison, due to its remit, aims and responsibilities, for Kate and the EA, a flood is seen as an extremely significant discontinuity. In this instance, flood is judged as causing a discontinuity to the order of government. Government in this sense refers to the structure, management and function of a city. A discontinuity to the order of government relates to a disruption to the daily business of coordinating services and functions in a city to ensure ‘normality’ for residents. For example, in 2007 across the UK, floods caused disruption in terms of transport, water provision, electricity services, education provision and emergency services (EA, 2007, p4). Order of government is primarily concerned with the continuation of essential services and infrastructure. The loss of these amenities can have a number of knock-on effects for society (Peters, 1995, p3; EA, 2009, p9).

Both SMEs and the EA perceive flooding in terms of discontinuity to operations. Whereas owner/managers are concerned with discontinuity to their operations at the individual organisational level, the EA looks at the ‘bigger picture’: the city-wide scale. At this scale, the EA regularly uses the words ‘community’ and ‘the public’ to describe those at risk of flooding. Kate made frequent remarks such as *“severe disruptions to communities”*, *“the message wasn’t there to let the public know”*, and *“it’s up to us to help communities”*. Publications presented by the EA also take a similar tone. The *National Flood Risk Assessment* (EA, 2009, pp13-15) speaks about *“communities living out of harm’s way”* and *“protecting communities in the future”*. These comments suggest that the EA groups homes, businesses, critical infrastructure and essential services at risk together under the labels of community and the public. SMEs are not seen as separate from other stakeholders. The EA approaches flood risk on ‘one-level’ only by tackling the problem for

the benefit of everyone who lives and works within the city. As Kate outlines, *“we just go and target everyone”* in an *“envelope of flood risk”*.

Focusing upon the larger, community at risk scale may not be the appropriate response. What is seen at the city-level may be misleading. The same flood can cause a variety of impacts across a city, with different stakeholders affected in different ways and to varying degrees. Yet, it is easy to overlook these different stakeholder experiences (Messner and Meyer, 2005, p156). As flood means different things to different stakeholders, the requirements of each individual group at risk within a location varies dramatically (Franklin, 2007, p140). A mitigation response suited to one group, may not be the best option for another. This can cause serious issues for some SMEs, especially as they already possess very diverse risks. Although taking a wider scale approach has advantages in terms of ensuring essential services and critical infrastructure, treating all those at risk in the same way has serious implications for policy and state implemented anti-flood measures.

6.2.2. ENVIRONMENT AGENCY: ANTI-FLOOD MEASURES

Due to the EA’s perception of flooding, Kate asserts that when faced with the risk the EA promotes a *“message of preparedness and resilience”*. Unlike SMEs, the EA prioritise a flood above other risks. To respond to a floods specific attributes and to draw upon its one-level, envelope of flood risk perception, the EA leans towards *“community resilience”* (EA, 2012a, p18). There are a number of community resilience definitions, all of which are influenced by the level of analysis being taken (Marsh and Buckle, 2001, p1325; Norris *et al.* 2008, p129). One of those most widely used is that provided by Pfefferbaum (2005): *“The ability of community members to take meaningful, deliberate and collective action to remedy the impact of a problem”* (p349). It is this definition which will be adopted by this research.

As the ability to ‘bounce back’ after a flood, effective community resilience requires active participation by all community stakeholders including residents, business owner/managers and service providers (Mileti and Peek, 2002, p186; National Research Council, 2006, p195; Ronan and Johnston, 2010, p6). Exogenous factors such as governmental policies and state regulations exert a powerful influence upon community level resilience (Cutter *et al.* 2008, p598). Within the UK, the term community resilience forms one of the most popular, regulatory ‘buzz-words’ of the present time. In 2010, David Cameron remarked that the present government was *“sapping responsibility”* leading to a drive amongst regulatory bodies to transfer responsibility from the state to society

(Duggan, 2011, p2). Citizens are no longer viewed as passive receivers of expert information. They are active citizens who can evaluate multiple sources of knowledge to understand their exposure and act accordingly (Wynne, 1991, p112; Brown, 1993, p18; Irwin, 1995, p53; Wynne, 1996, p238; Irwin and Michael, 2003, p29). In relation to flood, Kate maintains *“it’s all about helping people to help themselves”*: to understand and manage flood more effectively through work with local authorities and professional partners (EA, 2010f, p18). This community resilience allows society to draw strength from adversity using a transformational quality to promote growth and establish strong relations between members (Aldwin, 1994, p124; Tedeschi and Calhoun, 2003, p9).

One way in which community resilience is generated by the EA is through flood warnings. These warning are issued to communities at times of risk in order for them to take action to keep flooding impacts to a minimum. Kate outlines that with *“telemetry points all over the region”*, the EA *“knows what the river levels are doing”*. If a river gets very high in a certain location, Kate and her team are aware that *“it is going to flood city or town X in so many hours and can warn for it”*. Warnings can be provided as soon as the potential for flood begins to emerge. This is because river levels are monitored every 15 minutes and readily available on the EA website (EA, 2012c, online). Therefore, people living in flood risk areas are better informed and can decide what action to take as water levels change (EA, 2010b, p8). Warnings are provided in a number of different ways:

1. Those at risk are informed through an automated telephone call or text message, providing they have signed up for this service in advance.
2. Residents can visit the EA website, type in their postcode and view if there is a warning in place for their location.
3. Warnings are announced regularly on news bulletins and weather forecasts.

Three different warnings can be issued which assist the public in taking action and making preparations (Table 6.1). In Sheffield, this scheme is widely implemented, as 17 telemetry points measure five main watercourses. In Hull there is only one. In Hull, the flood risk primarily occurs from two sources: tidal surges up the River Humber and River Hull and surface water flooding. Kate maintains that the EA’s *“flood warnings are only warnings from the rivers and the sea”*. The EA cannot *“warn for”* surface water. This is a major threat to the city, as surface water flooding tends to be less predictable than fluvial flooding (Giller and Malmaqvist, 1998, p9; Scandlyn *et al.* 2013, p41). The EA knows where the river flows and therefore where the vulnerable places are. Conversely, surface water flooding is difficult to pin point to a certain location. It often happens quickly and is dependent upon particular features of certain streets, drains and the topography of urban

areas (House of Commons, 2008, p6). As Hull's catchment is drained by artificial channels, they do not react to extra water in the same way as the water courses in Sheffield. Accordingly, monitoring and warning is not a comprehensive resilience option in Hull. During 2007, only 13.3% of owner/managers recorded receiving a flood warning. Despite not being appropriate for all locations, flood warnings can still generate economic and social benefits (Parker *et al.* 2005, p3).

Warning	What it Means	What to Do
	Flooding is possible Be prepared	Be prepared to act on your flood plan. Prepare a flood kit of essential items. Monitor local water levels and the flood forecast on Environment Agency website.
	Flooding is expected Immediate action required	Move family, pets and valuables to a safe place. Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place.
	Severe flooding Danger to life	Stay in a safe place with means of escape. Be ready should you need to evacuate. Co-operate with the emergency service. Call 999 if you are in immediate danger.

Table 6.1: Flood warnings issued by the Environment Agency

Source: Adapted from EA, 2012b, online

The EA have two primary motivations for adopting community resilience: policy and economy. Following the 2007 floods, the Pitt Review (2008) highlighted a lack of communication between regulatory bodies and the lay public in terms of understanding the risks of flooding and how to prepare. As Kate asserts, information, advice and guidance is now required to be *“out there for the public to see”; “it shouldn’t be covert”*. In terms of economic motivations, Kate maintains that the EA *“are encouraging people to help themselves as we potentially don’t have the funds to do it for them at the moment”*. It is the

presence of these drivers which primarily leads the EA to implement a number of community initiatives.

"We're looking at an in depth engagement programme...We've got information on the website...We produce a lot of leaflets...But one of the best ways that people remember about the risk of flooding is actually talking face to face with us and we do a lot of work going out to communities...We do a lot of going door-to-door and speaking to people about their flood risk, asking them if they want to sign up to receive our flood warnings"

Community Resilience initiatives: Kate, Environment Agency

Kate draws attention to the fact that the drive for community engagement and the dissemination of advice is *"a difficult message to get across"*. She highlights that: *"we are saying to them, this is how you prepare for flooding and they're like oh we've been there, we've done that you know, it's not going to happen to us again, just leave us alone now"*. A community's lack of adaptive capacity is a problem recognised by the EA (Cutter *et al.* 2008, p600). The EA (2012f, p3) cite *"the reality is that true community resilience is about cultural shift and requires a change in philosophy, rather than simply applying new guidance"*. Kate believes *"it is hard to change behaviour"* and even if advice is accepted, there are still barriers present in relation to implementing property-level resistance and resilience (Chapter Five). There are also always those SME owner/managers who rely solely upon state flood mitigation measures meaning those 'technological flood fixes' provided by regulatory bodies such as the EA are still required by community stakeholders.

The EA compliments the notion of community resilience by installing city-wide, technological, anti-flood resistance and resilience measures and management plans. These include raising river embankments, installing barriers and managing river channels (EA, 2010f, p17-18). The EA is responsible for 25,400 miles of flood defences and spends an average of £427 million each year on improvements and maintenance (EA, 2009, p5). These defences are built with the purpose of reducing the risk of flooding to local communities, infrastructure, households and businesses, reflecting the EA's one-level, all-inclusive perception (Wedawatta and Ingirige 2012, p5-6). Every £1 spent on protecting communities from flooding saves £8 repairing flood damage over the lifetime of a scheme (EA, 2009, p17). It also assists continuity to the order of government through the continued survival of essential services and infrastructure in towns and cities.

Within Sheffield, the River Don is protected by 530 defences and the EA conducts regular maintenance work on riverbanks with plans to spend several million pounds

repairing its defences (EA, 2010b, p6). Within Hull, the city is protected by a tidal surge barrier (Figure 6.1) and defences which span along all main waterways, with plans to spend £24.5 million improving these defences in the foreseeable future (EA, 2012c, online). Although these defences protect 100,000 properties, 2007 still saw 55,000 premises flooded and a total of 500,000 properties are estimated to be at high risk of flooding by 2035 (Pitt, 2008, pix). Moreover, the delegation of responsibility for managing some types of flooding makes defending cities such as Sheffield and Hull a difficult endeavour. As Kate outlines: *“it’s not really clear from the new government what they are expecting from us...With surface water, who is responsible for that?”*. Regardless of these limitations, Kate asserts the EA are *“carrying on as best we can”*. Nevertheless, due to the EA’s one-level approach, resilience measures such as these may not suit the special requirements of SMEs.



Figure 6.1: Hull Tidal Surge Barrier (Original Photograph)

6.2.3. ENVIRONMENT AGENCY AND SMEs

EA publications and Kate’s assertions lead to the conclusion that, for the EA, all SMEs are included within a package of stakeholders that are at risk of flooding. An SME employing 250 people, and a family of five living in a council property, are both seen in the

same light: flood vulnerable. The EA's flood initiatives outlined previously protect and assist a wide range of stakeholders in a generic way without 'targeting' the specific needs of any one group.

"We don't sort of aim at business. It's more aiming for a bit of an envelope of everyone really that's impacted by flooding...We don't specifically give them any different advice because to us the message that we want to get across is the preparedness and resilience...When a place is at risk from flooding we need to contact all those people in that flood risk zone. It's not just the residents or just the businesses...I've always targeted them all at the same time and tried to engage with all of them...I think I would find it too difficult to target businesses just on their own."

SME assistance: Kate, Environment Agency

SMEs are quite distinct from other stakeholders, not only in nature, but also in flood perception. Owner/managers view themselves as separate from other vulnerable parties in regards to flooding consequences. Their concern is chiefly how a flood affects their business rather than the city-wide effects. Additionally, SMEs view flood as just another risk requiring a generic business continuity response. This is opposed to a unique type of risk requiring flood-specific mitigation. This disparity in perceptions raises issues as to whether a concentration upon the risk of flooding and the EA's one-level resilience approach is the most appropriate for SMEs.

The EA is responsible for protecting the 4.6 million people and 5.2 million properties at risk of flooding within the UK (EA, 2009, p3). Included in these statistics are many different stakeholders, all of whom would benefit from the availability of tailor-made flood advice and assistance including the elderly, families, hospitals, schools and SMEs. The large scale of this task means the EA can practically do little else but to, on the whole, roll out generic state flood protection measures and information. Furthermore, according to Kate the EA is a "*shrinking organisation*" and as such does not have the finances available to help all those at risk. Instead, the EA looks to vulnerable parties to take responsibility to help themselves (EA, 2009, p12). According to Siegrist and Gutscher (2006, p972), hazard risk information should be complemented by guidance about how people can prevent damage. However, residents, SMEs and other stakeholders experience flooding and recovery in different ways meaning the applicability and usefulness of the advice provided by the EA is questionable.

Despite all the evidence leading to the conclusion that the EA includes SMEs within an envelope of risk, towards the end of the interview Kate revealed something interesting.

For an extended period of time, she admits that the EA seemed to ignore the individual nature of many stakeholders due to issues of practicality and finance. Nevertheless, since 2007, the EA has begun to take into consideration the important contribution to the economy SMEs make. The agency notes how SMEs provide essential services which, if continued to operate during a flood, could also assist in maintaining continuity to the order of the government, the EA's primary aim. The EA has now produced an information leaflet designed specifically for businesses entitled *"Would your business stay afloat?"* (EA, 2012d). Kate outlines that this publication explains *"how to prepare your business for flooding, all the different things you should go through and preparing a flood plan"*. The existence of this document shows that the EA no longer treats everyone the same in regards to flood protection. However, it was not possible to locate this document on the EA website. This suggests that owner/managers are perhaps not receiving the information they require to make themselves flood resilient. It also hides the EA's change in stakeholder approach. However, even if this document were readily available to SMEs, there are a number of limitations associated with the advice provided.

SME levels of vulnerability to flooding vary as do the amount of resilience measures required to ensure business continuity. The one-level stakeholder approach adopted means the EA provides highly generic advice which is not applicable to all SMEs. The EA does not take into account differences between SMEs in terms of size and industry. From the owner/manager point of view, their SME may not possess the skills, resources, finances, time and knowledge required to implement effective flood resilience (Runyan, 2006, p19). An SME's cash flow and size can mean that it is not viable to create a flood pack for all employees. The guidance to move to another location or assign a member of staff to specifically plan for a flood event may not be attainable or financially viable. As outlined, due to the sheer number of SMEs and other stakeholders at risk of flood, the EA can practically do little else than deal collectively with all SMEs in unison. Kate asserts that she would find it *"too difficult"* to deal with SMEs on a case-by-case or even industry-by-industry basis. Nevertheless, the EA's specific concentration upon the risk of flooding, a concentration emphasised through statements such as *"businesses like yours are more likely to be flooded than destroyed by fire"*, could easily be altered (EA, 2012d, p2).

Due to their perception of flooding, SMEs mainly favour business continuity plans which help overcome the disruption caused by a multitude of risks. As it is not a local authority, the EA is not bound by the *Civil Contingencies Legislation 2004* to provide guidance regarding business continuity. The EA is tasked with focusing upon responses to flood only. The flood-specific advice it provides to owner/managers regarding the implementation of specialised flood responses differs to most SME current resilience

measures. The difference in priority between the EA and SME owner/managers means that these two stakeholders are at cross purposes when responding to the risk of flooding. As a result, the advice being provided by the EA is not suitable for SMEs and is not utilised or acted upon. This leads to SMEs remaining vulnerable and unprepared for the occurrence of a flood, and also to regulatory bodies believing owner/managers are uninterested in receiving its help.

"There is this perception that people expect us to do everything for them...We don't have the money, they've got to help themselves...and that's a difficult message to get across...We used to have a place on the Humber Chambers of Commerce...but it wasn't very successful so in the end we just pulled out. We went to a few events and we just ended up standing there, none-one would want to engage with us...it's quite a tough one."

Experiences with SMEs: Kate, Environment Agency

Within Yorkshire there is a need for people to help themselves and a demand for resistance and resilience advice. Yet, Kate remarked that when SME owner/managers were approached with guidance on how to mitigate against flooding, the EA was either spurned or ignored. Kate maintains that in some cases, even after the events of 2007, owner/managers asked the EA to *"just leave us alone"*. This is a surprising reaction given that SMEs rely upon and look to the EA as experts. There are a number of reasons for SMEs being unresponsive:

1. The advice provided by the EA is either not readily available, inappropriate for SMEs or in some cases arrives too late after an event.
2. It is suggested that following an event, SMEs owner/managers adopt a perception of it will not happen to me again.
3. Flooding is viewed as one in a package of risks rather than a specific threat.
4. A lack of understanding of the notion of community resilience by SMEs.

On the other hand, none of the SME questionnaire respondents reported receiving advice prior to the 2007 flood, and still only 37.5% know where to see advice now. Although Kate asserts that the EA does provide advice and guidance to businesses within Hull and Sheffield, SMEs are either not obtaining or utilising this assistance. This ultimately reflects a 'mismatch' of expectations and expertise between the EA and owner/managers.

In summary, the EA (social science) and SME (business practice) flood resilience measures take a different approach. The EA:

- A.** Ensures continuity to the order of government.
- B.** Coordinates services and functions in a city to maintain normality for residents through flood-specific technological fixes and flood-specific guidance under the notion of community resilience.

SME owner/managers:

- A.** Ensure continuity to the order of business.
- B.** Protect against, and plan for, the occurrence of a plethora of risks, not just flooding in isolation.

This means the EA and SME owner/managers, or social science and business practice approaches, are regularly at cross purposes: the EA often misunderstands how SMEs perceive flood. This may lead to the provision of inappropriate assistance. Although the EA has begun to see SMEs as an individual category of stakeholders, advice aimed at this group is not readily available. The EA is also not in a position to practically address the differences between SME industries and their interpretation of flood. Again, this can lead to unsuitable guidance which is then not acted upon. This provides the EA with the perception that SMEs are unresponsive to its advice. Although present in Yorkshire, is this scenario witnessed at a localised scale?

6.3. CITY LEVEL: HULL AND HULL CITY COUNCIL

Following the 2007 floods, the Pitt Review (2008) stressed that local authorities should take on responsibility for leading the co-ordination of flood risk management in their areas. Under the *Flood and Water Management Act 2010*, Hull City Council (HCC) as Lead Local Flood Authority (LLFA) became accountable for “*bringing together all relevant bodies to help manage flood risk*” within its locale (DEFRA, 2011, p1). HCC is required to “*develop, maintain, apply and monitor a local flood risk management strategy which is consistent with a national strategy, investigate flooding incidents and maintain a register of flood defences*” (DEFRA, 2011, p2). HCC’s perception of flood (social science approach) will influence whether this regulatory body chooses to implement flood resilience measures and if so, what type.

6.3.1. HULL CITY COUNCIL: FLOOD PERCEPTION

William is a Flood Risk Planner who works for HCC. The perceptions presented in this section are the opinions of William only, as access to council employees was restricted. William's perceptions have been supplemented with other documents, leaflets and press releases taken from the HCC website and other sources. As such, the conclusions drawn using William's opinions and secondary data are reliable and valid. For William *"Hull is a city which is governed by flood risk"*. In Hull, there are 19,557 properties at risk from surface water flooding, and fluvial events with a 1 in 100 or greater probability (HCC, 2007, p25; 2011, piv). These facts and figures help to formulate HCC's perception in regards to flood occurrence, likelihood and meaning.

As with SME owner/managers and the EA, a common theme running throughout many HCC flood risk documents is to perceive flood in terms of discontinuity. HCC draws close similarities with the EA. It looks at the 'bigger picture': city level discontinuity to the order of government. The *Strategic Flood Risk Assessment* for Hull highlighted the summer 2007 floods *"severe impact upon infrastructure"* and the *"need for essential civil infrastructure to remain operational during floods"* (HCC, 2007, p30 and 17). There is also a drive to safeguard more vulnerable developments such as hospitals (HCC, 2007, p43). To achieve these recommendations, HCC takes a holistic approach in regards to at risk stakeholders. William makes no differentiation between the different categories of groups involved. He labels them all as the general public. This notion is echoed within HCC publications where the word community encompasses all flood vulnerable parties: *"to ensure minimal risk to future communities"* (HCC, 2007, p37). Unlike the EA which has more recently identified SMEs as being different to other stakeholders, HCC does not see SMEs as a unique vulnerable group. This approach has implications in terms of the appropriate nature of the assistance provided to SMEs.

Although they share a common goal, reducing flood risk, there are some disparities between the EA and HCC in regards to flood perception. The EA views flood as a distinctive risk. HCC draws closer parallels with SME judgements: flooding is one in a package of discontinuities. For HCC, Hull is exposed to a multitude of discontinuities which have the potential to obstruct the order of government including industrial accidents, environment pollution and technical failure (HCC, 2010, p3). HCC are aware that *"things can happen which significantly disrupt our daily lives"* (HCC, 2012, p2). Within this plethora of risks, HCC prioritises flooding as being one of the top three risks likely to affect the city's community alongside pandemic flu and other severe weather (HCC, 2012, p2). Severe weather was also perceived to be a significant risk by SME owner/managers (business

practice). There are some discrepancies between HCC and SME risk perceptions. In Hull and Sheffield, it appears that a Business Impact Assessment would not reveal flooding to be perceived as significant risk to SME owner/managers. An economic downturn, a loss of telecommunications and a loss of electricity and gas are deemed to be important threats. None of the interviewed owner/managers or completed questionnaires stated that pandemic flu was a risk they believed could affect their SME. It is ultimately concluded that HCC are concerned with those city scale risks, while SME owner/managers are preoccupied with the smaller, organisational-level hazards.

HCC, the EA and SME owner/managers share one common perception: a flood has unique characteristics setting it apart from other risks. William stated that in 2007 *“there was a big pulse of water coming into the city”, “the street was trapped” and “rivers overtopped their banks”*. He also explained that *“in times of severe rainfall, surface water occurs through a complex interaction of drains ditches and dikes flowing into the city”*. These quotes demonstrate that for William, a flood occurs when water inundates usually dry areas with the source of the water irrelevant. If it is in an area where it is not usually present then it is out of place: a flood has occurred.

HCC perceptions of flood draw similarities and differences with the EA and SME owner/managers. HCC:

- A.** Judges a flood to be a discontinuity to the order of government.
- B.** Views those at risk as all the same.
- C.** Perceives flooding to be one in a package of discontinuities to affect a city.

These perceptions bear some resemblance to both EA and SME owner/managers beliefs. It is also these views which are highly influential upon the anti-flood mitigation measures implemented by HCC.

6.3.2. HULL CITY COUNCIL: ANTI-FLOOD MEASURES

Within Hull, *“measures will be required to protect strategic infrastructure”* in order to ensure continuity to the order of government (HCC, 2007, p43). William believes flood is *“a physical problem with specific physical solutions”*. As such, he asserts that HCC are *“continuing to invest to reduce flood risk in the city”* utilising *“high level strategies and defences...Everything we are doing is strategic, management, trying to get the big implementation of things”*. As part of this management, HCC has developed the *River Humber* and the *River Hull Flood Risk Management Strategies*. Under the *Strategic Flood*

Risk Assessment (HCC, 2007) and the *Surface Water Management Plan* (HCC, 2009), Hull is divided into flood zones of varying risk levels: areas “where water flows in times of flood highlighting the spatial variation of flood probabilities” (HCC, 2009, p11).

William maintains these plans include the use of “good flood defences” utilised to constrain water, “keeping it where it should be”. Thereby they protect critical infrastructure and essential services to allow their continuation during a flood. To achieve this, HCC have a network of riverside defences including “steel piling, timber wharfs, concrete walls...vertical sea walls...earth embankments...and the Hull Tidal Surge Barrier” (HCC, 2007, p33-34). William also outlines that in conjunction, the council is “looking at surface water storage at source to stop the flow coming into the city”. All these strategies and defences designed to protect critical services and infrastructure are implemented for the benefit of the whole city. They ensure dry areas remain dry. The general nature of these strategies demonstrates HCC’s perception of flooding as discontinuity to government, possessing unique qualities and also its holistic approach to those at risk. William maintains that “the benefits for housing and small- or medium-sized enterprises would obviously be massive”. However, the condition of these defences varies, with some in extremely poor condition (HCC, 2007, p7). William states this is because “it’s very difficult, in these times of funding, to maintain them to an appropriate level”. Accordingly, during times of flood these defences may not function as designed and could have serious repercussions. Should these defences fail, HCC looks towards community resilience and people helping themselves to respond and recover from a flood event.

Under the *Civil Contingencies Legislation 2004*, local authorities such as HCC are responsible for making local arrangements for civil emergencies (Cabinet Office, 2004, p2). Civil emergencies are those events or situations which cause a threat to human welfare, the environment, or national security, including flooding (Cabinet Office, 2004, p3). Within this act they are also responsible for providing “advice and assistance to businesses and voluntary organisations about business continuity management” (Cabinet Office, 2004, p4). In line with this act, HCC is an active member of the *Humber Emergency Planning Service (HEPS)*. Under the notion of community resilience, HCC and the other members of HEPS have developed a “Get ready for the unexpected” scheme. This scheme lays out plans of how HCC and local residents would “react and manage any major emergency” thus ensuring continuity to the order of government (HCC, 2010, p3). Accordingly, within Hull, HCC’s community focus is not specifically about flooding. It encourages all those at risk to prepare for a variety of hazards which may cause them discontinuity.

