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# **Small businesses and flood impacts: The case of the 2009 flood event in Cockermouth**

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## **Abstract**

Flooding can have a devastating impact on businesses; especially on Small and Medium-sized Enterprises (SMEs) who may be unprepared and vulnerable to the range of both direct and indirect impacts. SMEs may tend to focus on the direct tangible impacts of flooding, limiting their ability to realise the true costs of flooding. Greater understanding of the impacts of flooding is likely to contribute towards increased uptake of flood protection measures by SMEs, particularly during post flood property reinstatement. This study sought to investigate the full range of impacts experienced by SMEs located in Cockermouth following the floods of 2009. The findings of a questionnaire survey of SMEs revealed that businesses not directly affected by the flooding experienced a range of impacts and that short term impacts were given a higher significance. A strong correlation was observed between direct, physical flood impacts and post-flood costs of insurance. Significant increases in the costs of property insurance and excesses were noted, meaning that SMEs will be exposed to increased losses in the event of a future flood event. The findings from the research will enable policy makers and professional bodies to make informed decisions to improve the status of advice given to SMEs. The study also adds weight to the case for SMEs to consider investing in property level flood risk adaptation measures, especially during the post flood reinstatement process.

**Keywords:** Adaptation, Business continuity, Climate change, Flooding, Resilience, SMEs, Vulnerability

## 1 Introduction

The UK has been affected by a number of major flood events during the recent past, including those in 2005 and 2007 that affected many parts of the UK and the Cumbrian floods of 2009. According to the Environment Agency, about 5.2million properties; amounting to one in six, in England remains at risk of flooding (Environment Agency, 2009a). Of these, 2.8million are at risk of surface water flooding, and 2.4million are at risk of river and coastal flooding. Annual damages to residential and non-residential properties at risk of river and coastal flooding alone is considered to be more than £1 billion (Environment Agency, 2009a). The extent of the risk is further emphasized by the fact that the National Risk Register for the UK has acknowledged the relatively high likelihood and impact of coastal and inland flooding (Cabinet Office, 2010). From a business perspective, the impacts of flooding can be devastating, especially in the case of Small and Medium-sized Enterprises (SMEs); which are said to be highly vulnerable to flooding and other natural hazards due to their inherent characteristics (Crichton, 2006; Ingirige *et al.*, 2008). In identifying the importance of the issue, the Pitt review, highlighted the need for businesses to assess the risk of flooding and the potential impact on their trade (Pitt, 2008).

Several recent studies have looked at the effects of flooding on SMEs in the UK; e.g. Crichton (2006), EKOS Consulting (UK) Ltd (2008), Woodman (2008), Ingirige and Wedawatta (2011). Although some studies have looked at the effects of flooding on businesses, the extent and the significance of these effects on businesses, and the relationships between the effects remain largely unknown. Further, how the immediate effects have contributed to secondary impacts that cascade down into areas such as cost of insurance remains less certain. When taken as a whole the overall economic damage caused by a flood due to direct and indirect impacts can run into several billions of pounds. For SMEs the financial losses can result in total devastation, not only of their businesses but also the immediate communities and small townships that are dependent upon them. The aim of this research was to investigate the direct and indirect impact of flooding on SMEs with a view to developing a deeper understanding of these effects on businesses generally and specifically for SMEs. Accordingly, the research sought to answer the research questions of: 1. What are the impacts of flooding on SMEs? 2. How are these

effects related to each other? 3. How do these effects cascade down to secondary impacts on these businesses? 4. What lessons can be learned from these impacts by the SME community? The scope of the study concerns SMEs in Cockermouth in Cumbria, UK; many of which were severely affected by the flooding in November 2009.

## **2 Impacts of flooding on businesses**

Businesses can be affected by weather extremes and natural hazards in numerous ways. These have been classified by Metcalf et al (2010) under six broad categories based on the business areas on which they have an effect, namely; markets, logistics, premises, people, processes, and finances. Risks arising from weather extremes to a business have been broadly categorised as reputational, environmental, operational, financial, health and safety, and strategic risks (Metcalf *et al.*, 2010), emphasising the broad range of risks associated with weather extremes. Similarly, flooding can also lead to such impacts and risks to a business organisation.

Whilst some of the impacts of flooding; for example property damage, spoilt stocks, temporary business closure, and travel difficulties, are clearly noticeable, some of the impacts may not be so. For an example, loss of paperwork due to flooding may have an impact on the recovery process