Embracing its holistic approach to those at risk, HCC distributed an advice booklet to all vulnerable parties. This booklet explained *“the measures you can take so you know what to do in an emergency to keep you and your family safe”* (HCC, 2010, p2)(Figure 6.2). The number of individuals who have taken this advice on board is unknown. Not all vulnerable parties will act on this guidance due to a number of barriers and motivations to adopting individual resilience (Sustainable Development Commission, 2010, p80). Within the publication, the words ‘household’ and ‘family’ are consistently used to describe the audience. This is reflected in the advice given: the majority of measures are designed for a residential property. Whereas some guidance can be indirectly applied to SMEs, like storing important items higher up, the majority is not suitable for these stakeholders: It would not be economical to have a spare set of clothes for every worker at a medium-sized enterprise. Due to variations in vulnerability between SMEs and other vulnerable groups, there is a need for HCC to see SMEs as stakeholders separate from others at risk, tailoring the advice distributed to them. As the experience of the EA shows, even if this is done, it may still not be successful. Ideally, advice should be provided on a case-by-case or industry-by-industry basis. In practical terms there is little more HCC can do than adopt an all-inclusive response to community resilience. Therefore, William and the HCC’s choice to *“not aim at businesses”* impacts upon the relationship between HCC and SME owner/managers.

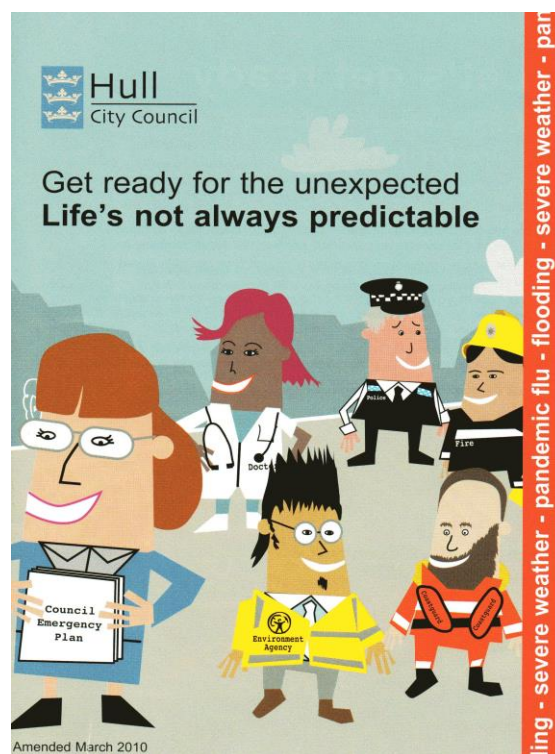


Figure 6.2: A leaflet provided by Hull City Council offering advice on how to prepare for ‘the unexpected’

Source: Hull City Council, 2010

6.3.3. HULL CITY COUNCIL AND SMEs

“How are we helping businesses to become more resilience? We’re trying to lead and do something from the front as a Lead Local Flood Authority...By trying to bring these schemes forward and lobby the right people in the right way, we are trying to do things for businesses.”

SME assistance: William, Hull City Council

William states that HCC does not *“particularly target businesses anyway different than we do individuals and property owners”*. By implementing structural and technological flood defences and strategically generated policies, William believes that residents, SMEs, critical infrastructure and essential services are directly and indirectly protected against the damage and discontinuity a flood causes. He maintains that HCC provides *“them all with advice about what to do before a flood and after a flood”*. This demonstrates HCC’s holistic stakeholder approach. Although HCC recognises that Hull stakeholders are exposed to a plethora of hazards, in some respects this awareness does not translate into practice. Following the 2007 floods, a drive towards flood-specific resilience became a priority for HCC. This causes HCC and SME owner/managers to be at cross-purposes regarding resilience. SME owner/managers prioritise continuity during the occurrence of any hazard. Consequently, the flood assistance provided by HCC was not the help that was required. This may have led to an unresponsive attitude by SMEs.

“We did a public event to pass on information...Zero people turned up...That was placed right in the hotspot of where businesses are...I attended Hull Business Week...I was there to talk about flood risk to whoever...I had some discussions but it was really like, oh that’s interesting, good to see that something is being done and there was nothing more than that.”

SME experience: William, Hull City Council

William asserts that *“if businesses do start to talk...about wanting to do more”* in regards to flood resilience, he will *“have a discussion with them and advise them”*. Yet, William maintains that despite owner/managers calling for HCC *“to do something”* in regards to flooding, he is *“not getting a lot of communication coming through”*. SMEs do not acknowledge the guidance being distributed. As with the EA, it is concluded that the unreceptive nature of SMEs in regards to flood advice is accountable to both HCC and owner/managers being at cross-purposes in regards to prioritising risk and what

assistance is required. SMEs desire continuity to the order of business when faced with any adversity. They require continuity advice, not risk specific advice. HCC focuses upon flood as a significant risk for SMEs to address. Accordingly, it disseminates flood-specific guidance. HCC's holistic stakeholder at risk approach means generic flood resilience guidance is not applicable to all SMEs. Practically, there is little HCC can do in regards to developing advice specific to every vulnerable group of stakeholders due to the size of the task and available finance. However, under the *Civil Contingencies Act 2004*, advice regarding business continuity planning could be made available, but only if the regulatory body in question was more aware of its necessity.

For William, HCC focuses upon the significance of flooding due to a lack of interaction between themselves and owner/managers. He states: *"You steer your actions by what you get coming towards you, but we're just not getting anything coming back"*. William asserts that if SMEs do not communicate their requirements, then HCC remains unaware as to the most appropriate strategies to employ to assist owner/managers in maintaining continuity. This lack of communication is attributable to many variables:

1. Owner/managers may not implement resilience measures if there is no drive to do so (Finch, 2004b, p185). As William outlines, *"they are not interested in looking after themselves"*.
2. Over time anxiety about flooding dissipates if it does not continue to reoccur (Roth and Cohen, 1986, p813).
3. Owner/managers have faith in state flood defences and thus no longer see flood as a threat (Cullen, 2001, p1). Known as 'The Levee Effect' (Tobin, 1995), this occurrence is highlighted by William: *"Flooding is soon forgotten...because they know the river is there and they live with it...they know they are behind the tidal surge barrier"*.
4. An SME's size: as William asserts: *"[X] and [Y] have got resilience...but is that because they are bigger?...What are the drivers for smaller businesses to speak to us?"*. Nevertheless a Chi² test showed no relationship between SME resilience and SME size (p=0.121).

Whatever the reason, William maintains that providing suitable advice to an unreceptive and non-communicative audience is *"a really difficult thing"*. Communication is a two-way process. From the SME stance, within Hull none of the owner/manager questionnaire respondents reported being given advice before the 2007 floods. Only 26.7% know where to seek advice at present demonstrating HCC's difficulties in

disseminating guidance. William asserts that HCC are providing advice and guidance. SMEs are either being unresponsive to this help or not obtaining the message. However, William does confess that *“when they do have dialogue with the business owners, it’s driven by a need rather than proactively going to them”*.

The above relationship between HCC (social science) and SME owner/managers (business practice) is strongly correlated with these stakeholders being at cross-purposes in regards to the most significant risk. William’s claim of HCC failing to recognise SME needs due to a lack of communication is unfounded. HCC is aware that Hull stakeholders are exposed to a plethora of unexpected events as is demonstrated by the leaflet in Figure 6.2. However, HCC is not able to transform this into practice in terms of the advice given. Following governmental pressures and due to national policies such as the *Flood and Water Management Act 2010*, HCC has been made to concentrate upon tackling the issue of flooding. Therefore the advice provided by HCC is not tailored to SMEs and it prioritises a hazard that is not significant to owner/managers. The advice provided is not required. This can result in SMEs not using this guidance and not taking steps to ensure their continuity, ultimately leaving themselves vulnerable to a multitude of risks. Is this situation only present within Hull?

6.4. CITY LEVEL: SHEFFIELD AND SHEFFIELD CITY COUNCIL

As a Lead Local Flood Authority (LLFA), Sheffield City Council (SCC)(social science approach) is also responsible for co-ordinating flood risk management within Sheffield. Under the *Flood and Water Management Act 2010* (DEFRA, 2011), the council is tasked with identifying and assessing the risk from all forms of flooding. It demonstrates how these risks will be managed, and identifies opportunities to reduce the probability and consequences of flooding in the future (SCC, 2011d, p5). As with HCC, the council’s perception of flooding influences how it fulfils these responsibilities.

6.4.1. SHEFFIELD CITY COUNCIL: FLOOD PERCEPTION

Jamie is the Senior Emergency Planning Officer for Sheffield City Council. The views presented in this section are the opinions of Jamie only, due to a lack of access to other council employees. However, Jamie’s perceptions have been supplemented with other documents, leaflets and press releases taken from the HCC website and other sources Like William in Hull, Jamie believes Sheffield *“is still at risk and will always be at risk”* of flooding due to the city’s location. Flood in Sheffield is of a different magnitude to

Hull, with exposure within the city is variable. Some areas experience a 1 in 100 year chance of being flooded. Others are susceptible to a 1 in 20 year probability. Although Sheffield is the larger city, only a tenth of the number of properties at risk in Hull are vulnerable to flood in Sheffield. In comparison to the 100,000 properties at risk in Hull, only 10,000 Sheffield properties are exposed to river and surface water floods, surcharging of the underground sewer system, reservoir failure and defence failure (SCC, 2008a, piii). These statistics influence what flood means to SCC.

SCC also views flooding as a discontinuity. As Jamie refers to a lack of access to hospitals, the loss of bridges and damage to utility pipes, his perception aligns more closely with that of the EA and HCC: flooding is a discontinuity to the order of government. SCC draws further parallels by adopting a one-level or holistic, all inclusive stance towards flood vulnerable stakeholders. When speaking about flood resilience, Jamie states *“that goes for residents as well as businesses”*. This approach is also demonstrated within Council publications. All those at risk are grouped together using statements such as *“safeguarding the wider community”* (SCC, 2008a, p29). It can be argued that Jamie’s perception shares more similarities with those held by SME owner/managers. He regards SMEs as a group separate from other vulnerable stakeholders: As Jamie remarked: *“you’ve got the residents, and then you’ve got the businesses; they are different”*. In this sense, SCC observes flooding at the macro- and micro-scale, an awareness that may be beneficial for SMEs in regards to risk resilience.

During interview, Jamie states that SCC is aware that flooding is *“just one of the risks”* Sheffield is exposed to: *“we get fires involving acetylene cylinders; we have one a month”*. As demonstrated by the *Community Risk Register*, other hazards can *“impact upon the communities of South Yorkshire”* (SYLRF, 2011, p1). Unlike the EA, flooding is not seen as a separate, unique entity. Drawing similarities with HCC, SCC perceives flooding or extreme weather as a significant threat alongside pandemic flu and industrial accidents (SYLRF, 2011, p5). Differing from HCC, SCC does not over-emphasise the risk of flooding. As Jamie outlines, SCC recognises SMEs face a plethora of events: *“there are other risks we and businesses have got to plan for”*. Once again though, SCC is concerned with those city-scale risks, while SME owner/managers are preoccupied with the smaller, organisational-level hazards.

Despite the disparities between these stakeholders, the EA, HCC, SCC and SME owner/managers share a common perception: floods possess unique characteristics setting them apart from other risks which threaten a city or business. Jamie observes that a flood has occurred when water is present in an area that is normally dry: *“calls started coming in saying streets were flooding...properties were flooding”*. However, when speaking

about the origins of flood, Jamie tends to refer to its extraneous origins such as “*when it rains heavy*” and rivers “*over topping*”.

All four stakeholders outlined above, and thus the social science and business practice approach share similar perceptions in that they regard flooding as a cause of discontinuity. The scale and significance of this disruption depends upon which perspective is being considered:

- A. Discontinuity can be caused to the order of business (business practice) or to the order of government (social science).
- B. A flood can be seen as a significant, separate disruption or one in a ‘package of risks’.
- C. Flood vulnerable stakeholders can be either seen as separate groups requiring unique resilience advice or bundled together under the term, community.

It is clear that of the three regulatory bodies outlined, SCC perceptions are closest to the opinions of SME owner/managers. This was an unexpected finding given that of the two cities, Hull has the highest number of owner/managers exposed. Is the similarity between SCC and SMEs reflected in its anti-flood measures?

6.4.2. SHEFFIELD CITY COUNCIL: ANTI-FLOOD MEASURES

For Jamie, “*wherever you’ve got a large population [number] of rivers, there’s always going to be a risk of flooding*”. He states that SCC has a “*duty towards emergency preparedness and emergency response*” and, like the EA and HCC, implement a number of flood management strategies including the *River Don Catchment Flood Management Plan* (EA, 2010b) and the *Strategic Flood Risk Assessment (SFRA)* (SCC, 2008a). Like Hull, Sheffield is divided into zones of low, medium and high probability of flooding based upon available data (SCC, 2008a, pi). Taking these zones into account, new developments can be steered into areas of low flood probability, thus reducing the threat to properties including SMEs.

To ensure continuity to essential services and infrastructure, SCC utilises a number of ‘technological’ flood mitigation schemes but only a relatively small number of these are ‘formal’ flood defences. The likelihood that members of the general public will be situated immediately behind a flood defence is relatively low. Unlike HCC, SCC uses many ‘defacto’ defences. These are structures not specifically built to retain flood water, yet provide some protection against flooding (SCC, 2008a, p13). For example, a railway embankment or

large building can act as an artificial dam containing the flood water in one location. There are limitations associated with both of these methods of defence. Formal structures do not guarantee protection. Defacto defences are not specifically designed to withhold a depth of water, placing pressure upon the structure and increasing its failure likelihood.

The perception of SCC acts as a barrier to the installation of flood defences in the city. SCC does not prioritise flooding as a distinctive risk and promotes continuity to many hazards rather than flood-specific mitigation. This could be due to the fact that a smaller population of residents are at risk of flood in comparison to Hull. Accordingly, SCC is not as constrained as to how flooding should be addressed. Under the *Civil Contingencies Legislation 2004*, SCC is responsible for making local arrangements for civil emergencies (Cabinet Office, 2004, p2). SCC has an *Emergency Planning Team (EPT)* who are responsible for “*preparing, maintaining and co-ordinating a robust and effective response to emergencies*” (SCC, 2010a, online). By using ‘multi-agency plans’ which “*ensure that the council can continue to deliver its key services during an incident, no matter how large or small*”, SCC assists continuity to the order of government during a flood (SCC, 2010a, online). According to Jamie, prior to an emergency the EPT is responsible for “*putting all the arrangements in place*”. During an incident they “*are in charge of response*”. When the danger has passed, they become the lead agency charged with recovery (SCC, 2010a, online). The benefits of using an EPT to maintain essential services and critical infrastructure are widely felt. The EPT adopts an all-inclusive stakeholder approach assisting all those in need when responding to the occurrence of a flood. However, Jamie remarks that SCC “*only have a limited amount of resources*”. Accordingly “*there has got to be some kind of responsibility by owners of properties to try and protect themselves*”.

As is the case for the EA and HCC, SCC promotes community resilience: To help people to help themselves. Jamie outlines how SCC distributes guidance leaflets, puts “*two events on year*” and has developed “*the website to be more public focused*”. Unlike other regulatory bodies, SCC promotes continuity to all risks and places more responsibility upon the shoulders of the community. It asserts that during and after an emergency, communities will be “*assisting the emergency services who will be very busy*”, and in some instances “*initial response to an emergency may rely entirely on local people*” (SCC, 2011e, online). As this is the case, Jamie outlines how SCC has a “*duty to warn and inform people*” and “*try and promote community preparedness*”. Yet once again, the main limitation associated with community resilience as outlined by Jamie is that “*you tell people to do it*”, but there is “*no way of checking they are actually doing it*”.

All three regulatory bodies examined use anti-flood measures which revolve around notions of:

- A. Keeping dry areas dry.
- B. Ensuring continuity to the order of government.
- C. Community resilience.
- D. Protecting those at risk.

How appropriate these measures are for SMEs depends upon the significance level given to flooding by the regulatory body in question. It also relies upon whether regulatory body and SME owner/manager perceptions converge or diverge. As SCC perceptions more closely resemble those held by SMEs, it is suggested that the measures it implements are more likely to complement the needs of SME owner/managers.

6.4.3. SHEFFIELD CITY COUNCIL AND SMEs

Of the three regulatory bodies in question, Sheffield City Council appears to the most 'in tune' to SME needs and perceptions. SCC recognises SMEs as separate stakeholders in regards to flooding risk. Jamie is aware of how the consequences of flooding vary between SMEs, and in comparison to other parties: *"it's such a variety of businesses...Big businesses suffered big losses...Smaller places will be hit differently"*. There is an acceptance that the city and SMEs are exposed to a plethora of risks. Although the EA has begun to see the importance of categorising SMEs as separate stakeholders, this is not made clear or publicised effectively. This is not the case in Sheffield. SCC openly promotes the individual nature of SMEs through the *Business Emergency Resilience Group (BERG)*.

"After the flooding...we tried to make it a forum run for businesses by business. I mean generally we're still running it. If we didn't kick them into right you're having an event then they wouldn't have it. We try to put two events on a year...The first two were about flooding. But then the feedback was "we're bored of flooding, we want to talk about something else". So we've broadened it out to talk about all sorts of risks."

The Business Emergency Resilience Group: Jamie, Sheffield City Council

BERG is a group run by businesses and is available to all businesses and voluntary organisations located in Sheffield. Through a process of networking and information sharing, it aims to build the resilience of Sheffield's business community to cope with the unexpected (SCC, 2010b, online). BERG promotes business continuity. It encourages SMEs

to produce emergency plans to respond to any risk, employing the notion of community resilience. As Jamie asserts, *“we are trying to get SMEs more responsible for their premises”*. The community in this respect are SMEs, rather than the city as a whole. In order to assist SMEs in their endeavour, BERG disseminates information through leaflets, websites and events which can be attended by 50 to 60 people. Information regarding BERG and its membership was requested from Jamie, yet due to confidentiality issues was not provided.

By allowing SMEs to be in control of BERG, SCC has become aware of differences in stakeholder perceptions. This awareness, and allowing businesses to dictate the agenda, assists BERG in providing advice relevant and suitable to SMEs in regards to business continuity. This reduces vulnerability and reduces the possibility of SME perceptions being misunderstood. There are some limitations associated with BERG. Although the advice provided by BERG compliments SME flood perceptions, Sheffield owner/managers still appear to be unresponsive to this assistance. Jamie highlights that if he *“didn’t kick them into right you’re having an event, then they wouldn’t have it”*. This appears to be a case of heightened risk awareness after the experience of a disruption, but then a diminishing interest as time passes (Singer, 1990, p362): owner/managers had become *“bored with flooding”*.

As with William, Jamie has his own opinions as to why owner/managers do not respond to the advice given. This primarily relates to how SMEs interpret the threat. Not only do perceptions of risk influence whether resilience measures are implemented, they can also impact upon whether risk communications are accepted (Mullins and Soetanto, 2010, p39). SCC is responsible for providing flood risk information and guidance on resilience measures. The way in which an SME reacts to this information influences whether they absorb guidance about resilience and act upon advice. If they do not believe a risk is present, then owner/managers will not protect against it or include it in their continuity plan. As Jamie states, *“a lot of businesses are not on rivers. Why do they care?”*. Furthermore, there is an opinion that owner/managers are not responsible for implementing business continuity as regulatory bodies do it for them through city-wide resilience measures and under the *Civil Contingencies Act 2014* (Duval and Munitis, 1999, p505).

Once again, from the SME or business practice approach:

- Only 2.3% of respondents stated that they were given advice prior to the 2007 floods.
- 4.1% maintain that they knew where to seek advice from during the flood.

- Following the flood, only 15.8% were aware of where to seek advice from.
- 6.4% were provided with guidance.

Although SCC are more in tune to the individual nature of SMEs and their needs, the above figures highlight that this makes no difference in practice. The result is still the same: SMEs appear to remain unresponsive to the advice being given. At the same time they maintain that this assistance is not readily available. In Sheffield, SMEs remain vulnerable to a plethora of hazards, including flood.

6.5. CONCLUSION

A common perception shared by SMEs, the Environment Agency, Hull City Council and Sheffield City Council is to view flooding in terms of 'discontinuity'. The scale of this disruption causes a divergence in perception between owner/managers and regulatory bodies. For SMEs and business practice, a flood causes discontinuity to the order of business: a flood event will either hinder or stop everyday business procedures. For regulatory bodies or social scientists, a flood causes discontinuity to the order of government, disrupting the 'normality' of a particular location through damage to critical infrastructure, loss of amenities and obstruction to essential services. As a result, all three regulatory bodies employ state defences designed to assist in maintaining continuity to these government services. Yet not all regulatory bodies approach SME flood assistance in the same way.

The EA:

- Prioritises flooding as an important risk due to its remit.
- Recognises SMEs as a uniquely vulnerable group, but does not provide advice appropriate for all owner/managers.
- May be at cross-purposes with SME owner/managers.

For HCC:

- All those at risk of flooding are protected through generic flood-specific protection advice, and flooding is prioritised as a significant risk.
- SMEs do not receive business continuity advice which is tailored to their needs.

- SMEs are at cross-purposes with HCC in regards to the assistance provided and required.

SCC:

- Perceives SMEs as separate stakeholders.
- Is aware that flooding is just one in a plethora of hazards a business faces.
- Provides more suitable assistance and measures complimentary to SMEs.

Within Hull and Sheffield, whether a regulatory body is in-tune to the needs of SME owner/managers or whether they are at cross-purposes seems irrelevant: from the regulatory body perspective, the outcome remains the same. Owner/managers appear to be unresponsive to the assistance being provided by the EA, HCC or SCC. They do not absorb the message of community resilience or act upon the advice being given. This may lead to SMEs remaining exposed to not only flooding, but a plethora of other hazards. From the SME perspective there are claims that flooding assistance from regulatory bodies is not readily available or widely publicised. Moreover, as some of the advice provided relates primarily to flooding, SMEs remain vulnerable to a number of additional hazards: the assistance they require in regards to business continuity plans is not available for them to use in order to make themselves resilient. This can have severe implications for all those involved should a flood or other risk materialise and SMEs are unprepared.

An SME owner/manager's ultimate lack of resilience is related to the notions of 'blame' and 'responsibility'. No-one actually knows who is responsible for what, creating a 'Responsibility Game' between SMEs and regulatory bodies in Hull and Sheffield. Regulatory bodies believe SMEs should be responsible for their own protection under the notion of community resilience. Owner/managers believe regulatory bodies should be responsible for protecting them against floods and other hazards as they are in positions of power and it is their responsibility. When a hazard such as a flood occurs, and SMEs are affected, each stakeholder 'blames' the other for not fulfilling their responsibility. This responsibility game can be traced back to issues associated with national policies. Under the *Flood and Water Management Act 2010*, government plans tend to be very prescriptive. They do not allow local authorities to tailor their strategies to suit their location's characteristics and those stakeholders present meaning regulatory bodies and SMEs are often at cross-purposes. The following chapter examines these claims. It explores the relationship between SMEs and regulatory bodies further, and examines the implications of the presence of a responsibility game upon both business practice and flood risk management policies.

7. SMEs AND REGULATORY BODIES: IMPLICATIONS OF ALTERNATIVE FLOOD RISK PERCEPTIONS

7.1. INTRODUCTION

SME owner/managers view the Environment Agency (EA), Hull City council (HCC) and Sheffield City Council (SCC) as the first line of defence in relation to flood risk. This is due to them being in positions of responsibility. These regulatory bodies:

- A.** Assert that they are directly and indirectly protecting and assisting SMEs through ‘community resilience’ advice, large-scale, flood-specific protection measures and flood management strategies.
- B.** Maintain that SME owner/managers are unresponsive to anti-flood advice or assistance and do not voluntarily communicate regarding flood mitigation.

This leads to suggestions that the EA and HCC are at cross-purposes with SMEs in regards to the assistance needed and provided, resulting in an owner/managers uninterested manner. Even when a regulatory body like SCC provides assistance suitable for SMEs, there are still claims that owner/managers ignore their guidance. Both of these scenarios mean SMEs continue to be exposed to the risk of flooding.

Alternatively, in Hull and Sheffield SME owner/managers:

- A.** Maintain that flood assistance is not readily available.
- B.** Assert that, if provided, advice cannot be used by all SMEs to make their businesses resilient.

A scenario exists where, from the social science approach, regulatory bodies claim they are providing guidance and assistance, yet, within business practice, SME owner/managers are either choosing to ignore this advice, or are not receiving the message. Either way, again SMEs remain susceptible to flood. Under what can be termed the ‘Responsibility Game’, both stakeholders hold one another responsible for this situation. In response, this chapter has three aims:

- 1.** Explore SME perceptions of and responses to ‘expert’ assistance.

2. Understand how perceptions of assistance and flood management strategies can contribute to the development of a responsibility game.
3. Examine the implications of a responsibility game upon SMEs and government policies.

7.2. THE THEORY OF BLAME

People are driven to seek causal explanations for how and why things happen (Heider, 1958, p172; Hart and Honoré, 1985, pxxv; Sloman and Lagnado, 2004, p287; Hilton *et al.* 2005, p44). Determining cause is complex. There are numerous events or factors that could be responsible for a particular outcome, with flooding no exception (Lagnado and Channon, 2008, p754). Under the hazards-based approach, concentration falls upon the ‘naturalness’ of a flood (Mitchell, 1989, p392). Causes are explained in terms of physical characteristics that are ‘beyond human control’ (Tobin and Montz, 1997, p49). In this scenario, a regulatory body cannot be blamed for causing a flood. It was not HCC or SCC that were responsible for the unprecedented heavy rains that were the catalysts for the floods in summer 2007.

However, recently there has been a shift towards the adoption of a disaster-based view, with floods seen as partially constructed by human action. That is, there is usually a ‘causal chain’ of events leading to a floods occurrence (Miller and Gunasegaram, 1990, p1117; Mandel, 2003, p423). Following this approach, Hull and Sheffield City Councils can be held at least partly responsible for contributing to past floods: they consciously made decisions to increase urbanisation and alter river channels. Nevertheless, through Shaver’s (1985) “*theory of blame*” notion, an individual should apportion blame only if an actor:

- A. Contributed to the event.
- B. Was aware of the consequences of their actions.
- C. Intended to bring about the event in question.

As both councils did not intend to cause a flood, the extent of their culpability over its occurrence can be questioned (Lagnado and Channon 2008, p755). Although those affected look for someone to blame following an event, the notion of who to blame for the occurrence of a flood is complex, with many people and factors responsible. Often the occurrence of a flood is ‘blameless’ as no-one party is solely culpable. However, regulatory bodies can be held culpable for the consequences experienced both during and after a floods occurrence.

Under Alicke's (2000) "*culpable control model*", people will assess potentially blameworthy actions in terms of an actor's personal control over harmful consequences. In some respects, regulatory bodies can be held responsible for the presence of ineffective flood mitigation measures which do not protect those at risk. The Environment Agency, Hull City Council and Sheffield City Council are charged with co-coordinating flood risk management in their areas. The fact that a flood in 2007 has occurred and caused harmful consequences means they have not fulfilled their responsibilities, and to this extent are to blame. Nevertheless, the *IPCC Report on Climate Change 2013*, states extremely localised weather events are becoming more frequent and increasingly difficult to predict (IPCC, 2013, p956). Therefore, it may be unfair to blame a regulatory body for not fulfilling its flood risk responsibilities when this risk is constantly changing in nature.

Researchers have discovered that blaming victims is also dominant and widespread, particularly in developed countries such as the USA and UK (Singer and Endreny, 1993, p167). Regulatory bodies are not solely responsible for protecting all those at risk. The 'ownership of risk' notion advocated by David Cameron within the 'Big Society' concept means regulatory bodies look to all vulnerable stakeholders, including SME owner/managers, to take responsibility for protecting their property and ensuring their own continuity (community resilience). Regulatory bodies provide assistance in order to assist SMEs in achieving this goal. In this instance, when a flood occurs and an SME is affected, the regulatory body holds owner/managers responsible for their own plight.

In summary, a responsibility game exists in Hull and Sheffield. Regulatory bodies and SMEs believe the other is responsible for implementing flood resilience measures. But are SMEs even aware that it is their responsibility to protect themselves against flooding and other hazards? To what extent is the resilience advice provided by regulatory bodies being received and if provided, how do owner/managers respond to the advice if it is inappropriate for their needs? Before these questions are answered, it is necessary to understand the nature of the assistance provided by regulatory bodies and what is required by SMEs.

7.3. THE NATURE OF ASSISTANCE

As regulatory bodies are seen as responsible for flood management, there are always calls for regulatory bodies to make changes in order to prevent flooding in the future or limit its impacts. As John from Company J (Sheffield) outlines: *"it's a societal problem. I can't take full responsibility for the river and what happens up the river so the council needs to do something"*. The 'something' John is referring to relates to the

assistance provided by the EA, HCC and SCC. Prior to 2010, regulatory bodies had the power, but not the legal obligation, to manage flood risk in England and Wales. In April 2010 the *Flood and Water Management Act* placed a duty on all local authorities (UK Groundwater Forum, 2013, online). Regulatory bodies are now responsible for managing local flood risk through the development of strategies or actions plans, and for dealing with the consequences of flooding (Wirral County Council, 2014, online). The EA is responsible for managing flood risk from main rivers, the sea, reservoirs and also overseeing the work of local authorities (EA, 2013, online). Regulatory bodies are also now legally required to provide flood assistance. This could explain why the EA, HCC and SCC all maintain that they provide help to the SMEs of Hull and Sheffield through the implementation of flood strategies, guidance on community resilience. Yet, they also maintain that SMEs are unresponsive to these efforts. SME owner/managers on the other hand, assert that regulatory body assistance is not readily available. This leads to the responsibility game scenario: regulatory bodies and SMEs hold each other responsible for implementing resilience measures.

A further explanation for the presence of this situation can be attributed to a variation in what the term ‘assistance’ means to these two groups of stakeholders and the social science and business practice approach. Soanes and Stevenson (2005) define assistance as the *“provision of money, resources and information to help someone”* (p95). As such, flooding assistance takes a variety of formats and is provided at a variety of stages during a flood including advanced measures, direct/emergency (during a flood), post-flood and rehabilitation (Bruzewicz, 2008, p104). The assistance provided to Hull and Sheffield SME owner/managers by the EA, HCC and SCC primarily focuses upon the implementation of technical resources and the dissemination of guidance for community resilience. For SMEs, there is a demand for financial assistance whether to help cover the cost of installing resilience measures or the recovery process: *“there were some grants and we claimed for everything we could”* (Rachel, Company R, Sheffield). Due to the current economic recession, the regulatory bodies in question *“just don’t have the money”* (Kate, EA) to provide large amounts of financial assistance: SMEs need to take responsibility for generating their own funds. Resultantly, regulatory bodies provide information and resources that do not satisfy the financial needs of the owner/managers. This leads owner/managers to perceive regulatory bodies as failing in their responsibilities and results in their unresponsive attitudes to assistance. It is this conclusion which will now be explored.

7.4. SME RESPONSES TO REGULATORY BODY ASSISTANCE

7.4.1. REGIONAL LEVEL: YORKSHIRE SME RESPONSES

Within the social science approach, Kate, An EA representative, asserted that at a regional level the assistance the agency provides to SMEs comes in the form of large-scale flood defences, flood warnings and the dissemination of advice through the media, websites and public events. Championing community resilience, Kate maintains that SMEs should “*help themselves*” and take more responsibility for their own survival. Owner/managers need to establish their own anti-flood measures and plans rather than relying solely upon state measures. Although Kate claims that SMEs are calling for “*something to be done*”, owner/managers appear to be unresponsive to flood assistance when it is provided. The questionnaire distributed to SME owner/managers within Yorkshire, and thus the business approach, demonstrated a different perspective (Box 7.1).

BOX 7.1: YORKSHIRE SME RESPONDENTS QUESTIONNAIRE RESULTS

Before the flood:

- 6.3% agree they were given warning.
- 0.0% agree they were given advice on how to cope with this hazard.

During the flood:

- 6.3% agree they were given advice on how to respond to this hazard.
- 41.7% agree that they did not know where to seek reaction advice or assistance from.

After the flood:

- 16.7% agree they were given advice and assistance on how to recover from this hazard.
- 37.5% agree that they did not know where to seek recovery advice or assistance from.

Many SME owner/managers perceive regulatory bodies as experts primarily responsible for reducing the consequences of flooding within Yorkshire. A lack of state resilience can affect the vulnerability of an SME, particularly if an SME does not have any private flood measures (Jha *et al.* 2012, p501). In fact:

- 42.6% of owner/managers maintain that a shortage of government or local authority initiatives increases their company’s flood exposure.

- 27.0% assert that the presence of government or local authority initiatives affects whether they implement flood protection measures themselves.

The figures in Box 7.1 demonstrate that from an SME perspective, flood warnings and guidance are either non-existent, not widely distributed or difficult to access when required. Consequently, 85.4% of owner/managers feel that they had to cope on their own during a flood event. These findings confirm the conclusions that a divergence in perceptions leads to a scenario where the EA maintain they are providing defence and advice, yet SMEs are either unresponsive to this help or ignoring the message. It is the poor distribution of inappropriate advice which mainly causes this situation.

A wealth of literature exists regarding the effectiveness of flood risk communications upon those at risk, including context and distribution (Sime, 1997, p155-175; Handmer, 2000, online). Risk communication relates to the 'expert-lay knowledge' divide. Citizens lack expert knowledge to judge the uncertainties that cause unexpected events (Wynne, 1996, p46; Terpstra *et al.* 2009, p1144). They rely instead upon expert authority perceiving them to be scientific, competent and trustworthy (Giddens, 1990, p98; 1994, p7; Brown and Damery, 2002, p49). This reliance means that any regulatory body communications designed to increase risk perception and understanding can be highly influential and lead to "*social learning*" (Raaijmakers *et al.* 2008, p315). Risk perception is an important predictor of people's decisions to adjust to flooding (Lave and Lave, 1991, p256; Grothman and Reussegewig, 2006, p103, Keller *et al.* 2006, p632). An increasing level of perceived risk leads to an increased motivation to install protection measures and vice versa (Floyd *et al.* 2000, p410; Neuwirth *et al.* 2000, p723). Nevertheless, communications can only have the desired effect if they are distributed sufficiently, widely received, and will only be effective if the expert advice is appropriate for the stakeholders in question: SMEs (Morgan *et al.* 2002, p4; Glik, 2007, p40).

Risk campaigns which closely reflect social perspectives are the most efficient (Shaw, 2005, p2). Some educational schemes fail to take into account the subjective and highly contextualised nature of public understandings of risk (Scanlon, 1990, p235). Campaigns designed to increase knowledge about flooding can be ineffective when the manner in which the education is undertaken is inappropriate (Brown and Damery, 2002, p235). If the content of 'top-down' expert information embodies inaccurate, contradictory and unrealistic assumptions about the nature of the receiving populations (e.g. SMEs), or the modes of disseminating such information do not reflect social perceptions, then the message will be ignored (Green, 1990, p31). An SMEs unresponsive nature can therefore be attributed to poorly distributed EA flood assistance which does not reflect their needs: the provision of flood-specific advice when guidance regarding continuity is required.

Responsibility for SMEs passive attitudes should not rest squarely with the misunderstandings by regulatory bodies. Returning to the expert-lay knowledge divide, the lay public or owner/managers have different intellectual standpoints than those of the experts (Wynne, 1992, p297; Irwin and Wynne, 1996, p84). They regularly possess unrealistic expectations of what the experts can achieve in regards to flood resilience (e.g. the provision of finance)(Brown and Damery, 2002, p416). Owner/managers place too much responsibility upon the shoulders of regulatory bodies. This results in an affirmation of owner/managers pre-existing poor perceptions of the EA, and perceived lack of assistance. As Rachel from Company R (Sheffield) highlighted: *"We need some kind of reassurance from the Environment Agency that they are going to get a flood warning system sorted out, that they are going to do their job properly!"*

Analysis of the SME perception of EA regulatory body assistance provides support for the notion of a responsibility game scenario:

- The EA holds owner/managers mainly responsible for SMEs lack of resilience as they are unresponsive to the assistance the EA provide.
- Owner/managers hold the EA responsible for their vulnerability maintaining that the agency is not providing suitable assistance which they can use to increase their resilience.

Both situations leave SMEs exposed to the very hazard the assistance is trying to protect them from (See section 7.4). There are a number of other reasons as to why owner/managers may not implement flood resilience measures, with the responsibility game just one of them. It is worth noting that 'doing nothing' can also be a form of continuity. Just because an SME does not choose to implement resilience measures does not necessarily mean that owner/managers have not thoroughly considered the matter and that their inaction is a strategic decision (Woodward *et al.* 2011, p339). Nevertheless, the responsibility game scenario may not be present between local councils and SME owner/managers. This questions the generalisability of the notion.

7.4.2. CITY LEVEL: HULL SME RESPONSES

Within Hull, SME owner/managers rely on HCC to provide the first line of flood defence. If flood resilience measures such as flood defences and management strategies are not provided by HCC, this can have a serious impact upon individual SME vulnerability to flooding. Resultantly, from the business practice perspective:

- 53.3% of Hull SME owner/manager survey respondents believe that a lack of government or local authority flood initiatives and protection measures affects their company's exposure to flood risk.
- 36.9% maintain that the presence of these measures affects whether their company implements anti-flood mitigation practices.

This reliance means owner/managers held HCC responsible for exacerbating the problems caused by the summer 2007 floods: *"the flooding...showed you the deficiency in the planning from Hull City Council...the limitations of the whole drainage system"* (Chris, Company C, Hull). HCC needs to be seen to be taking steps to address flooding and requires all vulnerable individuals, owner/managers included, to have confidence in its abilities. As a result, HCC utilises visible structural flood defences, strategic management strategies and disseminates flood mitigation advice. From the social science perspective, William maintains that owner/managers are unresponsive to this advice. Nevertheless, SME owner/managers state that this assistance is not widely observed or poorly communicated (Box 7.2). These findings support the conclusion that a divergence in perceptions leads to a scenario where HCC maintain they are providing defences and advice, yet SMEs are either unresponsive to this help or ignoring the message.

BOX 7.2: HULL SME RESPONDENTS QUESTIONNAIRE RESULTS

Before the flood:

- 13.3% agree they were given warning.
- 0.0% agree they were given advice on how to cope with this hazard.

During the flood:

- 0.0% agree they were given advice on how to respond to this hazard.
- 40.0% agree that they did not know where to seek reaction advice or assistance from.

After the flood:

- 6.7% agree they were given advice and assistance on how to recover from this hazard.
- 26.7% agree that they did not know where to seek recovery advice or assistance from.

Alongside the questionnaire respondents, Hull owner/managers also commented on HCC's lack of assistance during the flood. They maintained that the assistance provided was either:

- A. Non-existent: *"I don't think there was any assistance, I don't think there was anything like that"* (Neil, Company N, Hull).

- B. Not easily accessible: *"I wouldn't know where to turn"* (Paul, Company P, Hull).
- C. Not widely publicised: *"I don't know what Hull City Council are doing"* (Lee, Company L, Hull).

These quotes provide an alternative perspective to that held by HCC. SMEs appear passive in regards to assistance because it is believed that there is none available. Qualitative support was also found for the conclusion that regulatory body advice misunderstands SME flood perceptions.

"Hull City Council...asked about flood preparedness and preparation for home owners. We've never been asked as a business, nor do you get this support...There are 5,000 homes that they are looking after. They were all asked about how prepared they felt they were for flooding. But they don't do it for business, maybe there's no vested interest."

Perception of HCCs assistance: Victoria, Company V (Hull)

Within community resilience, flood risk communications are used to share information with, and influence the belief and behaviours of those who are vulnerable, including SMEs (Brewer, 2011, p3). HCC believes that this information will encourage owner/managers to take steps in regards to mitigation against the risk of flooding. For Victoria from Company V (outlined in section 7.4), the advice being provided is not tailored for businesses as HCC has no *"vested interest"* in helping SMEs recover or prepare for flood. As HCC misinterprets owner/managers perceptions, the assistance HCC provides does not fulfil owner/manager's needs. If SMEs believe regulatory bodies are uninterested in protecting certain stakeholders, or sharing inappropriate information based upon unrealistic assumptions, then risk communications will be ineffective (Otway, 1987, p126). SME owner/managers will not have confidence in the advice being distributed, the messages will not be absorbed, beliefs will not be influenced and resilience will not be implemented leaving SMEs exposed to the risk of flood (Frewer *et al.* 2003, p81; Rowe *et al.* 2004, p90; Brewer, 2011, p14).

At a local-level of analysis, support is found for the notion of a resilience responsibility game scenario:

- HCC maintain that owner/managers are unresponsive to the assistance they provide, refuse to interact with them and are thus not taking responsibility for their own resilience.

- SMEs hold HCC responsible for their vulnerability as assistance is either not widely available, misunderstands their perceptions or is not interested in their welfare.
- Owner/managers perceive HCC to be lacking in its responsibility.

The inappropriate nature of the assistance provided causes a situation where SMEs ignore the advice being given and lack the impetus to 'get involved' in community resilience. This leaves them vulnerable to flood. Can this responsibility game situation be generalised to Sheffield?

7.4.3. CITY LEVEL: SHEFFIELD SME RESPONSES

Unlike Hull, Sheffield SME owner/managers, who represent the business practice perspective, do not appear to rely as heavily upon experts as being the first line of defence in regards to flooding:

- 38.4% of Sheffield SME survey respondents perceive that a lack of government or local authority initiatives and protection measures affects their company's exposure to flooding. This could be related to Sheffield's limited geographical extent of flooding.
- 22.3% believe that their company and the city is at risk.
- 22.5% state that the presence of council measures affects whether their company implements flood protection practices.

Within the social science approach, SCC reports that SME owner/managers are unresponsive to the assistance it provides. This could be attributed to the fact that Sheffield-based SMEs do not rely on council resilience and assistance as heavily as those SMEs present in Hull, perhaps due to an increased level of finance and/or resources. Furthermore, if an owner/manager does not perceive themselves to be in need of assistance when developing their flood resilience measures, then they will use their own initiative to formulate their company's anti-flood or continuity measures rather than expert advice (Alesi, 2008, p1751). Accordingly, 67.7% of survey respondents reported that they had developed their back up plans internally without extraneous help. Yet, when assistance was sought by these stakeholders, many reported that, as with the EA and HCC, the advice was not widely available, disseminated or received (Box 7.3).

BOX 7.3: SHEFFIELD SME RESPONDENTS QUESTIONNAIRE RESULTS**Before the flood:**

- 5.7% agree they were given warning.
- 0.0% agree they were given advice on how to cope with this hazard.

During the flood:

- 8.6% agree they were given advice on how to respond to this hazard.
- 45.7% agree that they did not know where to seek reaction advice or assistance from.

After the flood:

- 20.0% agree they were given advice and assistance on how to recover from this hazard.
- 42.9% agree that they did not know where to seek recovery advice or assistance from.

In comparison to Hull, fewer Sheffield owner/managers were provided with a warning before the flood. Nevertheless, more respondents were given assistance both during and after the flood. This could reflect the presence of the *Major Incidence Response Group* which was set up in the immediate wake of the flood and tried to provide information and advice to businesses. This did not happen in Hull. The above finding can also be attributable to SCC perceptions of flooding aligning more closely with those held by SME owner/managers. This can lead to the dissemination of appropriate continuity advice. Alternatively, a greater percentage of owner/managers reported being unaware as to where to obtain assistance from both during and after an event. Therefore meaning SCC and the *Major Incident Response Group* is failing to make its assistance as 'visible' as HCC assistance.

The responsibility game scenario may not be fully applicable to Sheffield. SCC asserts that it is providing defences and advice. SMEs are unresponsive to this help. They prefer to rely upon their own knowledge, thus fulfilling the community resilience responsibility appointed to them by SCC. Despite the positive attributes associated with implementing resilience measures, reliance upon their own internal knowledge can be disastrous for an SME. If knowledge is inaccurate and measures are not implemented properly, there is the potential that this will fail at crucial times. Despite taking appropriate measures to enhance resilience, the outcome remains the same: some SMEs in Sheffield remain vulnerable to the risk of flooding.

If advice is sought, SME owner/managers maintain that assistance is not widely available or accessible. SCC is not seen by owner/managers to be fulfilling its responsibility and doing little to reduce SME vulnerability. As SCC recognise that a flood means different things to different owner/managers, they disseminate more tailored and

appropriate advice (for example, continuity advice). Unlike in Hull, in Sheffield unsuitable assistance is less likely to be attributed to owner/managers unresponsive attitude. SMEs maintain that their passive attitude is largely due to the way the advice or assistance is disseminated, the time-scale within which it is provided and the industry specific focus.

Sheffield owner/managers commented upon SCC assistance. They maintained that in order to be effective flood advice needs to:

- A. Be widely distributed (Kenyon *et al.* 2008, p351): *"We needed somebody to come in and say, right this is what is happening next, this is what you need to do, this is how to make yourself protected in future!"* (Rachel, Company R, Sheffield).
- B. Be provided at suitable times (Few and Matthies, 2006, p62): *"We had various bloody councillors turn up at completely inappropriate times...six weeks afterwards saying oh do you know that you should do this for flooding...Well it's too late now...If you had arrived the day after the flood and said this is important...it would have been really helpful"* (Rachel, Company R, Sheffield).
- C. Take into account local knowledge (Parker and Handmer, 1998, p47).

Local knowledge can be an extremely valuable asset to regulatory bodies like SCC (Wisner, 1995, p335; Ahmad and Simonovic, 2001, p208; Petts, 2006, p1045). For some scholars, local residents like SME owner/managers are seen as the experts. This is because they have experienced floods affecting their business and they know the local area. However, this knowledge is not generally considered: *"I am making an effort to talk to the council...not that I am getting anywhere"* (Rachel, Company R, Sheffield). SMEs feel that SCC does not consider owner/manager opinions as having any value. This reduces owner/manager impetus to get involved in community resilience more broadly and open a dialogue with SCC.

Following the 2007 flood, the assistance primarily required by SME owner/managers was financial. This was made available from the council. Nevertheless, knowledge of the funds existence was not widely publicised and communicated only via word of mouth, limiting its audience: John (Company J, Sheffield) outlined *"we got a couple of grand...A friend who owns another company told me about it...I think it was one of these things where you had to be told about it; it didn't come to you"* and Ulrich (Company U, Sheffield) commented *"it was one of those, if you didn't know about it then you wouldn't get it"*. Although grants were available, many were restricted to certain business sizes and industries. Some SMEs could not be assisted due to their sector. Gillian (Company G,

Sheffield) stated *“they were offering something, but we didn’t qualify for it”* and Harry (Company H, Sheffield) reported *“we never had any grants or anything because we’re not manufacturers so you’re sort of frowned upon”*.

In life there is the constant drive for individuals to hold someone responsible for a certain situation (Douglas, 1995, p154). In Sheffield, a limited amount of support has been found for the notion of a resilience responsibility game scenario. Despite providing mitigation and advice as they are legally obliged too, SCC assert that owner/managers are unresponsive to the assistance, refuse to interact with them and choose to implement their own resilience measures. For those SME owner/managers who do require assistance, SCC disseminates its advice poorly, provides guidance when it is too late and chooses to target specific industries. The nature of the assistance being provided can contribute to SME owner/managers failing to accept the advice being given and lacking the impetus to get involved in community resilience. Owner/managers fail to fulfil their own responsibilities in regards to flood preparedness.

In the study cities, there is the presence of a responsibility game. Whether stakeholders are at cross-purposes in regards to what assistance is needed, or the assistance provided is poorly communicated, neither regulatory bodies nor owner/managers perceives the other to be fulfilling their responsibility. This causes owner/managers to fail to implement the most appropriate measures to cope with the occurrence of a flood leaving themselves exposed to this hazard. Although a local occurrence, the catalyst for the responsibility game scenario is not a local issue. It can be traced back to the national level, and a number of limitations associated with governmental flood policies.

7.5. THE RESPONSIBILITY GAME: IMPLICATIONS FOR GOVERNMENTAL POLICY

Within the social sciences, at present, UK flood risk is approached through a tiered system, with the resolution increasing as you move downwards through the tiers:

- **Tier 1:** National Policy
- **Tier 2:** Environment Agency and DEFRA
- **Tier 3:** Lead Local Flood Authorities
- **Tier 4:** Local Communities

Prior to 2010, the occurrence of a vast number of flood events highlighted many shortcomings in the national policies in place at the time. As a result, reports such as *Learning to Live with Rivers* (Frost *et al.* 2001), *Future Flooding* (Foresight, 2004), *Making Space for Water* (DEFRA, 2005) and *The Pitt Review* (Pitt, 2008) made many recommendations as to how future flooding in the UK should be managed (EA, 2011, p2). The *Flood and Water Management Act 2010 (FWMA)*, a national policy (Tier 1), was designed to address many of the limitations highlighted within these reports. The act outlines a number of duties which must be fulfilled in response to flood risk management (House of Commons, 2010, p10).

The FWMA is required to “*develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England*” (EA, 2011, p2). Within this strategy, the Environment Agency and DEFRA (Tier 2) are given a national overview role (EA, 2011, p3). In response they have developed the *National Flood and Coastal Erosion Risk Management Strategy for England (FCERM)*. The FCERM is central to the implementation of the *Flood and Water Management Act*. As such it must reflect government policy (EA, 2011). It provides the framework for future action by all risk management authorities, and encourages more effective risk management by enabling people, communities, businesses, infrastructure operators and the public sector to work together to manage the risk and be able to recover more quickly after incidents (EA, 2011, p1-2). At the heart of the FCERM, is ‘localism’. There is recognition that a limit exists as to what the government and national bodies can achieve alone (EA, 2011, p1). Communities are given a greater responsibility for managing their own risks and as a result a greater accountability for the level of safety and protection achieved (EA, 2011, p14). Under the responsibility game, from the perspective of the EA and DEFRA, SMEs are responsible for their own flood resilience. If they fail to implement measures and are affected, then they should take some of the responsibility for their loss.

Towards the bottom of the tiered system are the Lead Local Flood Authorities (LLFAs)(Tier 3). The FWMA defines the LLFA for an area as “*the unitary authority or the county council*” and allocates them a local leadership role (House of Commons, 2010, p26, EA, 2011, p3). An LLFA’s functions include the development of local flood risk management strategies which show the extent of flood risk in the area and how it will be managed (EA, 2011, p3). As flood has a ‘local profile’, this is a positive step. Within the FCERM, flooding can be managed on a place-by-place basis by the relevant LLFA. Nevertheless, there are certain restrictions as flood risk management strategies must be consistent with national policy (EA, 2011, p3). Tier 4 consists of local communities, including SMEs. Within the FCERM strategy, communities are given a greater role in local

risk management decisions, as well as increased responsibility for their own welfare (EA, 2011, piii, p14).

On the surface, the FWMA and FCERM appear to ‘tick all the boxes’ in regards to flood management and assisting SMEs. However, there are a number of limitations associated with these policies. Even though LLFAs are permitted to design their local flood strategies to best suit their area, they are still governed by national policy and forced to follow the framework set out by the FCERM strategy. At present, both the FWMA and FCERM treat all those at risk holistically; there is no differentiation between vulnerable stakeholders. All groups are seen to be assisted through the FCERM strategy in what Kate from the EA describes as an *“envelope of everyone at risk”*. To this extent, national policy and SMEs are at cross-purposes. This cross-purpose is also reflected in the policies and strategies implemented by the EA and LLFAs, including Hull City Council and Sheffield City Council. As such, the EA and LLFAs:

- A.** Fail to recognise the unique qualities of flooding to SMEs.
- B.** Fail to separate SMEs from other vulnerable groups.
- C.** Do not address SMEs any differently.
- D.** Do not tailor their flood management strategies to meet SME special requirements.

National policy dictates that these regulatory bodies are required to focus upon flooding. They are not mandated to take into consideration the other risks a city or stakeholders can face when distributing advice and assistance. As a result, the assistance and advice provided by these regulatory bodies can be largely inappropriate for the needs of SMEs, and cannot be used effectively. Therefore, SMEs remain vulnerable to the occurrence of a flood.

A further limitation associated with national policy relates to the notion of community resilience. The EA and LLFAs focus primarily on the local community, including SMEs, being responsible for their own resilience. In some cases, the perception held by SME owner/managers remains that it is the relevant regulatory body’s responsibility to protect local communities, as flooding is viewed as a *“societal problem”* (John, Company J, Sheffield). For many stakeholders, including owner/managers, there is a lack of recognition that they should be taking steps to reduce their own resilience. However, the assistance regulatory bodies provide to SMEs in order to encourage community resilience is inappropriate. The assistance does not reflect their current flood perceptions. Neither does it reflect their current resilience strategies which are focused

upon continuity in the face of a plethora of risks. Even if appropriate advice were to be provided, there is still the question as to whether SMEs would act upon this guidance. This provides the other side of the responsibility game present between regulatory bodies and SMEs in Hull and Sheffield: Are SME owner/managers willing to, or even aware that they should take responsibility for their own business continuity?

Both of the limitations outlined above demonstrate that the EA, HCC and SCC cannot be held solely accountable for the generation of the responsibility game present in Hull and Sheffield. Governed by national policy, it is the issues associated with the *Flood and Water Management Act 2010* which act as the catalyst for both SMEs and regulatory bodies to be at cross-purposes in regards to flood resilience. Until changes could be made at a national level and until those stakeholders who are vulnerable to flooding are seen as having separate requirements from one another, the game will carry on being played and SMEs will ultimately remain vulnerable. This can have severe implications for SME owner/managers should a flood occur. The following section presents a case study from a Hull SME to show the implications of national policy causes a responsibility game. Ideally, a case study from Sheffield should also be outlined in order to present a balanced argument. Yet, as the perceptions of Sheffield County Council more closely matches that of SMEs, the responsibility game can only be applied carefully to Sheffield. Therefore, the SMEs of Hull can be used to greater effect to illustrate the above point.

7.6. THE RESPONSIBILITY GAME: IMPLICATIONS FOR SMEs

7.6.1. CASE STUDY: COMPANY V

At present, there is a lack of flood resilience amongst SMEs in Hull and Sheffield: 59.1% of owner/managers maintain they have no flood mitigation measures in place. This high percentage is attributed to a responsibility game scenario present between SMEs and regulatory bodies. This influences whether resilience measures are installed, and can have severe implications business practice and SMEs, as is the case for Company V.

Victoria co-owns Company V alongside her husband. They established this family run business in 1998 to operate within the professional, scientific and technical industrial sector. Today, they provide employment to 75 people and generate an estimated annual turnover of £1.5 million qualifying them as a medium-sized enterprise. In terms of location, Company V is positioned within Newland, a suburb to the North West of Hull which is extremely low lying (below sea level). This land enjoys no natural drainage

relying entirely upon a system of pumping stations and sewerage networks. Due to their location, and the occurrence of persistent heavy rain, Company V was severely flooded during the Hull Summer 2007 floods.

"I'm going to have to get my tissues out. It was absolutely awful...Anything that had been touched by the water we literally had to throw away...We had financial difficulties at the time...Our turnover dropped by about £300,000 the following year."

2007 flood experience: Victoria, Company V (Hull)

Within UK society, there exists a *"dependency culture"* or *"dependency syndrome"* (Carbonnier, 2013, p104). In other words, regular support functions from an external source generates a society that is passive, lazy and with reduced personal responsibility (Carbonnier, 2013, p104). Under the notion of the *"theory of blame"* (Shaver, 1985) Victoria holds HCC, as the LLFA, responsible for exacerbating the 2007 floods: *"You would expect the drains to cope with that amount of water, well if they are cleaned regularly by the council"*. As HCC is seen to have aggravated the floods, Victoria maintains that it should be held culpable for the subsequent recovery. This includes providing assistance to those who need it. Following the 2007 floods, Victoria turned to HCC for help in regards to getting back to normal and improving her company's resilience (McGlone, 1990, pp159-170). However, this advice and assistance was not forthcoming. Therefore Victoria holds HCC responsible for her continued lack of resilience to flooding: *"There was nothing there to help you"*. This perception contrasts with that of William from HCC. William claims that they are *"leading from the front"* and *"doing a hell of a lot"* to protect and assist SMEs. In William's opinion, owner/managers are responsible for their current predicament: a lack of impetus to get involved in community resilience leads to flood susceptibility: *"You steer your actions by what you get coming towards you but we're just not getting anything coming back"*. The occurrence of this responsibility game scenario between HCC and Company V is an end result. It stems from limitations associated with national policy. The next section explores how this local situation has been caused, beginning with an examination of flood perceptions.

7.6.2. COMPANY V Vs HCC: PERCEPTIONS

Perceptions of flooding are influenced by a plethora of factors, including past experience, location and hazard characteristics (Lave and Lave, 1991, p256; Kreutzwiser *et al.* 1994, p119; Brilly and Polic, 2005, p349; Ho *et al.* 2008, p641; Whitmarsh, 2008, p6).

These same factors are used by Victoria and HCC (William) in order to understand what flooding means to them as exposed stakeholders. Not all owner/managers who are vulnerable to the risk of flooding share the same judgements. Individuals will draw different conclusions or perceptions from a flood event (Correia *et al.* 1998, p210; Zaalberg *et al.* 2009, p1760). Yet, flood is experienced in different ways. As a result, it is a divergence in flood perceptions between SME owner/managers and HCC which is the catalyst for the occurrence of a responsibility game between the two.

In terms of similarities, both Victoria and William:

- Perceive flooding to be a risk today and a future threat: *"I think it's probably now a case of when it happens again, not if"* (Victoria); *"We've got an extremely high risk of flooding"* (William).
- Highlight flooding's unique qualities which set it apart from other risks: *"There was just water pouring through the door"* (Victoria); *"We don't want to see water in people's houses"* (William).

Unlike William, Victoria:

- Perceives SMEs as a separate group from other stakeholders at risk.
- Maintains *"the impact upon businesses is almost probably worse than it is on homes because it is their livelihood"*.

Alternatively, in conjunction with national policy, William:

- Judges SMEs to be part of a large, vulnerable group which includes all those parties exposed to flooding.

This perception affects the type of resilience assistance and advice HCC disseminates, ultimately affecting SMEs like Company V.

"Flooding still seems like such a remote risk...It's one of those things you don't think about when you're running your company...You're just getting on with the day to day running of the business...The biggest risk I thought about was theft of equipment. I know that is a very high risk...and fire is something else I consider."

The significance of flooding: Victoria, Company V (Hull)

The main difference between Victoria and William is in terms of the consequences of flooding. For Victoria, a flood predominantly causes disruption to her business

continuity at the organisational level as *“running the business is the priority”*. When speaking about the 2007 floods, she highlighted those effects which obstructed regular working operations as being the most serious: *“We moved out...We were out for a year...We couldn’t do enough work; we were turning jobs down”*. Although she had to move premises for a year, even now for Victoria a flood is still not perceived to be the most significant threat to her SME: *“it is still such a remote risk”*. In fact, she perceives flooding to be one of a package of discontinuities that has the potential to disrupt everyday operations. Consequently, for Victoria it is those risks which occur the most frequently and have a low impact which are seen as the highest priority including loss of telecommunications or amenities.

Alternatively, HCC is required by national policy to *“develop, maintain, apply and monitor a strategy for local flood risk management in its area”* (House of Commons, 2010, p7). It perceives flooding in terms of discontinuity to the order of government at the city level. In the event of a flood, William is concerned with loss of essential services and damage to critical infrastructure. William recognises that the city is vulnerable to other disruptions, yet he focuses instead upon those events that do not occur often but have a large impact such as an industrial accident or flu pandemic. Furthermore, as constrained by a national flooding framework, flooding is prioritised as a specific risk requiring specific responses rather than one in a package of discontinuities requiring continuity mitigation.

It can clearly be shown then, that HCC misunderstands Company V’s perceptions of flooding. It is this divergence in judgement, due to the confines of national policy, which is the initial catalyst for the responsibility game scenario present in Hull. Anti-flood measures are highly influenced by perceptions of flooding (Soanne *et al.* 2010, p4). If Victoria and William hold different perceptions of flooding, they will implement different forms of resilience measures. This difference in opinions raises questions in regards to the suitability of the advice disseminated by HCC to SME owner/managers and how, given the argued lack of assistance, SMEs make themselves resilient.

7.6.3. COMPANY V Vs HCC: RESILIENCE

HCC judges a flood to be a significant physical problem causing discontinuity to the order of government. All stakeholders who are exposed to this hazard are grouped together under the umbrella term of a ‘vulnerable community’. Influenced by this perception of flood, HCC has developed strategic management plans, commissioned the installation of a number of physical flood defences and encouraged the community to take

steps to protect their own property. All those who are vulnerable, including SMEs like Company V, are indirectly protected from a flood.

The questionnaire survey indicated that post 2007, 35.9% of Hull SME owner/managers implemented resilience measures designed to specifically reduce the impacts a flood would have upon their business. As 64.1% did not implement flood-specific measures, this demonstrates that not all SMEs share HCC's judgement of flooding posing a significant risk. Instead, Victoria views flooding as one in a package of discontinuities: other risks are deemed to be of more pressing concern. Therefore, Company V does not *"have flood preparedness"*.

"When I look at my building my first thoughts are security, access to staff, transport links. You don't think flood: It's not in my consciousness...We don't have flood plans but we have a plan for everything else"

Flood resilience measures: Victoria, Company V (Hull)

There are two factors which explain Company V's lack of flood-specific resistance and resilience measures. Victoria:

1. Perceives other risks to be more significant.
2. Maintains that advice from HCC regarding her community resilience responsibility is lacking.

Victoria asserts that HCC does not encourage the utilisation of mitigation: *"There is no social marketing campaign...They do it to get businesses to change to recycling, but they don't do that to make you think and prepare for a flood"*. She also believes that HCC has *"got no vested interest"* in helping businesses such as Company V. This guidance is absent due to HCC including SMEs within an 'envelope' of all who are vulnerable to flooding. HCC fails to recognise the individual nature of those SMEs who are exposed to flood. Everyone is treated in the same manner through the dissemination of generic flood advice which does not meet the specific needs of all vulnerable parties.

Given her perception, Victoria has drawn up and implements a business continuity plan which documents alternative procedures for any hazard: *"we always build in a bit of contingency planning"*. This shows that Company V is only indirectly protected against flooding. [Access to this BCP was sought, however due to the confidential nature of these plans, owner/managers were not willing to share their BCPS. Consequently there was an inability to examine them and their effectiveness]. Although not seen as a predominant

risk, Victoria's experience of the 2007 floods acted as a catalyst for change. Victoria used the procedures the company developed when responding and recovering to the flood as the basis of her BCP, as she outlined: *"it wasn't a contingency plan, but fortunately it did become our contingency plan and has been ever since"*.

For Victoria a BCP is her preferred method of ensuring business continuity. Nevertheless, she maintains that advice from regulatory bodies regarding BCP development and implementation is non-existent: *"there is nothing necessarily to help you...If I want something on health and safety I go to the website and download a pack"*. HCC is at cross-purposes with SMEs in regards to flood perceptions due to issues associated with the *Flood and Water Management Act 2010*. A focus upon flooding as a significant risk causes a lack of regulatory body BCP advice. HCC disseminates guidance concentrating upon flood mitigation and does not address the fact that owner/managers wish to protect against a plethora of risks.

There is a responsibility game scenario present between Company V and HCC. Victoria believes HCC is responsible for Company V's resilience. William asserts that Victoria is responsible for Company V's resilience. There are also differences in the type of flood mitigation implemented. These differences reflect the variations in flood perceptions between Victoria and William. Due to the design of national policy, William does not recognise the need for SMEs to be treated as a specific, flood vulnerable group requiring business continuity advice. The national framework is designed for flooding only, meaning advice provided by HCC does not encourage or help Victoria to implement business continuity plans. As the advice provided by HCC is unsuitable for Company V, Victoria believes HCC is uninterested in the welfare of her business and her resilience measures. Victoria no longer approaches them for assistance, developing her continuity plans internally with no expert advice. As she and her employees lack the expert knowledge to do so, these plans may be of limited effect and may ultimately leave her vulnerable to the occurrence of a flood to some degree.

On the other hand, as Victoria does not interact with HCC, William perceives that SMEs are unresponsive to assistance. William maintains *"you steer your actions by what you get coming towards you, but we're just not getting anything coming back"*. HCC does not develop mitigation assistance specifically targeted at businesses. It leaves owner/managers to develop their own strategies. If they lack the skills to do so, it can leave them exposed to disruption. HCC believes that SMEs like Company V should take some responsibility for their resulting vulnerability to disruptions. It is a simple variation in perceptions, and the fact that both stakeholders are at cross-purposes in regards to

resilience measures, which leads to the development of the responsibility game situation between Company V and HCC. What are the consequences of this scenario upon this SME?

7.6.4. COMPANY V VS HCC: IMPLICATIONS UPON VULNERABILITY

An SME's flood vulnerability is not static. It increases and decreases over time as an SME's internal and external environment changes (Pelling, 1997, p202; Few, 2003, p45; Dalziell and McManus, 2004, p4). Prior to 2007, Company V was extremely vulnerable to the risk of flooding. Although located in the city of Hull, a *"city governed by flood risk"* (William, HCC), Victoria was unaware of the risk this hazard posed to her SME: *"I had never even thought about the idea of being flooded"*. Accordingly, Company V had no flood resilience measures: *"There was a tendency to not do these things"*. An exposed location and lack of risk recognition can increase vulnerability. As a result, when the floods struck in the summer of 2007, Company V was extremely unprepared and the business was severely disrupted.

With the 2007 floods acting as a catalyst, Company V's vulnerability to flood has been reduced. Large, technological fixes provided by the EA and HCC are working in conjunction with Victoria's continuity schemes. Many academics suggest that as the physical risk to a location decreases, so too does the physical risk to those residents within its boundaries (Gallopín, 2006, p22). Following 2007, Yorkshire Water was not looked on very favourably. This body is responsible for the maintenance of Hull's drainage system. This drainage system was completely overloaded during the event meaning Yorkshire Water was seen to have exacerbated the floods (Coulthard and Frostick, 2010, p2). Since 2007, both HCC and Yorkshire Water have made improvements to the city's drainage system and implemented a number of strategies and defences with the aim of minimising the flood risk to Hull, indirectly protecting SMEs (HCC, 2007, p33; BBC 2012, online).

On an individual level, Victoria now recognises that her SME is exposed to the risk of flooding: *"now I know it is a risk and I can prepare for it"*. Her main response has been to make changes to operational procedures and develop a continuity plan which minimises the disruption of any risk. Although Victoria has not chosen to specifically implement property-level protection schemes aimed at reducing the impacts of flooding, she has built flood risk into her business continuity plan. For Nosworthy (2000, p596) and Jüttner, (2005, p121), it is possible to internally and indirectly reduce vulnerability to flood by increasing the likelihood that a business can continue to function during any disruption.

Despite these advancements, it is asserted that Company V is still exposed to flooding, although to a slightly lesser degree.

Hull's *Strategic Flood Risk Assessment* (HCC, 2007) maintains that many of the current structural defences are in extremely poor physical condition (p33). William asserts, that *"it's very difficult in these times of funding"* to maintain defences to an appropriate level. Accordingly, they may not function as designed when needed leading to serious repercussions (Penning-Rowsell *et al.* 2000, p12; Brown and Damery, 2002, p419). HCC is not entirely responsible for surface water flooding as it comes under the remit of the Environment Agency. Although measures have been taken by the EA, HCC and Yorkshire Water to reduce the risk, surface water flooding is much more difficult to predict and take action against. This leaves SMEs like Company V little time to react and prepare once an event is occurring.

A further exposure relates to flooding's unique characteristics. Although resilient to any operational disruption caused by a flood through their BCP, Company V is still susceptible to the inundation of usually dry areas by water. As Victoria believes flooding to be a remote risk, she has consciously chosen not to implement flood-specific protection measures. She has no means of keeping water out of her premises, or reducing the physical impacts associated with this hazard. A lack of resilience usually results in increased vulnerability (Klein *et al.* 2003, p7; Adger, 2006, p272). Consequently, Victoria is helping to create the conditions which leave her business exposed, contributing to her own vulnerability (Kenna, 2008 p72).

The vulnerability of Company V to flooding can also relate to variations in stakeholder perceptions. Through community resilience, vulnerable parties are encouraged to protect their own property (Johnson and Priest, 2008, p521). HCC believes that Company V should implement their own resilience measures. Victoria believes the opposite, HCC should be responsible for protecting them. Victoria's lack of flood-specific protection measures and flood exposure could be attributed to these different perceptions. Yet, she has taken it upon herself to implement a continuity plan to indirectly protect against flooding and a range of other risks. The plan is currently untested meaning there is no certainty of its effectiveness. Consequently, when needed the continuity procedures may fail leading Victoria's business operations to be interrupted during the occurrence of a disruption and her company to remain vulnerable (Rodentis, 1999, online)

Although HCC believes SMEs are responsible for their own flood resilience, it misunderstands what a flood means to owner/managers and does not recognise SMEs as separate from other stakeholders. HCC disseminates flood advice to all those who are

flood vulnerable ranging from large factories to 80-year-old widows. As this advice is not business specific or tailored to owner/manager needs in regards to business continuity, it becomes inappropriate and in some cases unusable. Even if Victoria did want to implement flood protection measures, she has not been provided with the skills and knowledge necessary to prepare for and adequately recover from this hazard (Kenna, 2008, p78). Moreover, as *“there isn’t anyone in the company responsible for and trained in flood risk management”*, Company V is left vulnerable thus reducing its chances of survival in the period following a flood. Nevertheless, Victoria’s decision not to implement flood-specific mitigation may have been taken following a calculated assessment of the risk: doing nothing can be a business continuity option.

In summary the responsibility game scenario stems from a lack of communication between regulatory bodies (the social science approach) and SMEs (business practice). There is a misunderstanding in regards to who is responsible for what, meaning the overall aim of resilience is not achieved and SMEs remain vulnerable. A variation in flood perceptions between regulatory bodies and SMEs leads regulatory bodies to implement and disseminate inappropriate and untimely generic state flood resilience measures and advice. This assistance cannot be used or is not heeded by owner/managers so decreases their ability to respond. Thus, SMEs are left vulnerable to the occurrence of a hazard. As they are conforming to a flooding framework set out by national policy, the Environment Agency, Hull City Council and Sheffield City Council should not be held solely responsible for the continued vulnerability of SMEs. It is concluded that suitable changes might need to be made within governmental policy in regards to protecting against all risks, not just flooding. If this happens, then all SME owner/managers should be able to develop effective business continuity plans and cities like Hull and Sheffield should see a reduction in SME exposure to all hazards.

7.7. CONCLUSION

A responsibility game exists in the cities of Hull and Sheffield. A need to conform to a National Flooding Framework, set out by government policy, means regulatory bodies and SME owner/managers perceive the risk of flooding and those who are at risk differently. The measures they implement to adapt and respond to flooding also diverge. In some instances, the assistance provided by the regulatory bodies of the Environment Agency, Hull City Council and Sheffield City Council may be inappropriate for SMEs. As such the flood mitigation advice provided may not be acted upon and SMEs remain vulnerable to the occurrence of a flood. Regulatory bodies and owner/managers hold each other responsible for this situation. Yet SCC demonstrates that even if the assistance

provided to SMEs was more in-line with owner/manager flood perceptions, and addressed their resilience needs, there is still a question as to whether owner/managers would take this advice; especially as they believe regulatory bodies should be protecting them. However, all the regulatory bodies examined have shown that, whether the assistance provided is appropriate for SMEs or not is irrelevant, the result always remains the same: SMEs still lack the resilience needed to adequately prepare and recover from the impact of flood, leaving them vulnerable and exposed to the risk. This situation can have serious consequences.

Whether the limitations associated with the *Flood and Water Management Act 2010* and subsequent *National Flood and Coastal Erosion Risk Management Strategy for England* (EA, 2011), which can cause a responsibility game, will be addressed within the near future remains to be seen. The UK's economy is currently experiencing an economic recession. Funding to develop new initiatives, treat those who are at risk individually, and tailor the assistance provided as is required is decreasing (EA, 2011, piii; Joyce and Sibieta, 2013, p176). As a result, the regulatory bodies to whom those SMEs at risk turn to for support at times of need increasingly require owner/managers to be responsible for their own resilience and funding (EA, 2011, p14). From the owner/manager perspective, the regulatory bodies don't provide adequate and effective support.

The events of January 2014 in the South of England have served as a 'wake-up' call in regards to the likelihood of future flooding in the UK. In the current situation, it is only a matter of time before the SMEs of Hull and Sheffield are affected by another flood. The potential impacts of this occurrence, made worse by a responsibility game scenario, ultimately leads SMEs to continue or even increase their vulnerability to the risk of flooding and a plethora of other discontinuities. There is a need for SME owner/managers to be more proactive in regards to resilience measures and be supported in a suitable way by regulatory bodies. This could be achieved through both business continuity advice and financial remuneration. Yet, until the actions and perceptions of both owner/managers and regulatory bodies change, the vulnerability of the SME economy to floods will continue, a vulnerability which could have serious repercussions for the residents of Hull and Sheffield.

8. DOING BUSINESS UNDERWATER: SOME SYNTHESIS

8.1. INTRODUCTION

The fundamental aim of this thesis was to explore flood risk in Hull and Sheffield from the perspective of Small and Medium-Sized Enterprises. This was in order to gain insights into the relationship between flood risk management policy and SME business continuity. Flooding has been, and remains, a risk to both cities. Moreover, SMEs form the 'backbone' of UK commerce through the provision of employment, goods and the services upon which local communities, such as Hull and Sheffield, depend. Many SMEs operating within Hull and Sheffield have experienced flooding at some point within their business lifecycle. Certain perceptions of flooding are held which can have far reaching implications for business resilience. Nevertheless, 'flood' is an ambiguous term and risk perception is a very subjective notion (Slovic, 1987, p4; Bankoff and Lee, 1983, p96). Accordingly, owner/manager perceptions vary in comparison to other vulnerable groups including local residents and governmental regulatory bodies such as the Environment Agency and local councils.

The case studies of Hull and Sheffield have shown that for many SME owner/managers, there is reliance upon regulatory bodies to be the first line of defence against flooding. Regulatory bodies are also the first port of call for support during and after a flood occurrence. Accordingly, in Hull and Sheffield:

- 42.6% of owner/managers believe a lack of local authority flood initiatives affects the exposure of their SME to this hazard.
- 25.8% of SMEs report that the presence of large-scale, flood defences and strategies provided by regulatory bodies affects whether they chose to implement flood protection measures.

Flood risk perceptions influence what large-scale, city wide mitigation measures are implemented by regulatory bodies, and the individual resilience strategies implemented by SME owner/managers. As SMEs rely upon regulatory bodies for flood defence and assistance, the differences in resilience measures that emerge as a result of differing perceptions ultimately influences SME vulnerability.

This research examined the threat of flooding upon SMEs from both a social science and business practice approach to risk. It investigated competing perceptions of flood, compared them to the ‘reality’ of these flood occurrences and explored the implications of these attitudes upon practice. In regards to an empirical contribution, different perceptions of flood and their implications were examined through the case studies of SMEs situated within Hull and Sheffield. A systematic investigation was conducted to fulfil three research questions:

1. To what extent are SMEs in the cities of Hull and Sheffield at risk from flooding and other hazards?
2. How do SMEs and regulatory bodies in the cities of Hull and Sheffield perceive the risk of flooding and other hazards?
3. To what extent does perception of the risk of flooding influence policy and continuity practice for regulatory bodies and SMEs?

Primary and secondary data was collected and a triangulation of methods from both academic approaches was used, including semi-structured interviews and postal questionnaire. This chapter presents a synthesis of the investigations main findings, answers the research questions posed, and reveals how Hull and Sheffield SME owner/managers perceive the risk of flooding.

8.2. ORIGINAL AND EMPIRICAL RESEARCH FINDINGS

8.2.1. THE LOCALISATION OF FLOODING

In order to understand how realistic individual stakeholder judgements of risk are, they need to be compared to the ‘actual’ or measured risk of these hazards. For Evans (2005, p1), floods have always been a feature of the landscape of Britain. Their frequent nature means that, at one time or another, the residents and businesses of Hull and Sheffield have witnessed a flood in every decade since 1950. This makes flooding a “*very real risk*” to these cities.

Within Hull, experiences of flood can be traced back to ‘The Great Flood’ of 1265 (Van de Noort, 2004, p156). Over the last 60 years, Hull has been impacted by 28 events, the most memorable being the Summer 2007 floods. The events of June 2007 saw 8,600 homes and 1,300 businesses up to six foot underwater. It caused widespread disruption and damage and also cost one resident his life. At present 100,000 properties, including SMEs, are exposed to a flood with a 1 in 200 year probability (ABI, 2006, p28). A further

66,200 properties are vulnerable to a major storm surge with an annual return period of 1 in 200 years (EA, 2007, p33; 2010e, p9). It is unsurprising that both regulatory bodies and academics categorise Hull as 'at risk' now and into the foreseeable future (Coulthard *et al.* 2007, p27; Whittle *et al.* 2010, p3).

Hull's vulnerability to tidal, fluvial, groundwater and surface water floods stems from its location. Built upon a chalk aquifer overlain by tills of loam, clays, sands and gravels, Hull experiences low permeability and large surface run-off rather than infiltration into the soil (Aldrick *et al.* 1999, p93; Rycroft and Amer, 1995, p2). Five watercourses run through Hull. Villages situated to the West of the city drain East towards the centre, and 95% of the city is built on reclaimed marshland lying below the mean high water level necessitating artificial drainage (Prince, 1973, p89; Coulthard *et al.* 2007, p5). Much of this drainage system extends back to the Victorian era, meaning the drainage capacity has reduced as the city has increased in size (Coulthard and Frostick, 2010, p2).

One of the most notable flooding experiences in Sheffield is the 1864 Sheffield Flood. On 11th March, the collapse of banks surrounding the Dale Dyke Reservoir sent 691 gallons of water along the River Loxley, killing 240 people (Harrison, 1864, p11). The last 60 years has seen the materialisation of 22 further events, including the flood that occurred in 2007. The month of June saw 135.4mm of rain fall in just three days (Smith, 2007, p6). It flooded 2,300 properties, caused widespread disruption and took two lives (Smith, 2007, p6). A flood of this magnitude had been predicted as between a 1 in 150 and 1 in 200 year event (SCC, 2008, p21). Within Sheffield, only specific areas are subject to flooding: A large proportion of residents are exposed to a 1 in 100 year probability, while other low-lying areas are vulnerable to a 1 in 20 year occurrence (SCC, 2008, p21). Flooding in Sheffield will also continue to be a threat into the future (Bengtsson and Hodges, 2006, p3536).

Sheffield's vulnerability also relates to location. Transected by five water courses, it nestles in a natural bowl surrounded by steep-sided valleys which creates a high risk of flash flooding (SCC, 2008, p9). Deep, fast flowing rivers create a fluvial risk, and the presence of water supply reservoirs above the city creates a dam failure hazard. Although the geology of Sheffield is absorbent Namurian and Phalian soils, once saturated they rapidly release a high volume of water, intensifying the risk (Chapman *et al.* 1998, p236).

Although they share the same title of being "*at risk of flooding*", the sources, magnitude and frequency of floods experienced within Hull and Sheffield mean the cities are categorised as different. It is asserted that a flood possesses a 'local profile': A set of characteristics tied to a particular location which makes a flood have a distinct source and

behave in a certain way. A large section of the population affected by these local flood profiles are SMEs. The next section explores how these stakeholders and regulatory bodies perceive the risk of flooding and other hazards.

8.2.2. PERCEPTIONS OF FLOODING

8.2.2.1. SMEs

An SME's primary objective is to serve customers through the provision of goods and/or a service and make a profit (Wynarczyk and Watson, 2005, p40). Within the business practice approach, owner/managers are concerned with any occurrence which prohibits or obstructs regular business operations and the accomplishment of their goals (Gbadamosi *et al.* 2011, p68). Flooding is one such hazard which can hinder business practices. Owner/managers primarily judge flooding to be a hazard that causes discontinuity to the 'order of business'. One way in which discontinuity is caused is through the characteristics it possesses, characteristics which set it apart from other risks which can impact upon an SME (Bouwer and Vellinga, 2007, p477). A flood is seen to have taken place when water, from any source, is in an area that is usually dry, wetting objects (Arnell, 2002, p112). These characteristics, as outlined by SME owner/managers, make floods appear to be a unique hazard which causes disruption to the order of business. Yet, within business practice the significance of this unique risk to an SME can vary depending upon level of disruption caused.

When speaking about past flood experiences, many owner/managers used phrases such as "*it stopped us*". The primary concern for SMEs is the discontinuity a flood causes to operations. This is opposed to the specific consequences associated with this hazard. It is not the unique characteristics of flood which make it significant, it is the level of disruption it causes. A large level of disruption means flooding is judged as significant and vice versa. This is a highly subjective notion. What one owner classifies as discontinuity to business operations, may not apply to another. For some, being able to provide a product or service to a customer no matter what disruption is taking place is their notion of continuity. For others, continuity is having everything within their business operating as normal, with no deviations from regular procedures.

The level of disruption caused by a flood is not felt uniformly amongst SMEs. Disruption has a different impact upon an owner/manager's perception of flooding's significance. There are a number of different variables which can affect the amount of disruption caused (Keane and Caletka, 2008, p99). Academics have highlighted flooding

characteristics, flood recognition, SME size and access to finance as just some of the factors which can influence discontinuity levels (Durkin, 1984, p4; Aldrich and Auster, 1986, p165; Lindley et al, 2006, p544). Hull and Sheffield owner/managers demonstrated no apparent statistical correlation between these variables and the level of discontinuity caused. There was a relationship established between disruption and industrial sector. This has been observed by scholars such as Gordon and Richardson (1995) and Wedawatta *et al.* (2010a). Moreover, some owner/managers claimed to be better able to respond and cope with the occurrence of a flood than others. Accordingly for SME owner/managers, it seems the significance of flooding relates mostly to the level of discontinuity caused, influenced by which industrial sector it operates within. It is the nature of the business, or the choices made by an SME owner/manager in regards to procedures, which mainly results in whether an SME is susceptible to the discontinuity of a flood (Tierney, 1997, p89).

SMEs are exposed to a plethora of strategic, compliance, financial and operational disruptions (Gilmore *et al.* 2004, p352). Not only is flooding viewed as an 'agent of discontinuity', it is seen to be one in a 'package of discontinuities' that has the potential to hamper business operations. As such, 75.0% of owner/managers are concerned about the impacts a disruption can have upon their company. Only 45.0% are concerned about flooding in particular.

The significance appointed to flooding and other disruptions by owner/managers can be related to three different variables:

1. In regards to the amount of discontinuity caused. The most significant risks to an SME are those that cause the highest level of disruption, for example closure for a certain period or business failure. Due to the subjective notion of this variable, it was not possible to discern which disruptions are the most significant in Hull and Sheffield. Furthermore, no figures are available in regards to the number of SMEs that have closed following a flood or disruption event in Hull and Sheffield.
2. Significance can also relate to the number of times a hazard occurs. In the case of the study cities, SMEs experienced other disruptions more frequently than extreme weather events (including flooding), such as loss of telecommunications/IT and staffing issues. These disruptions are judged by owner/managers to be the most prominent.

3. The significance of a disruption can simply relate to how it is perceived. Some owner/managers are averse to some risks and indifferent to others (Fischhoff *et al.* 1978, p128).

Using a “*taxonomy for hazards*” or *Business Impact Analysis (BIA)*, SME owner/managers make judgements about the desired level of risk of different hazards (Hassan, 2004, p119). The perception of whether a hazard will occur, and how it will affect their business allows owner/managers to assess which risks pose the biggest threat and thus respond accordingly. In Hull and Sheffield, SME owner/managers act as if they are more preoccupied with events such as loss of IT or electricity, in comparison to events such as flooding or a fire. This lack of prioritisation accorded to flooding is not the attitude held by regulatory bodies.

8.2.2.2. REGULATORY BODIES

The regulatory bodies to be addresses in this section which represent the social science approach are the Environment Agency, Hull City Council and Sheffield City council. All three are answerable to an overarching national policy. The *Flood and Water Management Act 2010 (FWMA)* outlines a number of duties which must be fulfilled in response to flood risk management (House of Commons, 2010, p10). It also specifies UK flood management provision, or who is responsible for what should a flood occur, thus avoiding any confusion (DEFRA, 2011, p1). As a result, all of the strategies and resilience measures implemented, and even the perceptions held, reflect this national policy and ultimately the policy priorities of the UK government.

At a regional level within Yorkshire, the Environment Agency (EA) also perceives flooding to be an agent of discontinuity. Unlike SMEs, discontinuity is observed at a much larger scale, the city-level. Regulatory bodies see flood as causing discontinuity to the ‘order of government’, rather than order of business. This leads the EA to be concerned with disruption to the normal functioning of a region or city. Disruption thus includes damage to critical infrastructure, loss of amenities and obstruction of essential services (Peters, 1995, p3). On the surface, it appears that whereas SME owner/managers see themselves as stakeholders separate from other groups at risk, the EA looks at the ‘bigger picture’: disruption to the whole population. The EA adopts a holistic approach including all those who are vulnerable to flood such as residents, SMEs, large businesses, hospitals and schools in “*an envelope of risk*”. The EA is beginning to recognise that stakeholders need to be addressed on an industry-by-industry basis in regards to resilience. Nevertheless, due to issues with funding, and the perceptions held by national policy and

the EA, there have been limitations to converting this recognition into practice. One final difference between the EA and owner/managers is the significance of flooding as a hazard. SME owner/managers include flooding within a package of discontinuities, with some other risks seen as more prominent. The EA perceives flooding as a specific, individualised and extremely significant risk to all populations. Thus it over-promotes resilience to this hazard, a limitation also associated with Hull City Council's response to flooding.

Due to the structure of flood governance, Hull City Council (HCC), as a Lead Local Flood Authority (LLFA), is charged with implementing strategies and resilience measures which conform to a framework outlined by the EA. It is unsurprising to find that HCC perceptions closely reflect those of the EA, and ultimately the national government. HCC also views flooding in terms of discontinuity and judge floods to cause disruption to the order of government at the city scale rather than focusing upon the micro-level as SMEs require. Unlike owner/manager perceptions, HCC adopts an all-inclusive stance to flood risk. SMEs are included within the notion of a 'vulnerable community' in comparison to being seen as different to other stakeholders such as residents or large businesses. HCC also judges flood to be one in a package of discontinuities that has the potential to cause disruption. It maintains that flooding, alongside industrial accidents and pandemic flu, is the most significant risk to threaten a city. As such, resilience to flooding is over-promoted by HCC. For Hull SME owner/managers, hazards such as an economic downturn or loss of telecommunications are deemed to be the most significant. SME resilience is therefore in the form of Business Continuity Plans (BCPs) which respond to a wide variety of risks, including flooding. The disparities in perception between owner/managers and the EA or HCC demonstrate how social science and business practice approaches to flood risk perceptions can diversify, in some cases to the disadvantage of SMEs (Section 8.2.3.1.).

The responses to flooding taken by Sheffield City Council (SCC) must also conform to the framework set out by the EA. However, despite being answerable to the same EA framework, SCC judgements differ to HCC leading to a viewpoint more sympathetic to the concerns of SME owner/managers. While flood is likewise seen to cause discontinuity to the order of government, SCC does not prioritise flooding as a significant risk. In fact, as with SMEs they believe flood is one in a package of risks which not only affects the city but also enterprises. Accordingly, there is more recognition that SMEs are stakeholders separate from all other vulnerable groups, and that there are differences in vulnerability between SME industrial sectors. SCC also recognises that SMEs are exposed to a plethora of events, such as transport issues or criminal actions, which are viewed as more important than flooding. The most significant risk to an SME largely depends upon the section of industry in which it operates. The similarities exhibited between

owner/managers and SCC suggests some overlap between the social science and business practice approach to flood risk. Nevertheless, this does not always benefit SME owner/managers (section 8.2.3.1.).

Of all three regulatory body perceptions considered, it is SCC's judgements which most closely resemble those adopted by owner/managers. This is a surprising result given that all three are governed by the same national policy, and both HCC and SCC work to the same framework. The interviews with William and Jamie suggest that the differences in the way HCC and SCC interpret the national framework is influenced by past flood experiences, and how those who are resident within Hull and Sheffield were affected by these events. There is also agreement that floods possess unique characteristics which set them apart from other risks: the presence of water in an area that is usually dry, wetting objects.

In summary, although there are similarities, for the most part flood means different things to different stakeholders. Even though governed by the same policies, regulatory bodies are not homogenous in the way they perceive flooding. All stakeholders have a choice whether to adopt resilience measures, and the type to utilise. Their choice depends upon their perception of the level of risk. In some instances, differences in the perceived level of flood risk between SMEs and regulatory bodies means the flood resilience measures implemented by the EA, HCC or SCC are not appropriate for, and thus do not assist, owner/managers. How different flood perceptions can have further implications upon flood resilience practice will now be outlined.

8.2.3. IMPLICATIONS OF SME AND REGULATORY BODY FLOOD PERCEPTIONS

8.2.3.1. RESPONSES TO FLOODING

All decisions made by individuals have a motive lying behind them (Redish, 2013, pxiii). Many drivers and barriers exist which influence SME and regulatory body decisions about whether to implement resilience measures and what form they should take (Harries, 2012, p327). These include access to finance, resources, knowledge, previous experience, location and SME characteristics (Kundzewicz and Takeuchi, 1999, p559; Molino and Gissing, 2005, p6; Grothman and Reusswig, 2006, p102; Boshier *et al.* 2009, p11; Bichard and Kazmierczak, 2010, p29). One of the largest motives influencing whether SME owner/managers utilise flood resilience measures in Hull and Sheffield is perception of the risk (Slovic, 1987, p14). In Hull and Sheffield, 52.7% of owner/managers reported

being concerned about the impact of flood upon their SME. 61.2% maintained that their concern for flooding influenced their flood mitigation choices. Both Hull and Sheffield support the widely accepted contention that perceptions influence flood mitigation (Grothman and Patt, 2005, p200).

Risk perceptions are the intuitive risk judgements of individuals and social groups in the context of limited or uncertain information (Slovic, 1987, p4). These judgements vary due to different levels of uncertainty, information gathered and intuitive behaviours (Messner and Meyer, 2005, p149). SME owner/managers interpret the risk of flooding in a variety of ways, which in turn influences their resilience choices. If flood risk perception is low amongst owner/managers, then they are unlikely to implement protection. This is opposed to those who are well aware of the flood threat (Baan and Klijn, 2004, p114). Risk perception does not only influence whether the decision is made to utilise mitigation, it can also dictate the form that resilience takes.

Within business practice, when addressing flood resilience, SME owner/managers implement Business Continuity Plans (BCPs) or a synthesis of both BCPs and flood-specific protection depending upon their flood risk assessment. Owner/managers primarily perceive flooding to be one in a package of risks that has the potential to disrupt business operations. But it is not seen to be the most threatening. As a result, 72.8% of Hull and Sheffield owner/managers have effective back-up plans in place to ensure the maintenance of business operations during the occurrence of a plethora of disruptions, including flooding. Floods are seen to possess unique characteristics which set them apart from other risks. Therefore, within a BCP, some owner/managers install flood-specific mitigation measures which reduce the impacts associated with flooding's physical qualities (Wingfield *et al.* 2005, p8). Resistance and resilience options reduce the likelihood of flood water entering dry areas, and limit the damage caused should this not be possible (Bowker *et al.* 2007, p9). In Hull and Sheffield, only 37.6% of SMEs have measures in place to specifically respond to flooding. Consequently, in the study cities the majority of owner/managers choose to address the risk of flooding through a generic BCP rather than flood-specific protection measures. This is reflected in the type of regulatory body flood assistance required by SME owner/managers: advice on flood-specific protection measures, yet delivered through guidance designed to help SMEs develop a BCP (Shaw *et al.* 2004, p1; Crichton, 2006, p29; Wedawatta *et al.* 2011a, p6).

A disparity in perceptions between regulatory bodies and SMEs, or the social science approach and business perspective, leads to a divergence in the resilience measures and assistance provided by regulatory bodies. As a consequence, SME requirements remain unfulfilled. On the whole, the EA perceives flooding to be an extreme

risk with unique characteristics which threatens many stakeholders. It concentrates upon providing large-scale, physical structural defences and warnings. The EA's city-wide, holistic approach means their measures are designed to ensure continuation to the order of government at a large-scale thus protecting all vulnerable stakeholders. There is an increasing push towards 'community resilience', where all those exposed to flood are encouraged to take responsibility for installing their own anti-flood measures. More recently, there has been some recognition of SMEs being a group to be viewed as separate from other stakeholders. Nevertheless, the EA's prioritisation of flooding as a significant risk means that flood-specific advice is provided to all businesses regardless of variations between businesses. There is no difference in the advice provided between size and industry. Accordingly, the assistance provided by the EA is not appropriate enough for the individual needs of SME owner/managers as they require 'tailor-made' business continuity guidance. This cross-purpose can have serious implications in regards to resilience.

Scaling down the resolution to city-level also reveals a similar situation. For Hull City Council (HCC), flooding is seen as a physical risk requiring physical solutions. This regulatory body also focuses upon the provision of state structural flood defences that aim to protect against flooding's unique qualities, ensure continuity to the order of government and protecting all vulnerable stakeholders. In regards to other disruptions, HCC recognises flooding to be one in a package of discontinuities that can affect the order of government at the city-level. As an active member of the *Humber Emergency Planning Service (HEPS)*, they adopt the notion of community resilience and ask individuals to "prepare for the unexpected". However, the expert notion of "the unexpected" focuses upon events such as flooding and pandemic diseases at the city-level. HCC takes a holistic approach including SMEs within the notion of a community. Their advice and guidance is generic in nature with a focus upon resilience to flooding. With this approach, SMEs are not seen as separate stakeholders requiring tailored advice. SME's concern with other disruptions apart from flooding is misunderstood, leaving HCC and owner/managers at cross purposes. Given that regulatory body assistance reflects their own prioritization of risk, it is not specifically tailored to the needs of owner/managers. This can lead to severe consequences for SMEs in regards to resilience. Once again, this demonstrates differences in the social science and business practice approach to risk.

Sheffield City Council (SCC) also perceives flooding to possess certain qualities and has implemented large-scale resilience measures to protect against these threats, thus reducing the physical risks to those exposed. These defences are designed to ensure continuity to the order of government at a city level. Unlike the EA, SCC primarily views

flooding as just one in a plethora of risks that can disrupt the order of government. They also perceive SMEs as stakeholders separate from other groups which may be exposed to these hazards. In the city, the *Emergency Planning Team* and the *Business Emergency Resilience Group (BERG)* works alongside SMEs in order to help owner/managers prepare for, and respond to, a wide variety of hazards, not just flooding. As a result, SCC and SMEs do not appear to be at cross-purposes in regards to flooding and other risks. The advice and assistance provided by SCC is more suited to owner/manager requirements. Again this provides evidence for an overlap of the social science and business practice approach to risk. However, as an employee from SCC revealed, although their resilience measures are more 'in-tune' to that required by SMEs, owner/managers still fail to respond to this advice or act upon it. This demonstrates that within Hull and Sheffield, the nature of regulatory body resilience advice provided is not the main driver for flood resilience. Whether appropriate or not, the result is still the same: SMEs remain vulnerable to both flooding and other hazards. Some other factor must be contributing to this occurrence.

8.2.3.2. THE RESPONSIBILITY GAME

If SME owner/managers do not perceive flooding to be a risk, they will not implement flood resilience measures, a situation that leaves them vulnerable to this risk (Bubeck *et al.* 2012, p1482). If they do not see themselves as responsible for resilience, then again, they will not take the relevant steps, leaving themselves exposed.

Under the "*theory of blame*", people are driven to seek causal explanations for how and why things happen (Heider, 1958, p172; Hart and Honoré, 1985, pxxv; Sloman and Lagnado, 2004, p287; Hilton *et al.* 2005, p44). The actions of regulatory bodies are often held responsible by SMEs for exacerbating the occurrence of floods. Owner/managers hold these experts responsible for preventing flooding or lessening the impact in the future. On the other hand, regulatory bodies assert that they are responding to the risk of flooding by implementing resilience measures such as large-scale technological fixes, strategies and flood warnings. They also stress that the funding and resources required to protect everyone, everywhere, all the time, is not available. Instead, they look to those stakeholders at risk to take steps to protect themselves under the notion of community resilience. In order to assist vulnerable groups such as SMEs in improving their resilience, the EA, HCC and SCC provide advice. Yet the same bodies claim that SME owner/managers do not respond to their guidance, fail to interact and choose not to protect themselves.

From the business practice or SME perspective, many owner/managers are unaware that they are required to take responsibility for their own resilience as it is not a

statutory act. In other words, they are not legally obliged to protect their own properties from a disruption. As such, SMEs still look to regulatory bodies to do this for them. Even if an owner/manager did want to address their own vulnerability, the variation in perceptions between the experts and SMEs means that the advice available is reported to be ineffectively communicated and poorly distributed. Furthermore, the majority of this guidance is flood-specific and generic in nature. This is opposed to being business-specific and encompassing a wide range of hazards. As a consequence, it is largely inappropriate for SME owner/manager needs, meaning this advice is not taken on board and does not allow owner/managers to gain a better understanding of how to respond to an event. SME owner/managers are not protecting themselves against flooding and other hazards. This threatens their operations and leaves their businesses vulnerable.

The differences between the social science and business practice approach to flood risk results in a responsibility game scenario in both Hull and Sheffield. Both regulatory bodies and owner/managers hold the other largely responsible for implementing flood resilience measures, leaving SMEs exposed and vulnerable to the risk of flooding. In fact, 59.1% of Hull and Sheffield owner/managers maintain that they have no flood mitigation measures in place, an exposure which could spell the end of a business should it be unable to adequately respond during the occurrence of a flood (Gallopín, 2006, p295). Figures regarding the permanent closure of SMEs following a disruption in Hull and Sheffield are not available. The presence of the responsibility game stems from variations in flood perception. Both regulatory bodies and SMEs are at cross-purposes in regards to implementing flood resilience. However, the blame for this occurrence should not be laid squarely at the feet of the EA, HCC and SCC. Governed by national policy, there is little regulatory bodies can do but to follow legislation and policy guidelines set out by government, even if it means being at cross-purposes with those stakeholders they are trying to help. Until changes are made at a national level, SMEs will remain vulnerable and exposed to a plethora of hazards.

8.2.3.3. A CHANGE TO FLOOD POLICY?

At present, flood risk is managed on a generic basis. England and Wales are seen as one large unit addressed through a National Flood Policy set out by the House of Commons: *The Flood and Water Management Act 2010 (FWMA)*. Driven by governmental perceptions of flood risk, this policy sets out legislations dictating how floods should be managed. This is implemented through a tiered system:

- **Tier 1:** National Policy
- **Tier 2:** Environment Agency (EA) and DEFRA
- **Tier 3:** Lead Local Flood Authorities (LLFAs)
- **Tier 4:** Local Communities

Below the government (Tier 1) is the Environment Agency and DEFRA (Tier 2) who have developed the *National Flood and Coastal Erosion Risk Management Strategy for England and Wales (FCERM)*. The FCERM is a statutory framework designed to help local communities manage the risk. Naturally, it reflects the FWMA legislations and government perceptions. Within the FCERM, LLFAs (Tier 3) are allocated the responsibility for managing the risk of flooding in their area and developing relevant responses. These responses must follow the FCERM framework and, again, conform to UK legislation. As a result, local resilience measures are highly influenced by UK governmental views.

Flood has a local 'profile'. Its frequency, magnitude and effects vary from place to place. Legislation outlined by the FWMA and the resulting FCERM framework may not be applicable to all locations. Even though LLFAs approach flooding on a place-by-place basis, it has been shown that the current method of flood governance, where LLFAs follow a standardised framework, is not necessarily helping certain vulnerable stakeholders. There is a lack of clarity in regards to who is responsible for flood resilience. Moreover, the current assistance provided to SMEs does not meet owner/manager specific requirements. This leaves SME owner/managers vulnerable to the occurrence of floods and other hazards. This resulting exposure raises questions as to how effective the current *Flood and Water Management Act* is at managing flooding and protecting all those at risk. It even raises the issue as to whether it is possible to have a generic National Flood Policy.

The way SMEs react to flooding and are currently treated is representative of wider issues in the governance of flood policy. Therefore, perhaps a local level approach is required. It may be necessary for only national guidelines regarding flood management to exist, while statutory policies could be generated on a place-by-place basis according to the principles of these guidelines, allowing flexibility. Within these policies, and any anti-flood initiatives that may emerge from their development, a number of key recommendations might be included (Box 8.1).

If these proposed changes are made to the way flood is governed at a national-level, alterations to local, anti-flood schemes will ultimately filter down to benefit SMEs, a solution supported by the work of Ingirige and Wedawatta (2011b). By implementing local flood acts, and taking the recommendations outlined below into account, regulatory

body flood policies will be more suited to the area in which they are being implemented. They will also be more accommodating to the type of assistance required by SMEs in regards to flood resilience and business continuity. The more applicable the guidance, the more likely it is to be heeded by owner/managers. This will improve the resilience of SMEs to plethora of other hazards, and improve their chance of business continuity following the occurrence of a disruption. There are barriers which can hinder policy changes including bureaucratic issues between regulatory bodies, queries over finance and sheer practicalities. From the point of view of this research, the recommendations outlined in Box 8.1. below seem the appropriate action to take in theory. However, the likelihood of their implementation in practice due to issues of practicalities and cost is questionable.

BOX 8.1: RECOMMENDATIONS FOR FLOOD MANAGEMENT POLICY

- 1. Statutory policies to manage flooding should be designed for implementation at the local-level on a place-by-place basis.*
- 2. Community resilience should be incorporated into these policies, thereby becoming statutory.*
- 3. Flood policies and initiatives should be developed that recognise SMEs as different to other vulnerable stakeholders, and recognise their different flood consequences and perceptions.*
- 4. Flood policies and initiatives should be developed that recognise the difference between SME industries and how this affects their vulnerability to flooding.*
- 5. Regulatory bodies should be allowed to develop policies and initiatives which reflect SME perceptions of flooding being one in a 'package of discontinuities' and thus address flooding and other risks in a holistic way.*
- 6. Regulatory body flood initiatives, advice and assistance should be effectively publicised, widely communicated and regularly available.*

8.3. ORIGINAL CONTRIBUTION

As the largest physical threat to the UK, an extensive array of academic literature already exists which examines the impact of floods upon UK residents (Cutter, 1996, Crichton 2006; Gupta, 2007; Ingirige *et al.* 2008; Balica *et al.* 2009; Wedawatta *et al.* 2009;

Williams and Scafer 2010; Smith, 2012). This research contributes to this academic discipline by adding to a new and emerging field: the relationship between SMEs and flooding. Due to the increased threat of flooding in the future, and the importance of SMEs to the UK economy, this research makes an important contribution to both flooding research and business practice. Highlighting how SMEs and floods interact makes it possible to comprehend how SMEs can be made more resilient to flooding and recognise how regulatory bodies can effectively assist SME owner/managers in reducing their own flood vulnerability.

To understand the relationship between flooding and SMEs, an interdisciplinary approach was adopted. Understanding the social science approach to flood risk can have positive implications for business practice. Therefore, this approach brought the social science and business practice views of risk together, a combination that is rarely attempted within the flooding research field. SMEs are viewed as a unique set of vulnerable stakeholders who possess specific perceptions of flood risk. These perceptions are seen as independent from those held by the regulatory bodies of the EA, HCC and SCC. Risk perception is a widely researched area (Green *et al.* 1991, Lave and Lave 1991, Krasovskaia *et al.* 2001, Siegrist and Gutscher 2006; Raaijmakers *et al.* 2008). Prior to this research, different perceptions of flood held by SMEs and regulatory bodies had not been compared. Moreover, the implications of these perceptions for both business practice and government flood initiatives were still to be explored, and explored in particular locations. This has left what can be termed as a 'gap in the knowledge' which has now been filled by this research.

This investigation has revealed that many current regulatory body flood resilience initiatives are unsuitable for SMEs and do not assist them in reducing their flood vulnerability. It has also demonstrated that a scenario exists between SMEs and regulatory bodies in terms of who should be implementing flood resilience. Termed, the 'Responsibility Game', this situation has a number of negative consequences for SME owner/managers, some of which have been acknowledged in this research. These implications have led to a questioning of the suitability of a National Flood Policy, thus placing the research into a wider UK context. This questioning has led to exploring a different approach to managing the risk of flooding within the UK which will benefit SMEs. Policies might be designed at a local-scale on a place-by-place basis. They should also consider the other risks SMEs face on a daily basis and thereby require a holistic approach to risk management.

8.4. LIMITATIONS OF RESEARCH

As with all research, there were some methodological issues associated with this investigation. These included problems with participant recruitment and misinterpretation of survey questions. The main limitation of this investigation is that all the conclusions drawn were informed by only two case study locations: Hull and Sheffield. This questions the applicability of the research findings: Can the results generated be generalised to SMEs in other locations, especially larger cities like London, Birmingham or Manchester. Also, can the findings be applied to other vulnerable stakeholders?

Representativeness is not generally sought after with qualitative data. It is expected to be a characteristic of quantitative statistics (Mays and Pope, 1995, p109; Britten, 1995, p253; Black, 1999, p118; Bryman and Bell, 2007, p58). This research used both qualitative and quantitative data to formulate its arguments. As such, an element of representativeness is present. There is also the potential to apply some findings to a national scale. This research has argued that flood has a 'local profile'. In other words, its occurrence varies from place-to-place meaning Hull and Sheffield possess unique characteristics which set them apart from each other. This suggests that other locations experience their own flood risk local profile. Yet, it is not certain whether the responsibility game scenario only exists in Hull and Sheffield. SMEs and regulatory bodies in other locations may not perceive the risk of flooding in the same way as this research uncovered. It may not be possible to apply the findings to other locations. This limitation shows the importance of investigating flooding on a place-by-place basis and why local-level decision making on flood governance is so essential. To explore how representative the assertions made by this research are of other locations was beyond the scope of this research. Yet, the presence of this limitation does not detract from the investigation's inherent merit and it provides scope for further research on this topic.

8.5. SCOPE FOR FURTHER RESEARCH

This research contributes to a new and emerging body of literature regarding flooding and SMEs. It has also contributed through a new type of interdisciplinary research: bringing together the social science and business practice approach. As such, there is scope for conducting future research of a similar nature. One of the most significant ways in which research, in all disciplines, progresses is through replication where previous studies are repeated under different circumstances (White, 2003, p69). It is

hoped this thesis may provide a benchmark against which other investigations can be evaluated, measured, explained and compared.

As previously outlined, comparing and contrasting two case study locations can provide a stepping stone for generalising results to other cities. Therefore a future study might replicate this research by examining the relationship between SMEs and flooding in other locations. The sites of Hull and Sheffield were determined by their unique geographical qualities, history of flooding and heavy reliance upon SMEs economically. The investigation could be repeated in cities with different geographical, historical and industrial characteristics to see whether the findings of this thesis are generalisable or exclusive to Hull and Sheffield. As well as replication in other locations, this research could also focus upon a different risk, perhaps some of the hazards which owner/managers perceive as being the most significant to their SME such as fire. By doing so, it will be possible to see whether the issues associated with flood resilience and assistance are applicable to other risks.

The replication of this study will have further implications for flood management. In other words, the presence of the responsibility game in other locations would provide supporting evidence for the claims that current regulatory body flood management policies and initiatives are not effectively assisting SME owner/managers. This also supports the thesis' assertion that changes should be made to both national and local-level flood strategies for the benefit of SMEs. In summary, replication has the potential to strengthen conclusions, solve issues surrounding generalizability and ultimately assist owner/managers in reducing their SMEs vulnerability to flooding through changes to regulatory body flood initiatives.

8.6. THE FUTURE

More than 30.0% of small-sized enterprises are unable to survive the first three years of operation (Crichton, 2006, p11). Accordingly, SMEs are the most vulnerable section of the UK economy to climate change impacts (Crichton, 2006, p1). Climate change is a very real event and has already impacted dramatically upon British SMEs (Crichton, 2006, p1, 11 and 15):

- Weather damage caused £2.3 billion of claims in the UK from SMEs between 2000 and 2006.
- Average claims for flood damage from each SME effected has increased from £22,000 in 2001 to £35,000 in 2005.

- Average costs of business interruption has risen by 60% in four years.
- The complex nature of SMEs means the average business interruption period following an event has increased from eight months in 1996, to fourteen months in 2005.

The already high costs borne by SMEs as a result of climate change are set to rise dramatically. Projected scenarios predict the cost to an enterprise is likely to rise by 30 or 40 times by 2080 (Crichton, 2006, p1). This means flooding would cost the SME sector up to £42 billion every year. But why?

Climate change is due to change the nature of future flooding. This year (2014) has seen severe flooding in the south-west of the country, with large expanses of land in counties such as Somerset physically underwater for more than three weeks (Carter, 2014, online). Hull was once again flooded in December 2013 due to the occurrence of the largest UK tidal surge for over 60 years travelling from the North Sea up the River Humber, and along the River Trent (Hull Daily Mail, 2013, online). It is these occurrences, and the predicted increase in extreme flooding events, which could begin to change the perceptions of owner/managers in regards to the significance of flooding.

Additional research on SMEs may provide further support for the notion that current regulatory body strategies are not reducing, but perhaps increasing, the vulnerability of stakeholders, including SMEs. In order to correct this condition, changes might need to be made to national policy guidelines. The local profile of flooding means flood initiatives might be developed and implemented at a local-level. The unique characteristics of individual areas, including their geography, history and industry should be taken into account when these policies are drawn up. Flexibility is the key, with businesses allowed to work alongside regulatory bodies during the development of local policies and strategies (Major and Cordey-Hayes, 2000). Whether this is achievable due to the barriers associated with cost and the bureaucratic nature of the UK remains to be seen. Yet, by taking heed of the recommendations outlined in Box 8.1, it is believed that UK wide changes to flood management will filter down to the local level. Frameworks, strategies and initiatives implemented will be more complementary to stakeholders such as SME owner/managers and thus reduce SME vulnerability, as they are designed to.

Although changes to national flood management are seen as the best solution at present, flooding is not a static hazard. Looking to the future, within Hull it is estimated that by 2100 climate change, alongside development pressures, will increase flood depths by between 0.3 and 1.5 metres across the city (ABI, 2006, p45). This change, in conjunction with sea-level rise, would exacerbate flooding costs in Hull by £1.4 billion

(440% increase), and place 10,000 more properties at risk (ABI, 2006, p45). Within Sheffield, an increase in the frequency of localised intense storms will increase precipitation rates by 12.0% (Bengtsson and Hodges, 2006, p3541). Furthermore, peak river flows are set to increase by 8.0 to 14.0% (SCC, 2008, p26). Consequently the 10,000 properties currently exposed will be susceptible to more severe flooding in future years (SCC, 2008, p21). These predictions show that although the conclusions drawn for Hull and Sheffield are valid now, climate change may change all parameters currently associated with flooding in these areas and necessitate a rethink in flood governance.

Consequently, will climate change remove the local profile of flooding? The recent floods in December 2013 and January 2014 resulted in tidal surges and floods which have covered many catchment areas and floodplains (BBC News, 2013, online). If this is going to be a more frequent occurrence, then there is the requirement for a constant reassessment of the emphasis between local and national flood governance according to changing circumstances. There is also a continued requirement to study flooding in regards to vulnerable stakeholders for the foreseeable future. Although different flooding scenarios associated with climate change can be modelled scientifically, the results do not make it possible to accurately answer whether a local flood profile will remain. Until the dimensions of climate change are fully realised, regulatory bodies are left making 'educated guesses' as to what are the best strategies and initiatives to use to help stakeholders such as SMEs.

8.7. FINAL WORDS

The adoption of a case study approach has allowed this research to make a significant contribution to literature. In both Hull and Sheffield two alternative approaches to risk have been brought together. Through this interdisciplinary approach, both the social science perception of risk and risk in terms of business practice have been explored within the context of how floods affect SMEs. It was discovered that:

- Regulatory bodies hold a similar perception to the social science approach. Risk is seen in terms of the notions of vulnerability and resilience.
- SME owner/managers align more with business practice. Risk is viewed as business continuity.

Different stakeholders define risk differently. As demonstrated, the perceptions of flood risk held by the SME owner/managers and regulatory bodies of Hull and Sheffield run parallel to one another. This can cause confusion in regards to responsibility for flood

resilience, issues with resilience practicalities and ultimately exacerbate vulnerability. Of the regulatory bodies studied, Sheffield City Council perceptions align the most closely with SME owner/managers. This raises the question as to whether SCC is better at bridging the gap between the social science and business practice perceptions of risk for the benefit of reducing SME flood vulnerability. If so, lessons should be learned by other regulatory bodies in other cities so that SMEs do not spend their future *“doing business underwater”*.

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APPENDICES

APPENDIX 1

Table of Historical Sources

TABLE OF HISTORICAL SOURCES

Hull Historical Sources	Sheffield Historical Sources
14 th October 1954 Daily Mail	21 st August 1954 Sheffield Telegraph
6 th November 1954 Daily Mail	2 nd July 1958 Sheffield Telegraph
11 th November 1954 Daily Mail	11 th December 1965 The Star
12 th November 1954 Daily Mail	16 th June 1966 The Star
15 th October 1958 Daily Mail	16 th July 1973 The Star
9 th January 1960 Daily Mail	17 th July 1973 Morning Telegraph
1 st February 1960 Daily Mail	26 th June 1982 The Star
13 th September 1969 Daily Mail	18 th October 1980 The Star
29 th July 1969 Daily Mail	22 nd December 1991 The Star
20 th July 1973 Daily Mail	11 th June 1993 Sheffield Telegraph
5 th January 1976 Daily Mail	12 th June 1993 The Star
12 th January 1978 Daily Mail	11 th July 1993 The Star
13 th January 1978 Daily Mail	20 th December 1996 The Star
7 th June 1982 Daily Mail	1 st September 1997 The Star
4 th August 1984 Daily Mail	30 th October 1998 The Star
8 th June 1999 Hull Daily Mail	6 th November 2000 The Star
8 th November 2000 Hull Daily Mail	11 th August 2004 The Star
12 th February 2001 Hull Daily Mail	15 th June 2007 The Star
23 rd July 2004 Hull Daily Mail	16 th June 2007 The Star
24 th August 2004 Hull Daily Mail	12 th June 2009 The Star
15 th June 2007 Hull Daily Mail	
30 th July 2007 Hull Daily Mail	
1 st June 2010 Hull Daily Mail	

APPENDIX 2

Historical and flood risk maps for Hull and Sheffield used to identify interview and questionnaire sampling locations

HULL

Historic Flooding September 1969

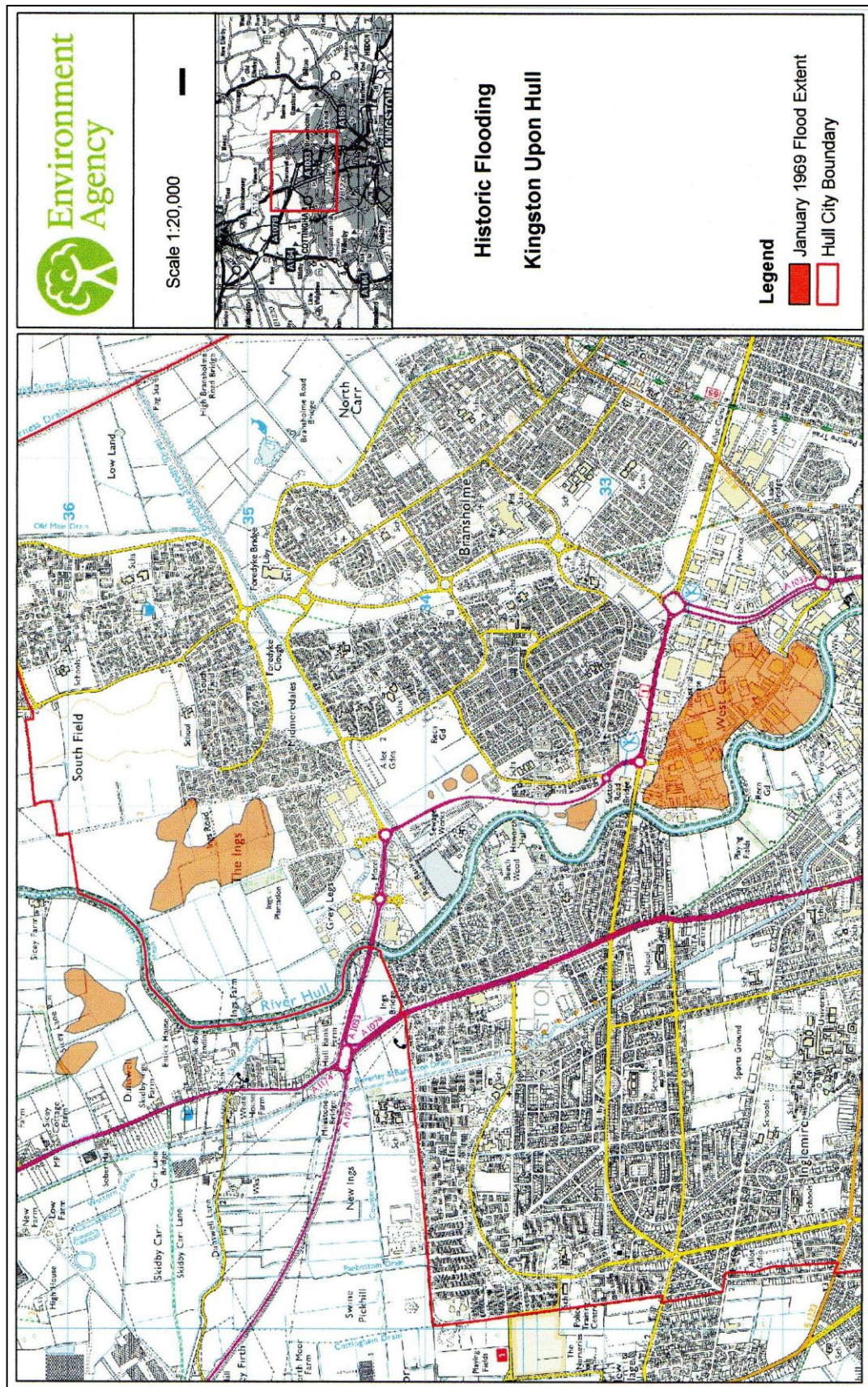
Local Flooding

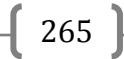
SHEFFIELD

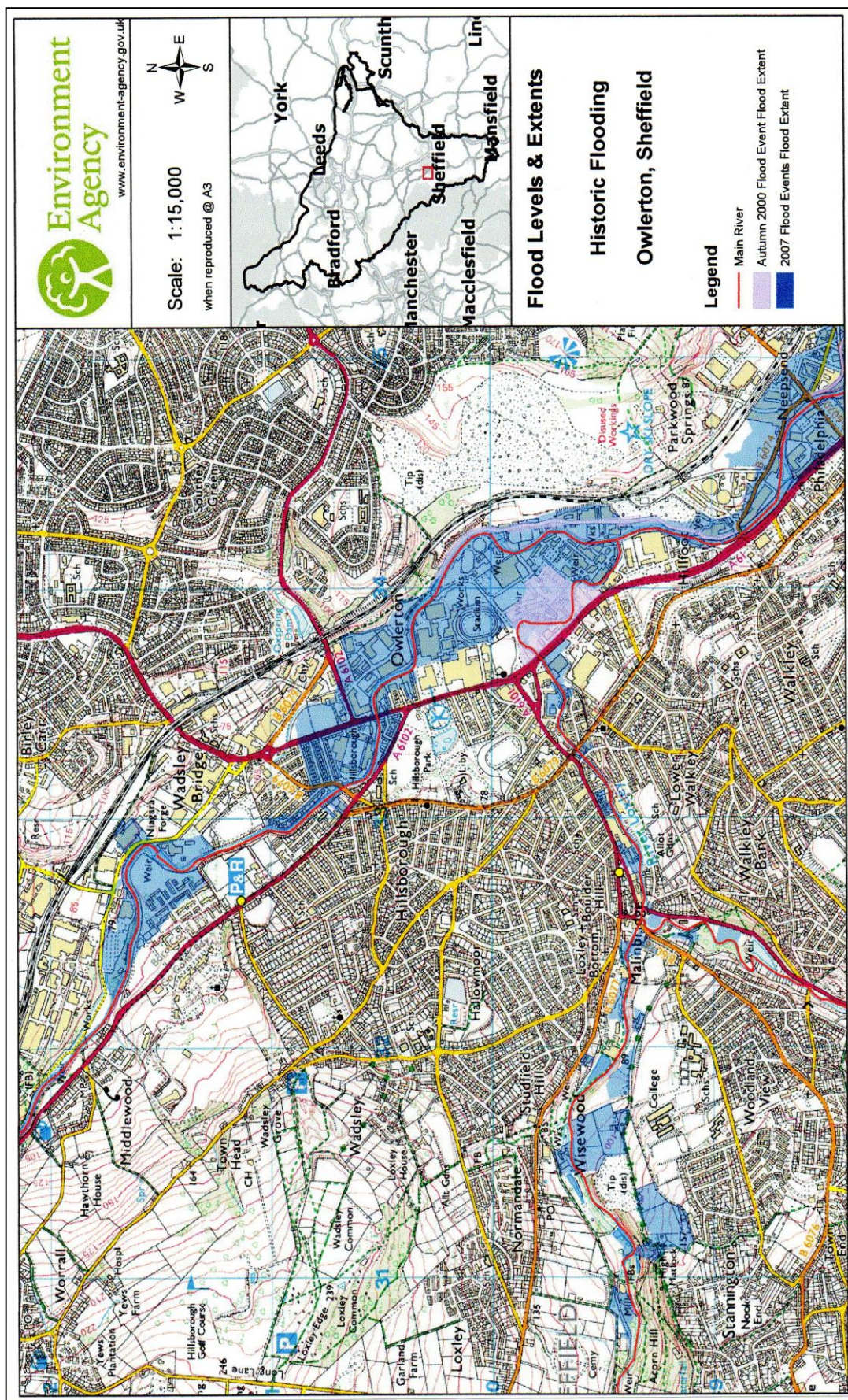
Historic Flooding, Owlerton

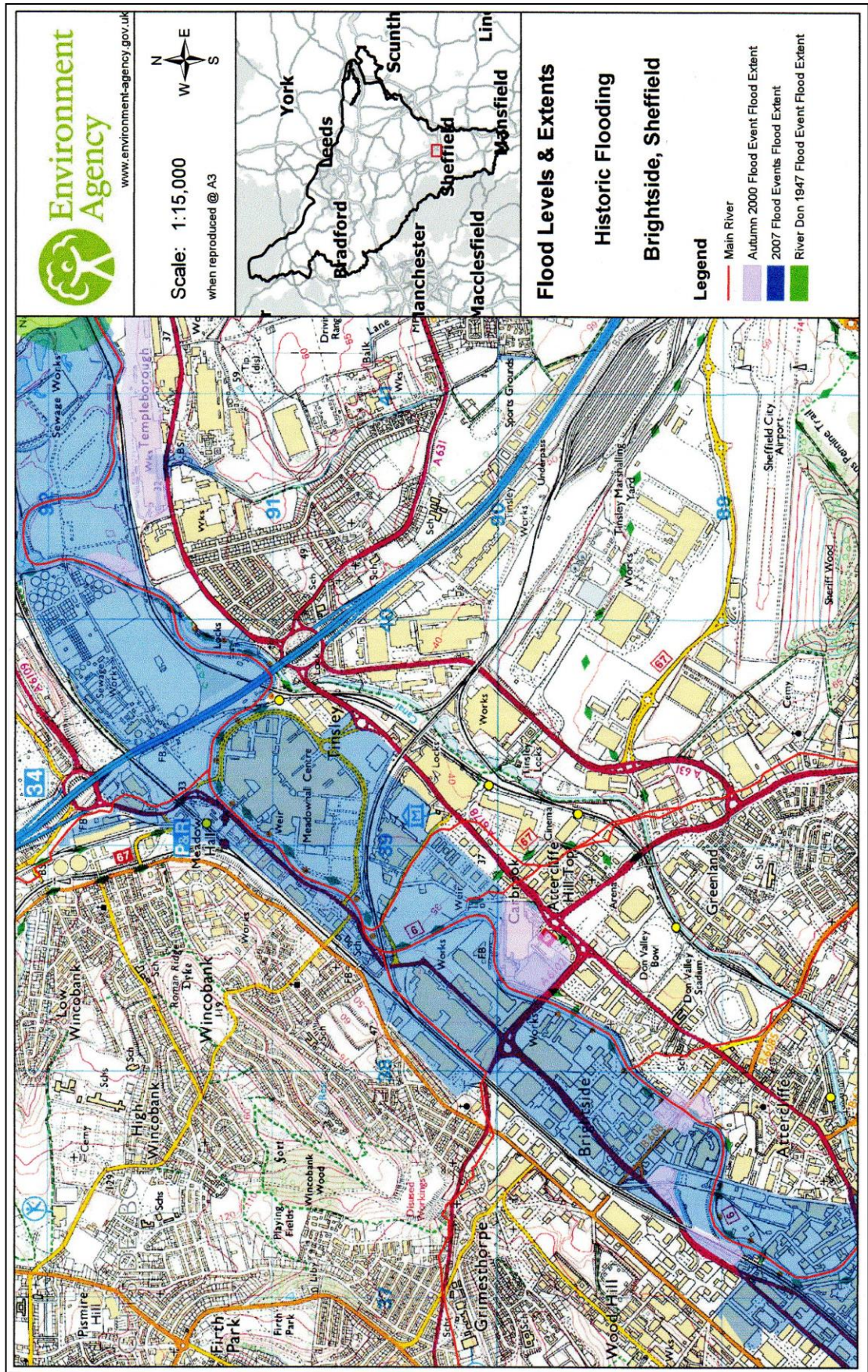
Historic Flooding, Sheffield City Centre

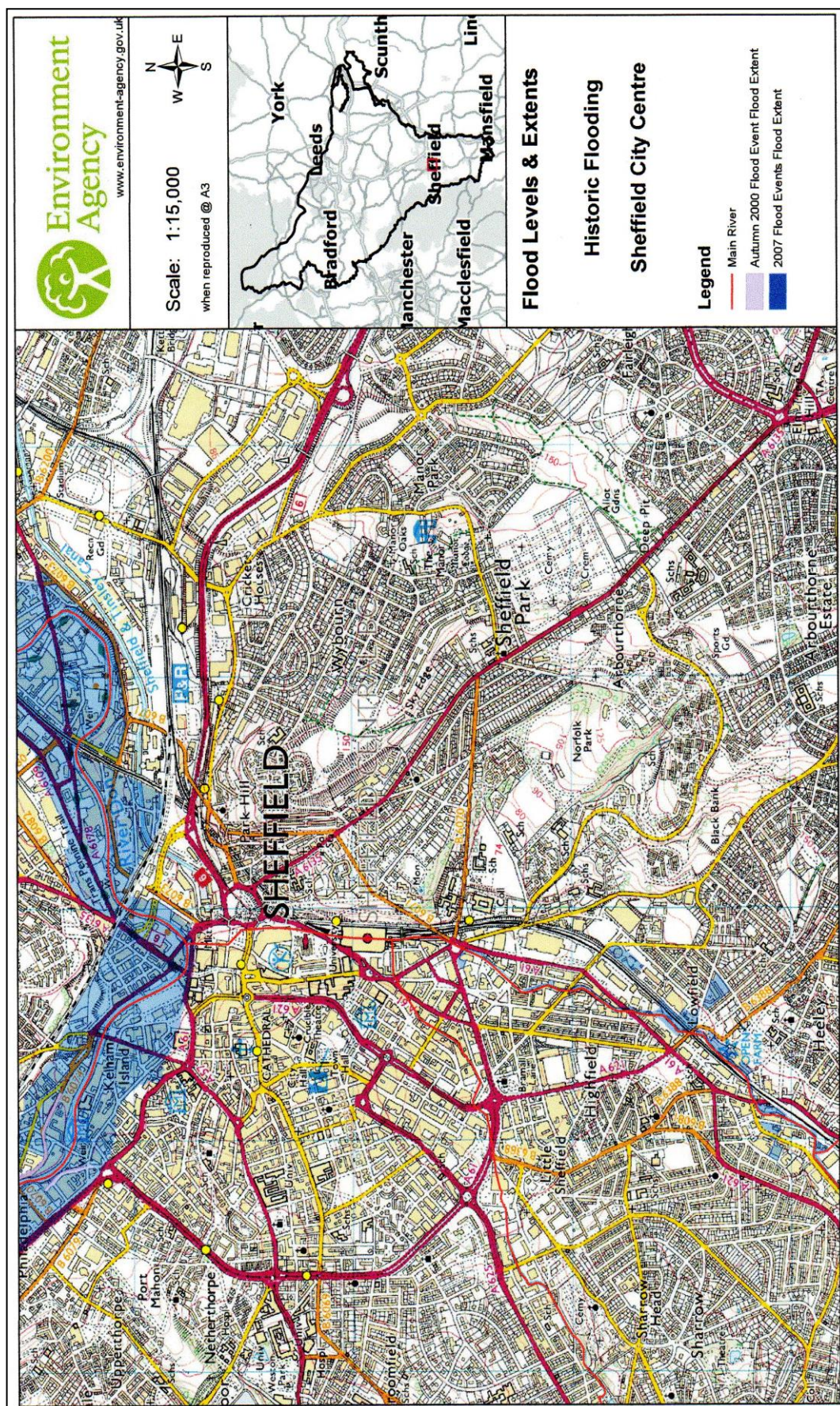
Historic Flooding, Brightside











APPENDIX 3

INTERVIEW APPENDAGES

Interview Recruitment Email

From: Rebecca L Messham

To: (INTENTIONALLY LEFT BLANK)

Sent: Tuesday, December 28th, 2010, 7:10 PM

Subject: University of Hull Research: Business and Flooding

Rebecca Messham
Department of History
University of Hull
Cottingham Road
HULL
HU6 7RX
Mobile: INTENTIONALLY LEFT BLANK
Email: INTENTIONALLY LEFT BLANK

To Whom It May Concern;

My name is Rebecca Messham and I am a second year PhD student studying at the University of Hull. For my thesis I am investigating the impacts of flooding upon small and medium sized businesses in the cities of Hull and Sheffield. As you may have seen on the news, it is suggested that climate change is a serious issue that is arguably having detrimental effects across the globe. Flooding is just one of the problems associated with a changing climate and, as has been witnessed within the last decade, it is increasing in occurrence within the United Kingdom causing large amounts of damage for thousands of people, including the city of Sheffield.

As you are a business located in Sheffield, I am writing to ask if you would be willing to spare an hour of your time in the new year to take part in a brief interview to discuss some of the issues surrounding the topic of flooding and how it effects businesses like yours. Despite the increasing threat of flooding within the UK, as of yet the effects this hazard has upon small and medium sized enterprises business has not been investigated fully. Therefore with your assistance this research is aiming to explore this neglected and highly topical area with a view to assisting business owners and managers, just like yourself, to prepare for the risk of flooding should it occur in the future.

This is a very new area of research and I would be extremely grateful if you could spare the time to assist me in my venture. Even if you have not had any experience with flooding I would still like to hear you thoughts and opinions and this topic. All information provided will be kept completely confidential and will only be used for academic purposes. If you require any extra information, have any questions regarding the research or are willing to take part in the study, please contact me on the details provided above.

Thank you for taking the time to read this email and I look forward to hearing from you

Yours Truly

Rebecca Messham

APPENDIX 4

Characteristics of Hull Interview Participants

Characteristics of Sheffield Interview Participants

CHARACTERISTICS OF HULL INTERVIEW PARTICIPANTS

Postcode	Standard Industrial Classification 2007	Year of Establishment	Turnover	Size (Number of employees)	Position	Gender	Age	Ethnicity	Highest Educational Qualification
HU6 7QN	Production/manufacturing	1975	-	100	Owner	Male	31	White	A-levels
HU7 3HF	Information and Communication	2005	£60,000	2	Owner	Male	38	White	Diploma/NVQ
HU7 0YF	Professional, scientific and technical	1988	£1,100,000	24	Owner	Male	49	White	Degree
HU5 5XG	Accommodation and food services	2006	-	3	Owner	Male	45	Asian	Other
HU1 1HJ	Social Enterprise	2006	£400,000	9	Managing Director	Female	43	White	Degree
HU5 1RL	Production/Manufacturing	2001	£10,000,000	40	Director	Male	59	White	A-levels
HU1 1PS	Professional, scientific and technical	2003	£200,000	2	Owner	Male	44	White	Degree
HU10 6UA	Accommodation and Food Services	-	£20,000	6	Manager	Female	-	Asian	-
HU5 5JE	Arts, entertainment, recreation and other services	1930	-	5	Bar Manager	Male	65	White	-
HU6 7TQ	Information and Communication	1993	£250,000	3	Director	Male	38	White	Degree

Postcode	Standard Industrial Classification 2007	Year of Establishment	Turnover	Size (Number of employees)	Position	Gender	Age	Ethnicity	Highest Educational Qualification
HU6 7TQ	Business administration and support services	1998	£900,000	15	Director	Female	52	White	Degree
HU9 1RH	Amenities	1975	-	27	Manager	Male	47	White	Degree
HU1 1PS	Hull City Council	-	-	-	Flood Manager	Male	47	White	Degree
HU8 8HA	Construction	1995	£1,000,000	16	Director	Male	42	White	Degree
HU13 0EG	Professional, scientific and technical	1858	£1,200,000	15	Manager	Male	40	White	Degree
YO30 4UZ	Environment Agency	-	-	-	Other	Female	28	White	Degree

CHARACTERISTICS OF SHEFFIELD INTERVIEW PARTICIPANTS

Postcode	Standard Industrial Classification 2007	Year of Establishment	Turnover	Size (Number of employees)	Position	Gender	Age	Ethnicity	Highest Educational Qualification
S6 2FH	Agriculture, forestry and fishing	1991	£500,000	5	Manager	Male	35	White	O-levels/ GCSE

Postcode	Standard Industrial Classification 2007	Year of Establishment	Turnover	Size (Number of employees)	Position	Gender	Age	Ethnicity	Highest Educational Qualification
S3 8HT	Retail	1951	-	75	Manager	Female	32	White	Degree
S6 2FH	Construction	1980	£600,000	8	Owner	Male	46	White	O-level/ GCSE
S3 8AG	Business administration and support services	1965	-	120	Owner	Male	48	White	A-levels
S6 2FH	Construction	1993	£2,500,000	22	Manager	Male	41	White	Degree
S2 3EP	Production/manufacturing	1972	£1,000,000	5	Owner	Male	63	White	Other
S65 3SH	Arts, entertainment, recreation and other services	1960	£120,000	20	Director	Male	65	White	Degree
S8 0YA	Production/manufacturing	1912	£7,200,000	36	Owner	Male	64	White	Diploma/ NVQ
S4 7UD	Business administration and support services	1857	£2,000,000	35	Manager	Female	49	White	Other
S9 1BW	Health	2005	£100,000	3	Owner	Female	47	White	Other
S7 1LW	Health	1995	£900,000	38	Owner	Male	43	White	Other
S2 4ED	Education	1986	£100,000	4	Manager	Female	42	White	Degree
S9 2RX	Charity	1992	£350,000	10	Manager	Female	41	White	Diploma/ NVQ
S35 2PX	Property	1992	-	11	Manager	Female	57	White	Other
S3 8GF	Education	1990	£70,000	1	Owner	Male	61	White	Degree

Postcode	Standard Industrial Classification 2007	Year of Establishment	Turnover	Size (Number of employees)	Position	Gender	Age	Ethnicity	Highest Educational Qualification
S1 2HH	Sheffield City Council	-	-	-	Emergency Planning Officer	Male	30	White	Degree
S6 1NF	Amenities	2008	£90,000	8	Manager	Male	25	White	Degree
S11 7EH	Construction	1930	£500,000	9	Owner	Male	57	White	Degree
S6 1TD	Arts, entertainment, recreation and other services	1991	£220,000	4	Owner	Female	43	White	Degree
S4 7DH	Transport and storage	2001	£30,000	1	Owner	Male	62	White	Degree
S3 8DG	Wholesale	1983	£1,500,000	10	Manager	Male	-	Black	Diploma/ NVQ
S3 8EN	Production/ Manufacturing	2005	£100,000	2	Owner	Male	42	White	Degree

APPENDIX 5

Final Interview Schedule

INTERVIEW SCHEDULE

DISRUPTION EXPERIENCE

1. Since it was established, has your business been impacted by any disruptions)? By a disruption I mean any event/occurrence which has interfered with the running of your business in a significant way?
 - If yes, ask them to outline all the occasions when they were disrupted (e.g. month, year) and how they were disrupted (e.g. industrial strike, recession, etc), ask the respondent to explain what they mean by disruption.
 - If no, move on to question 8.
2. Could you please explain what effects/impacts this/these disruption(s) had upon the running of your business?
 - Allow them to answer and, if not already done so, ask them to elaborate on the direct/indirect, short/long term impacts, direct/indirect costs, total recovery costs, etc.
3. How did you respond to these impacts/effects?
 - Allow them to answer and, if not already done so, ask them to elaborate on their actions after the disruption(s).
4. Were you given any support/assistance during the disruption(s)?
 - If yes, allow them to answer and, if not already done so, try to get them to elaborate on what assistance/support was received (i.e. grants, donations of furniture, etc), when it was received, who it was received from, did they have to search for the help or did it come to them, etc.
5. Were you given any support/assistance after the disruption(s)?
 - If yes, allow them to answer and, if not already done so, try to get them to elaborate on what assistance/support was received (i.e. grants, donations of furniture, etc), when it was received, who it was received from, did they have to search for the help or did it come to them, etc.
6. Is there any assistance/support which you didn't receive that would have helped your business prior, during and after the disruption(s)?
 - If yes, allow them to answer and, if not already done so, ask them to elaborate on what assistance they would have liked, who they wanted assistance from, when they would have wanted the assistance, etc.
 - If no, allow them to answer and, if not already done so, ask them to explain the reason(s) for this perspective.
7. Has anything else interfered with your business in significant way?
8. In your opinion what would you classify as the top three disruptions your business faces?
 - Allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they hold this perspective.
9. In your opinion what would you classify as the most important disruptions your business will face in the next ten years?
10. To what extent do you think that the type of disruptions your business faces today, and their associated impacts, have changed since your business was established?

- If they think they have changed, allow them to answer, and if not already done so ask them to elaborate in what ways they think the disruptions have changed and explain the reason(s) as to why they hold this perspective.
- If they don't think they have changed, allow them to answer, and if not already done so, ask them explain the reason(s) as to why they hold this perspective.

11. During and after the disruption(s) did your business experience any advantages?

- If yes, allow them to answer and, if not already done so, ask them to outline what the unexpected occurrence was and whether they would categorise it as good/useful or bad, e.g. allowed them to refurbish shop, got other customers etc.

DISRUPTION PROTECTION/ADAPTATION

12. To what extent do you think that your business is adequately prepared to respond to the occurrence of a disruption i.e. plans in place?

- If adequately prepared, allow them to answer and, if not already done so, ask them elaborate the disruption protection/adaptation measures they have in place and why they have employed them. i.e. continuity plans, insurance, etc.
- If not adequately prepared, allow them to answer and, if not already done so, ask them to explain the reasons as to why they are not prepared or do not have any disruption resilience/adaptation measures in place.

13. Whilst under your management/during your employment has there been any changes made to the disruption protection/adaptation measures your business employ? (e.g. change in the number and types employed)

- If yes allow them to answer and, if not already done so, ask them to explain and elaborate on the changes made and why they made them.
- If no, allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they have not made any changes.

FLOOD PERCEPTION

14. To what extent do you think flooding is a risk to the city of Hull/Sheffield?

- Allow them to answer and, if not already done so, ask them to elaborate or explain the reason(s) as to why they hold this perspective and also ask them to explain if they perceive Hull/Sheffield to be protected against/adapted to flooding.

15. To what extent do you think that the nature of flooding in the city of Hull/Sheffield has changed over the last sixty years?

- If they think it has changed, ask them to outline in what ways they believe flooding has changed and the reason(s) why they hold this perspective.
- If they do not think it has changed, ask them to outline the reason(s) as to why they hold this perspective.

16. To what extent do you think that your business is at risk to the occurrence of a flood?

- If they believe it is vulnerable, allow them to answer and, if not already done so, ask them to outline which factors they believe affects the vulnerability of their business to flooding and explain the reason(s) as to why they hold this perspective.
- If they don't believe it is vulnerable, allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they hold this perspective.

17. To what extent do you think that the susceptibility/vulnerability of your business to flooding has changed since it was established?
- If they think it has changed, allow them to answer and, if not already done so, ask them to outline in what ways they think their vulnerability has changed and why.
 - If they don't think it has changed, allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they hold this perspective.

FLOOD EXPERIENCE

18. Has your business been directly flooded in the last 60 years (since 1950), by directly I mean has your premises been in direct contact with flood water?
- If yes ask them to outline all the occasions when they were flooded (e.g. month, year)
 - If no, move on to question 25.
19. Could you please explain what effects/impacts this/these flood(s) had upon the running of your business?
- Allow them to answer and, if not already done so, ask them to elaborate on the direct/indirect, short/long term impacts, direct/indirect costs, total recovery costs, etc.
20. How did you respond to these impacts?
- Allow them to answer and, if not already done so, ask them to elaborate on their actions during and after the flood event(s).
21. Were you given any warning prior to the flood event(s)?
- If yes, allow them to answer and, if not already done so, try to get them to elaborate on what warnings were given, when they were received and who they were received from.
22. Were you given any assistance/support during the flood event(s)?
- If yes, allow them to answer and, if not already done so, try to get them to elaborate on what assistance/support was received (i.e. grants, donations of furniture, etc), when it was received, who it was received from, did they have to search for the help or did it come them them, etc.
23. Were you given any assistance/support after the flood event(s)?
- If yes, allow them to answer and, if not already done so, try to get them to elaborate on what assistance/support was received (i.e. grants, donations of furniture, etc), when it was received, who it was received from, did they have to search for the help or did it come them them, etc.
24. Is there any assistance/support which you didn't receive that would have helped your business prior, during and after the flood event(s)?
- If yes, allow them to answer and, if not already done so, ask them to elaborate on what assistance they would have liked, who they wanted assistance from, when they would have wanted the assistance, etc.
 - If no, allow them to answer and, if not already done so, ask them to explain the reason(s) for this perspective.
25. To what extent do you think that the impacts and costs associated with flooding have changed over time?
- If they think things have changed, allow them to answer and, and if not already done so, ask them to outline the reason(s) for this view point. Also if they do

think that the impacts and costs have changed, ask them to outline in what ways and over what time scale.

- If they think things have not changed, allow them to answer and, if not already done so, ask them to explain their reason(s) for this perspective.

26. Whilst under your management/during your employment have any of your business suppliers been impacted by the occurrence of a flood?

- If yes, allow them to answer and, if not already done so, ask them to explain the impacts this has had upon their business (if it had any).

27. Whilst under your management/during your employment, have any of your customers been impacted by the occurrence of a flood?

- If yes, allow them to answer and, if not already done so, ask them to explain the impacts this had upon their business (if it had any).

28. During and after the occurrence of a flood in the city of Hull/Sheffield (even if you were not directly affected) did your business experience any advantages?

- If yes, allow them to answer and, if not already done so, ask them to outline what the unexpected occurrence was and whether they would categorise it as good/useful or bad, what e.g. allowed them to refurbish shop, got other customers etc..
- If no, allow them to answer then ask them if they looked to see if they could make any gains/advantages i.e. use it as a business opportunity

FLOOD PROTECTION/ADAPTATION

29. To what extent do you think that that your business is adequately prepared to respond to the occurrence of a flood i.e. plans in place

- If adequately prepared, allow them to answer and, if not already done so, ask them elaborate the flood protection/adaptation measures they have in place and why they have employed them. i.e. business continuity plans, insurance, site check, flood guide
- If not adequately prepared, allow them to answer and, if not already done so, ask them to explain the reasons as to why they are not prepared or do not have any flood protection/adaptation measures in place.

30. Whilst under your management/during your employment have any changes been made to the flood protection/adaptation measures employed by your business? e.g. change in the number employed, change in the type of measures employed etc

- If changes made, allow them to answer and, if not already done so, ask them to elaborate the changes made and why they made them.
- If no changes made, allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they have not made any changes.

31. In your opinion, what factors may prevent you from preparing for/adapting your business to future flooding?

- Allow them to answer and, if not already done so, ask them to explain the factors which may prevent them and elaborate the reason(s) as to why they hold this perspective.

32. What resources/assistance do you think may help you in preparing for/adapting your business to future flooding?

- Allow them to answer and, if not already done so, ask them to elaborate upon why these resources/this assistance will help them.

33. Ask if not already covered) Is your business adequately insured to cover the cost of the impacts/effects caused by some of the disruptions we have previously discussed?
- If yes, allow them to answer and, if not already done so, ask them to outline to what extent are they insured i.e. under insured, partly insured, do they think the level of cover is enough if not why not, has the price gone up, has their insurer/insurance broker talked to them about flooding, have they had to claim for the damage caused by a disruption, what is their experience with the insurance company, have they been re-quoted insurance since their claim to their satisfaction, and explain the reason(s) as to why they have insurance.
 - If no, allow them to answer and, if not already done so, as them to explain the reason(s) as to why they do not have insurance.
34. Do you know if your suppliers/partners have plans in place to ensure the continued running of their business during the occurrence of a disruption?
- If plans are in place, allow them to answer and, if not already done so, ask them to elaborate as to who has a plan, what these plans are, whether they require their suppliers/partners to have plans in place, what plans they require and how they verify these plans.
 - If no plans in place, allow them to answer and, if not already done so, ask them to explain the reason(s) as to why they do not require their suppliers/partners to have plans in place.
35. Do you have any other comments to make on the issue of flooding and your business that has not been covered in any of the previous questions?
- Open ended question, no prompting required.

APPENDIX 6

Postcodes Sampled by Questionnaire in Hull and Sheffield

POSTCODES SAMPLED BY QUESTIONNAIRE IN HULL AND SHEFFIELD

Hull Postcodes	Sheffield Postcodes
HU1	S1
HU2	S2
HU3	S3
HU4	S4
HU5	S5
HU6	S6
HU7	S7
HU8	S8
HU9	S9
HU13	S10
	S11
	S12
	S13
	S14
	S35

APPENDIX 7

Industrial Sectors to be Sampled by Questionnaire

INDUSTRIAL SECTORS TO BE SAMPLED BY QUESTIONNAIRE

	Industry
A	Agriculture, forestry and fishing
B	Production/manufacturing
C	Construction
D	Motor trades
E	Wholesale
F	Retail
G	Amenity provision (e.g. water, gas, electricity, recycling)
H	Transport and storage (including postal)
I	Accommodation and food services
J	Information and communication
K	Finance and insurance
L	Property
M	Professional, scientific and technical
N	Education
O	Health
P	Public administration and defence
Q	Business administration and support services
R	Arts, entertainment, recreation and other services
S	Charity

APPENDIX 8

Hull SME Postcode and Industrial Sector Breakdown

Sheffield SME Postcode and Industrial Sector Breakdown

HULL SME POSTCODE AND INDUSTRIAL SECTOR BREAKDOWN

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
HU1	14	57	68	6	42	73	2	38	33	15	25	120	59	14	38	1	265	67	937
HU2	5	82	45	15	59	45	8	10	16	2	7	44	14	3	19	2	113	40	529
HU3	6	89	107	31	61	77	2	27	28	4	14	106	34	22	45	4	197	89	943
HU4	1	26	45	6	21	22	1	8	4	1	7	25	14	4	9	0	58	12	264
HU5	4	51	151	15	21	80	2	13	40	3	7	68	32	16	21	0	263	82	869
HU6	1	29	37	9	9	18	6	10	10	0	3	14	14	11	6	0	63	18	258
HU7	3	80	72	2	20	26	2	8	6	0	4	26	25	6	8	0	97	24	409
HU8	0	46	98	24	61	32	3	40	24	0	6	17	7	8	6	0	84	30	486
HU9	3	72	71	21	28	45	3	57	9	1	2	25	11	6	17	1	115	41	528
HU13	17	49	78	11	35	53	0	18	21	3	14	51	30	6	24	1	168	48	627
Total	54	581	772	140	357	471	29	229	191	29	89	496	240	96	193	9	1423	451	5850

SHEFFIELD SME POSTCODE AND INDUSTRIAL SECTOR BREAKDOWN

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
S1	7	88	88	14	43	119	5	22	41	14	22	118	124	28	48	3	259	153	1196
S2	3	74	45	14	36	50	3	12	20	5	5	50	48	22	20	1	180	75	663
S3	1	96	45	16	42	23	6	11	21	4	6	53	59	10	17	0	153	55	618
S4	1	129	35	7	34	16	3	12	4	6	4	34	17	6	9	0	137	43	497
S5	1	12	32	2	3	24	4	7	6	0	1	10	11	3	9	0	38	20	183
S6	9	111	185	19	133	55	4	16	15	6	21	56	47	18	34	0	207	91	1027
S7	1	24	31	5	15	31	0	4	12	3	9	38	43	11	19	1	129	47	423
S8	3	75	150	24	47	86	2	10	19	12	25	263	69	18	16	1	264	84	1168
S9	4	275	95	42	145	68	22	34	28	7	30	78	60	20	25	3	396	92	1424
S10	5	70	141	18	40	76	7	19	42	4	26	231	114	34	75	2	671	278	1853
S11	3	53	103	15	49	78	0	24	31	8	20	176	106	15	37	1	391	90	1200
S12	2	19	87	6	12	18	2	15	6	9	2	14	15	5	8	1	80	33	334
S13	1	42	57	5	16	23	1	4	8	4	4	14	15	2	6	0	57	30	289
S14	0	2	4	0	0	2	0	0	0	1	0	1	2	0	0	1	6	3	22
S15	9	63	157	18	35	42	7	17	14	6	22	59	54	14	21	6	216	55	815
Total	50	1133	1255	205	650	711	66	207	267	89	197	1195	784	206	344	20	3184	1149	11712

APPENDIX 9

Number of Samples Required to Represent Each Postcode (Hull)

Number of Samples Required to Represent each Industrial Sector (Hull)

Hull Sample Breakdown

NUMBER OF SAMPLES REQUIRED TO REPRESENT EACH POSTCODE (HULL)

Postcode	Number of Businesses	Percentage of Total Businesses	Percentage of Sample	Number of Businesses to Sample
HU1	937	16.02	160.17	160
HU2	529	9.04	90.43	91
HU3	943	16.12	161.20	161
HU4	264	4.51	45.13	45
HU5	869	14.85	148.55	149
HU6	258	4.41	44.10	44
HU7	409	6.99	69.91	70
HU8	486	8.31	83.08	83
HU9	528	9.03	90.26	90
HU13	627	10.72	107.18	107
Total	5850	100	1000	1000

NUMBER OF SAMPLES REQUIRED TO REPRESENT EACH INDUSTRIAL SECTOR (HULL)

Industry	Number of Businesses	Percentage of Total Businesses	Percentage of Sample	Number of Businesses to Sample
Agriculture, forestry and fishing	54	0.92	9.23	9
Production/manufacturing	581	9.93	99.32	99
Construction	772	13.20	131.97	132
Motor trades	140	2.39	23.93	24
Wholesale	357	6.10	61.03	61
Retail	471	8.05	80.51	81
Amenity provision	29	0.50	4.96	5
Transport and storage	229	3.91	39.15	39
Accommodation and food services	191	3.26	32.65	33
Information and communication	29	0.50	4.96	5
Finance and insurance	89	1.52	15.21	15
Property	496	8.48	84.79	85
Professional, scientific and technical	240	4.10	41.03	41
Education	96	1.64	16.41	16
Health	193	3.30	32.99	33
Public administration and defence	9	0.15	1.54	2
Business administration and support services	1423	24.32	243.25	243
Arts, entertainment, recreation and other services	451	7.71	77.09	77
Total	5850	100	1000	1000

HULL SME BREAKDOWN

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
HU1	2	10	12	0	7	12	0	6	6	3	5	21	11	2	6	0	45	11	160
HU2	1	14	7	3	10	8	2	2	2	0	1	8	2	1	3	1	19	7	91
HU3	2	15	19	5	10	13	0	5	4	0	2	18	6	4	8	1	34	15	161
HU4	0	4	8	1	4	4	0	1	1	0	1	4	2	1	2	0	10	2	45
HU5	1	9	26	3	4	14	0	2	7	1	1	12	6	3	4	0	43	13	149
HU6	0	5	6	2	2	3	1	2	2	0	1	2	2	2	1	0	10	3	44
HU7	0	14	12	0	3	4	0	1	1	0	1	4	4	1	1	0	19	5	70
HU8	0	8	17	4	10	6	1	7	4	0	1	3	1	0	1	0	15	5	83
HU9	0	12	12	4	5	8	1	10	2	0	0	4	2	1	3	0	20	7	90
HU13	3	8	13	2	6	9	0	3	4	1	2	9	5	1	4	0	28	9	107
Total	9	99	132	24	61	81	5	39	33	5	15	85	41	16	33	2	243	77	1000

APPENDIX 10

Number of Samples Required to Represent each Postcode (Sheffield)

Number of Samples Required to Represent each Industrial Sector (Sheffield)

Sheffield Sample Breakdown

NUMBER OF SAMPLES REQUIRED TO REPRESENT EACH POSTCODE (SHEFFIELD)

Postcode	Number of Businesses	Percentage of Total Businesses	Percentage of Sample	Number of Businesses to Sample
S1	1196	10.21	204.27	204
S2	663	5.66	113.24	113
S3	618	5.28	105.55	106
S4	496	4.24	84.71	85
S5	182	1.55	31.08	31
S6	1027	8.77	175.41	176
S7	423	3.61	72.25	72
S8	1168	9.97	199.49	200
S9	1424	12.16	243.21	243
S10	1853	15.82	316.48	316
S11	1200	10.25	204.95	205
S12	334	2.85	57.05	57
S13	289	2.47	49.36	49
S14	22	0.19	3.76	4
S15	815	6.96	139.20	139
Total	11710	100	2000	2000

NUMBER OF SAMPLES REQUIRED TO REPRESENT EACH INDUSTRIAL SECTOR (SHEFFIELD)

Industry	Number of Businesses	Percentage of Total Businesses	Percentage of Sample	Number of Businesses to Sample
Agriculture, forestry and fishing	50	0.43	8.54	9
Production/manufacturing	1133	9.67	193.48	194
Construction	1255	10.72	214.31	214
Motor trades	205	1.75	35.01	35
Wholesale	650	5.55	111.00	111
Retail	711	6.07	121.41	121
Amenity provision	66	0.56	11.27	11
Transport and storage	207	1.77	35.35	35
Accommodation and food services	267	2.28	45.59	46
Information and communication	89	0.76	15.20	15
Finance and insurance	197	1.68	33.64	34
Property	1195	10.20	204.06	204
Professional, scientific and technical	784	6.69	133.88	134
Education	206	1.76	35.18	35
Health	344	2.94	58.74	59
Public administration and defence	20	0.17	3.42	3
Business administration and support services	3184	27.19	543.72	544
Arts, entertainment, recreation and other services	1149	9.81	196.21	196
Total	11712	100	2000	2000

SHEFFIELD SME BREAKDOWN

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	Total
S1	1	15	15	2	7	20	1	4	7	2	4	20	21	5	8	1	44	26	204
S2	1	13	8	2	6	9	1	2	3	1	1	9	8	4	3	0	31	13	113
S3	0	16	8	3	7	4	1	2	4	1	1	9	10	2	3	0	26	9	106
S4	0	22	6	1	6	3	1	2	1	1	1	6	3	1	2	0	23	7	85
S5	0	2	5	0	1	4	1	1	1	0	0	2	2	1	2	0	6	3	31
S6	2	19	32	3	23	9	1	3	3	1	4	10	8	3	6	0	35	16	176
S7	0	4	5	1	3	5	0	1	2	1	2	6	7	2	3	0	22	8	72
S8	1	13	26	4	8	15	0	2	3	2	4	45	12	3	3	0	45	14	200
S9	1	47	16	7	25	12	4	6	5	1	5	13	10	3	4	1	68	16	243
S10	1	12	24	3	7	13	1	3	7	1	4	39	19	6	13	0	114	47	316
S11	1	9	18	3	8	13	0	4	5	1	3	30	18	3	6	0	67	15	205
S12	0	3	15	1	2	3	0	3	1	2	0	2	3	1	1	0	14	6	57
S13	0	7	10	1	3	4	0	1	1	1	1	2	3	0	1	0	10	5	49
S14	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4
S15	2	11	27	3	6	7	1	3	2	1	4	10	9	2	4	1	37	9	139
Total	9	194	214	35	111	121	11	35	46	15	34	204	134	35	59	3	544	196	2000

APPENDIX 11

QUESTIONNAIRE APPENDAGES

Online Questionnaire

Questionnaire Recruitment Letter

Final Questionnaire

Doing Business Underwater Survey - Survey powered by eSurveyPro.com - Windows Internet Explorer

http://www.esurveypro.com/survey.asp?id=74feb217-05d8-4085-a013-5c4d628a5a7a

Doing Business Underwater Survey - Survey powered by eSurveyPro.com

3. To what extent do you believe that your company is exposed to the risk of a disruption?

☐ No Opinion ☐ Not Exposed ☐ Slightly Exposed ☐ Moderately Exposed ☐ Extremely Exposed

4. To what extent do you believe that your company is adequately prepared to cope with the occurrence of a disruption?

☐ No Opinion ☐ Extremely Unprepared ☐ Slightly Prepared ☐ Moderately Prepared ☐ Extremely Prepared

5. To what extent do you agree with the following statements about business disruptions?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) I am concerned about the impacts a disruption could have upon my company	☐	☐	☐	☐	☐
b) We feel that the disruptions our company faces today have changed since it was established	☐	☐	☐	☐	☐
c) Being able to respond/manage a disruption effectively is vital to the success of my company's operations	☐	☐	☐	☐	☐
d) The company has effective 'back up' plans in place	☐	☐	☐	☐	☐
e) It is the occurrence of a disruption that stimulated the company to put 'back up' plans in place	☐	☐	☐	☐	☐

Done

Internet | Protected Mode On

Doing Business Underwater Survey - Survey powered by eSurveyPro.com

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2013



The
University
Of
Sheffield.



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To whomever it may concern,

My name is Rebecca Messham and I am a PhD student carrying out research through the University of Hull and the University of Sheffield. For my research I am conducting a study entitled "Doing business underwater: Flooding, entrepreneurship and resilience". The aim of this investigation is to identify the impacts of flooding upon Small and Medium Enterprises (SMEs), their associated responses to this disruption, and furthermore understand different perceptions of flooding from a business/company point of view.

Despite the suggested increasing threat of flooding within the UK, as of yet the affect of this hazard upon small and medium sized enterprises has not been investigated fully. A study of this nature will therefore help companies, such as yourself, in examining their own exposure to floods and assist in finding suitable flood protection measures which small and medium sized businesses can employ to reduce their risk to flooding in the future. Consequently I am writing to ask if you would be willing to help me in this venture by sparing 15 minutes of your time to complete the short survey attached. Even if your company has no experience of flooding, I would still be very interested in hearing your thoughts and opinions on this topic.

The results of this survey will be used purely for research purposes and presented at academic conferences. The results may also provide an input into the formulation of national policy. All information provided will be anonymised and kept completely confidential. However, should you feel uncomfortable answering any of the questions, please leave them blank. You can return your completed survey by placing it in the FREEPOST envelope enclosed. If you have any questions regarding the survey or my research in general please do not hesitate to contact me on the details provided above. In the meantime, thank you for your time and for your participation.

Yours Faithfully,

R. Messham

DOING BUSINESS UNDERWATER: SURVEY

SECTION ONE: BUSINESS DISRUPTION

NOTE: Within this survey a disruption refers to any internal or external event/occurrence that has interfered with the running of your business in a significant way.

1. Since your company was established, on how many occasions have the following disruptions impacted upon your company?

Loss of IT	_____
Loss of telecommunications	_____
Loss of electricity/gas	_____
Loss of water/sewage	_____
Loss of access to site	_____
Loss of staff/loss of staff productivity	_____
Fire	_____
Flood	_____
Extreme weather event (e.g. snow, high winds)	_____
Terrorist damage	_____
Criminal actions	_____
Industrial action/pressure group protest	_____
Transport disruption (e.g. road works, rail strikes, etc)	_____
Supply chain disruption	_____
Damage to corporate reputation	_____
Loss of competitive advantage	_____
Employee/customer health and safety/product incident	_____
Reduction in or change in customer demands	_____
Economic downturn (e.g. the recession, VAT increase, etc)	_____
Accessing finance (e.g. bank accounts, loans, etc)	_____

2. In your opinion what would you classify as the top 3 disruptions your business faces and why?

3. To what extent do you believe that your company is exposed to the risk of a disruption?

No Opinion	☐	Not Exposed	☐	Slightly Exposed	☐	Moderately Exposed	☐	Extremely Exposed	☐
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4. To what extent do you believe that your company is adequately prepared to cope with the occurrence of a disruption?

No Opinion	☐	Extremely Unprepared	☐	Slightly Prepared	☐	Moderately Prepared	☐	Extremely Prepared	☐
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5. To what extent do you agree with the follow statements about business disruptions?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) I am concerned about the impacts a disruption could have upon my company	☐	☐	☐	☐	☐
b) I feel that the disruptions my company faces today have changed since it was established	☐	☐	☐	☐	☐
c) Being able to respond/manage a disruption effectively is vital to the success of my company's operations	☐	☐	☐	☐	☐
d) The company has effective 'back-up' plans in place to cope with the occurrence of a disruption	☐	☐	☐	☐	☐
e) Experiencing a disruption stimulated the company to put 'back up' plans in place	☐	☐	☐	☐	☐
f) The company has worked with others, external to the business, in developing our disruption 'back-up' plans	☐	☐	☐	☐	☐
g) The company has developed disruption 'back-up' plans internally	☐	☐	☐	☐	☐
h) Since the business was started, changes have been made to the disruption 'back-up' plans in place	☐	☐	☐	☐	☐
i) Experiencing a disruption stimulated the company to make changes to the 'back up' plans in place	☐	☐	☐	☐	☐
j) Our suppliers/customers/partners require our company to have disruption 'back-up' plans in place to cope with the occurrence of a disruption	☐	☐	☐	☐	☐
k) If a disruption affected the company, our insurance would compensate us for the associated impacts	☐	☐	☐	☐	☐

SECTION TWO: PERCEPTIONS OF FLOODING

6. To what extent do you believe that the following are exposed to the risk of flooding?

	No Opinion	Not Exposed	Slightly Exposed	Moderately Exposed	Extremely Exposed
The United Kingdom	☐	☐	☐	☐	☐
Hull/Sheffield (delete as appropriate)	☐	☐	☐	☐	☐
Your Company	☐	☐	☐	☐	☐

7. To what extent do you agree with the following statements about flooding?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) Within the United Kingdom flooding causes more damage to society than any other natural hazard or extreme weather event	☐	☐	☐	☐	☐
b) Within the United Kingdom the risk of flooding in the future is likely to increase	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
c) People are more aware of the risk of flooding today than in the past	☐	☐	☐	☐	☐
d) Floods are more powerful/larger than 60 years ago	☐	☐	☐	☐	☐
e) The impacts/effects of floods upon society are more severe today than in the past	☐	☐	☐	☐	☐
f) The exposure of Hull/Sheffield to the risk of flooding has increased over time (delete as appropriate)	☐	☐	☐	☐	☐
g) The exposure of my company to the risk of flooding has increased since its establishment	☐	☐	☐	☐	☐
h) I do not have adequate knowledge to make judgements about the risk of flooding	☐	☐	☐	☐	☐

8. To what extent do you believe that the following factors affect your company's exposure to the risk of flooding?

	No Opinion	Not At All	Slightly	Moderately	A Great Deal
Predicted increase in the risk of flooding	☐	☐	☐	☐	☐
Your own view of the risk of flooding	☐	☐	☐	☐	☐
Geographical location	☐	☐	☐	☐	☐
Lack of financial capital	☐	☐	☐	☐	☐
Lack of resources	☐	☐	☐	☐	☐
Lack of knowledge about flooding	☐	☐	☐	☐	☐
Exposure of your supplier/customers to flooding	☐	☐	☐	☐	☐
Lack of your own flood protection measures	☐	☐	☐	☐	☐
Lack of government and local authority flood initiatives/protection measures (e.g. flood defences)	☐	☐	☐	☐	☐
Lack of access to hazardous and technological knowledge	☐	☐	☐	☐	☐
The characteristics of your business (e.g. size, annual turnover, industrial sector, etc)	☐	☐	☐	☐	☐
Owner/manager characteristics (e.g. age, gender, etc)	☐	☐	☐	☐	☐

9. To what extent are your views towards the risk of flooding based upon the following?

	No Opinion	Not At All	Slightly	Moderately	A Great Deal
Whether you have been flooded previously	☐	☐	☐	☐	☐
Whether you have seen other people flooded	☐	☐	☐	☐	☐
The media (e.g. news, films, documentaries)	☐	☐	☐	☐	☐
Geographical location	☐	☐	☐	☐	☐
History of flooding in the local area	☐	☐	☐	☐	☐
Information about flooding provided by experts (e.g. the Environment Agency)	☐	☐	☐	☐	☐
Presence of your own flood protection measures	☐	☐	☐	☐	☐
Presence of government and local authority flood initiatives/protection measures (e.g. flood defences)	☐	☐	☐	☐	☐
Characteristics of past floods (e.g. depth, duration)	☐	☐	☐	☐	☐

3

	No Opinion	Not At All	Slightly	Moderately	A Great Deal
Emotional response to the hazard (e.g. fear)	☐	☐	☐	☐	☐
Other (please specify) _____	☐	☐	☐	☐	☐

SECTION THREE: FLOODING EXPERIENCE

NOTE: Within this survey directly flooded refers to whether your company premises has been in direct contact with flood water.

10. Has your business ever been directly flooded?

Yes ☐

No (please go to question 19) ☐

11. Has your business been directly flooded on more than one occasion?

Yes ☐

No ☐

12. How severe would you classify the disruption/damage caused to your company by flooding?

No Disruption	☐	Slight Disruption	☐	Moderate Disruption	☐	Severe Disruption	☐
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13. To what extent has your company been affected by the following impacts after a flood event?

	No Opinion	Completely Unaffected	Slightly Affected	Moderately Affected	Severely Affected
Damage to company premises/buildings	☐	☐	☐	☐	☐
Damage to/loss of company contents	☐	☐	☐	☐	☐
Loss of utilities (e.g. gas, water, electricity, etc)	☐	☐	☐	☐	☐
Disrupted cash flow and lost income	☐	☐	☐	☐	☐
Staff unable to work/get to work	☐	☐	☐	☐	☐
Unable to conduct business for a period of time	☐	☐	☐	☐	☐
Disruption to supply chain	☐	☐	☐	☐	☐
Unable to supply customers	☐	☐	☐	☐	☐
Heightened flood awareness	☐	☐	☐	☐	☐
Other (please specify) _____	☐	☐	☐	☐	☐

14. What is the total amount of money you have spent recovering from a flood event (estimated amount, including insurance claim, to the nearest thousand)?
£ _____

15. Were you insured for the damage caused by the flooding?

Yes ☐

No ☐

16. How much of the total cost was covered by your insurance (estimate to the nearest thousand)?
£ _____

17. To what extent do you agree with the following statements about your flooding experience?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) The time of day the flood occurred impacted upon the damage and disruption caused to my business	☐	☐	☐	☐	☐
b) I was given warning prior to the flood occurring	☐	☐	☐	☐	☐
c) I was given advice prior to the flood occurring	☐	☐	☐	☐	☐
d) I was given assistance during the flood event (e.g. by the local authority, charity, etc)	☐	☐	☐	☐	☐
e) I did not know where to seek advice or assistance from during the flood event	☐	☐	☐	☐	☐
f) I had to cope on my own during the flood event	☐	☐	☐	☐	☐
g) I was given assistance after the flood event (e.g. by the local authority, charity, etc)	☐	☐	☐	☐	☐
h) I did not know where to seek advice or assistance from after the flood event	☐	☐	☐	☐	☐
i) I received a financial grant to help with the recovery costs after the flood event	☐	☐	☐	☐	☐
j) I was unaware that I could apply for a grant to cover the cost of recovery	☐	☐	☐	☐	☐
k) I claimed for the damages/disruption caused by the flood on my insurance	☐	☐	☐	☐	☐
l) My dealings with the loss adjusters and insurance brokers went "smoothly"	☐	☐	☐	☐	☐

18. Did anything positive materialise from your experience with the floods?

SECTION FOUR: FLOODING PROTECTION

NOTE: Within this survey flood protection measures relates to any measure in place that either protects, reduces the impacts, or helps people to cope with the occurrence of a flood.

19. To what extent do you agree with the following statements about flood protection?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) Floods are far too unpredictable to bother preparing for	☐	☐	☐	☐	☐
b) Floods are far too destructive to bother preparing for	☐	☐	☐	☐	☐
c) As a society we need to prepare as much as possible for the occurrence of a flood	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
d) As a business we need to prepare as much as possible for the occurrence of a flood	☐	☐	☐	☐	☐
e) It costs proportionally more to prepare for the occurrence of a flood than it did in the past	☐	☐	☐	☐	☐
f) There are more flood protection measures available today than in the past	☐	☐	☐	☐	☐
g) The flood protection measures available today are more effective than those available in the past	☐	☐	☐	☐	☐

20. To what extent do you believe that your company is adequately prepared to cope with the occurrence of a flood?

No Opinion	☐	Extremely Unprepared	☐	Slightly Prepared	☐	Moderately Prepared	☐	Extremely Prepared	☐
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21. Does your company have any measures in place that will help you prepare or cope with the occurrence of a flood?

Yes	☐
No	☐

22. If yes, please outline some of the protection measures your company has in place to prepare or cope with the occurrence of a flood:

23. To what extent do you believe that the following factors affect whether your company implements flood protection measures?

	No Opinion	Not At All	Slightly	Moderately	A Great Deal
Whether you have been flooded previously	☐	☐	☐	☐	☐
Whether you have seen other people flooded	☐	☐	☐	☐	☐
Your personal view of whether your company is at risk	☐	☐	☐	☐	☐
Having more important things to think about	☐	☐	☐	☐	☐
Cost of protection measures	☐	☐	☐	☐	☐
Company is not large enough to afford such measures	☐	☐	☐	☐	☐
Lack of resources available to prepare	☐	☐	☐	☐	☐
Lack of skills available to prepare	☐	☐	☐	☐	☐
Lack of knowledge about protection measures	☐	☐	☐	☐	☐
Type of insurance cover you have in place	☐	☐	☐	☐	☐
Whether you own or rent your premises	☐	☐	☐	☐	☐
Lack of assistance from local authority	☐	☐	☐	☐	☐
Presence of government and local authority flood initiatives/protection measures (e.g. flood defences)	☐	☐	☐	☐	☐

24. To what extent do you agree with the following statements about flood protection?

	Strongly Disagree	Disagree	No Opinion	Agree	Strongly Agree
a) We are concerned about the impacts a flood could have upon our company	☐	☐	☐	☐	☐
b) Flood protection measures can significantly reduce the disruption, impacts and costs associated with a flood	☐	☐	☐	☐	☐
c) We have worked with others, external to the company, in developing our flood protection measures	☐	☐	☐	☐	☐
d) We have developed our flood protection measures ourselves	☐	☐	☐	☐	☐
e) Since our business was started, we have increased the number of flood protection measures we utilise	☐	☐	☐	☐	☐
f) Since our business was started, our ability to cope with the occurrence of a flood has improved	☐	☐	☐	☐	☐
g) We require our suppliers to have flood protection measures in place	☐	☐	☐	☐	☐
h) Our customers/suppliers/partners require us to have flood protection measures in place	☐	☐	☐	☐	☐

25. Do you have any other comments to make regarding flooding and your company?

SECTION FIVE: PERSONAL AND COMPANY INFORMATION

NOTE: If you feel uncomfortable answering any of the following questions, please feel free to leave them blank.

What is your position within the company?

Owner	☐
Manager	☐
Partner	☐
Director	☐
Other (please specify) _____	☐

What is your gender?

Male	☐
Female	☐

What is your age? _____ years

How would you classify your ethnicity? (tick only one)

White	☐
Black	☐
Asian	☐
Other (please specify) _____	☐

What is your highest educational qualification? (tick only one)

None	☐
O-levels/GCSEs	☐
A-level	☐
Diploma/NVQ	☐
Degree (e.g. BSc, BA)	☐
Other (please specify) _____	☐

In what year was your company established? _____

What is the postcode of your company? _____

How many full time employees are there in your company? _____

What is your company's annual turnover? (to the nearest thousand) £ _____

In which industrial sector does your company operate? _____

FURTHER PARTICIPATION

	Yes	No
Would you like to receive the results of this study?	☐	☐
Would you be interested in participating in a follow-up interview to this survey?	☐	☐

If you ticked **yes** to either of the above questions, please provide the following information:

Name:-

Company Name:-

Email Address:-

THANK YOU VERY MUCH FOR YOUR PARTICIPATION

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APPENDIX 12

Percentage of Questionnaire Responses in each Postcode

Percentage of Questionnaire Responses in each Industrial Sector

SME Business Characteristics

SME Employee Characteristics

PERCENTAGE OF QUESTIONNAIRE RESPONSES IN EACH POSTCODE

HULL

SHEFFIELD

Postcode	Number of Responses	Valid Percent	Postcode	Number of Responses	Valid Percent
HU1	8	10.5	S1	23	13.5
HU2	10	13.2	S2	8	4.7
HU3	13	17.1	S3	24	14
HU4	1	1.3	S4	8	4.7
HU5	12	15.8	S5	1	0.6
HU6	5	6.6	S6	13	7.6
HU7	7	9.2	S7	4	2.3
HU8	2	2.6	S8	14	8.2
HU9	11	14.5	S9	26	15.2
HU11	1	1.3	S10	9	5.3
HU13	6	7.9	S11	21	12.3
Total	76	100	S12	7	4.0
			S13	6	3.6
			S14	0	0
			S35	7	4.0
			Total	171	100

PERCENTAGE OF QUESTIONNAIRE RESPONSES IN EACH INDUSTRIAL SECTOR

Industry	Number of Responses	Valid Percent
Agriculture, forestry and fishing	0	0
Production/manufacturing	34	14.3
Construction	28	11.8
Motor trades	13	1.3
Wholesale	11	4.6
Retail	15	6.3
Amenity provision	6	2.5
Transport and storage	7	3
Accommodation and food services	10	4.2
Information and communication	11	4.6
Finance and insurance	16	6.8
Property	13	5.5
Professional, scientific and technical	21	8.9
Education	17	7.2
Health	7	3.0
Public administration and defence	14	5.9
Business administration and support services	5	2.1
Arts, entertainment, recreation and other services	14	5.9
Charity	5	2.1
Total	247	100

SME BUSINESS CHARACTERISTICS

Size of Business	Turnover	Number of Responses	Valid Percent
Micro	Less than €2 Million	122	70.5
Macro	€2 Million to €10 Million	38	22
Medium	€10 Million to €50 Million	13	7.5
	Total	173	100

Size of Business	Number of Employees	Number of Responses	Valid Percent
Micro	Less than 10	147	59.7
Macro	10 to 50	71	28.9
Medium	50 to 250	28	11.4
	Total	246	100

Year of Establishment	Number of Responses	Valid Percent
1850 - 1900	10	4.0
1901 - 1950	14	5.7
1951 - 1960	2	0.8
1961 - 1970	8	3.2
1971 - 1980	18	7.3
1981 - 1990	47	19.0
1991 - 2000	70	28.3
2001 - 2010	78	31.6
Total	247	100

SME EMPLOYEE CHARACTERISTICS

Position in Company	Number of Responses	Valid Percent
Director	74	29.8
Manager	46	18.5
Owner	94	37.9
Partner	7	2.9
Other	27	10.9
Total	248	100

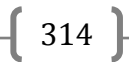
Gender	Number of Responses	Valid Percent
Male	198	79.2
Female	52	20.8
Total	250	100

Age	Number of Responses	Valid Percent
21 - 30	16	6.9
31 - 40	37	15.9
41 - 50	65	27.9
51 - 60	85	36.5
61 +	30	12.8
Total	233	100

Ethnicity	Number of Responses	Valid Percent
White	238	97.6
Black	2	0.8
Asian	3	1.2
Other	1	0.4
Total	244	100

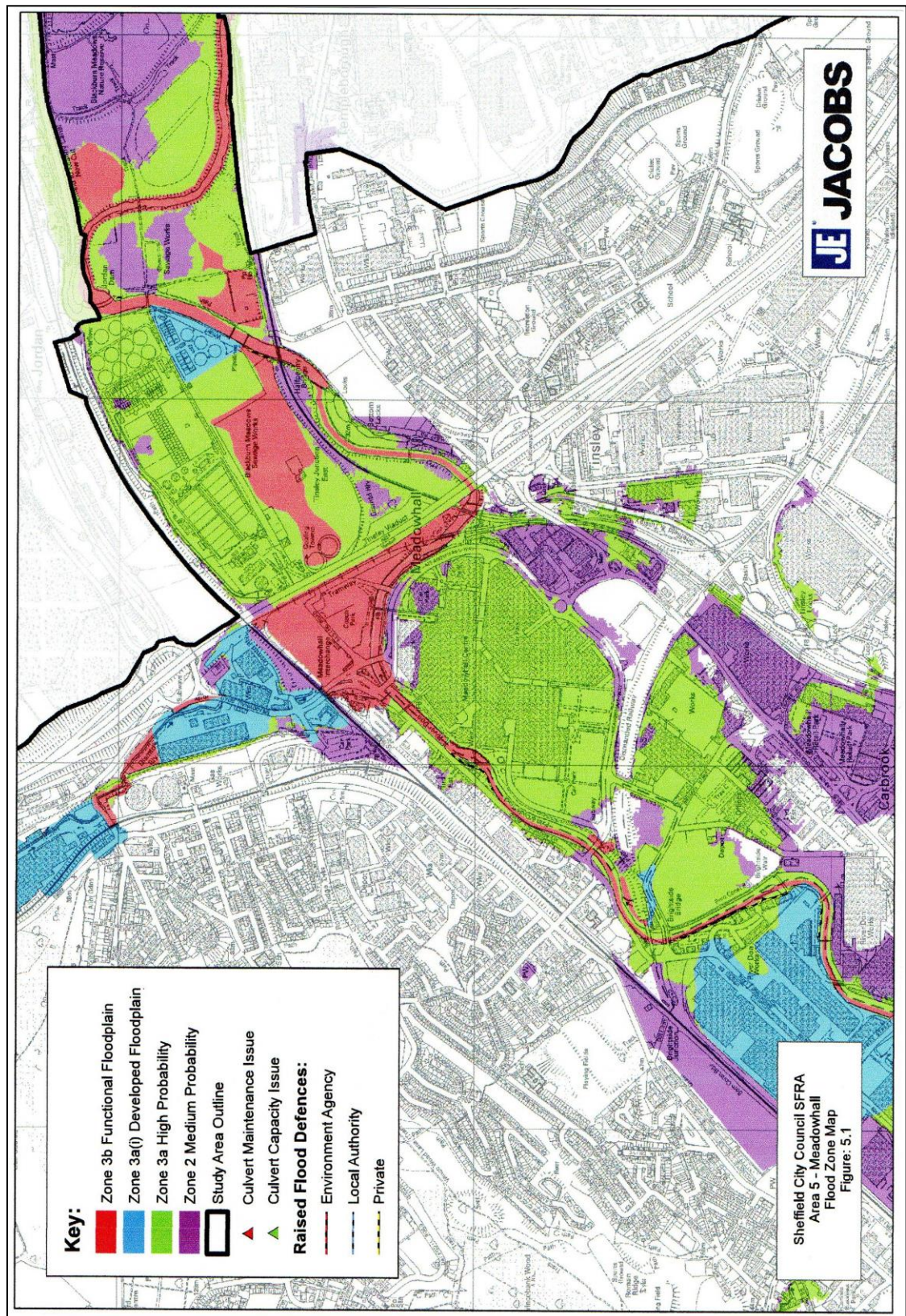
APPENDIX 13

Flood Risk Map of Hull (2007)



APPENDIX 14

Flood Risk Map of Sheffield (High risk level) Brightside - 2010



APPENDIX 15

Flood Risk Map of Sheffield (Low risk level) Malinbridge (2010)

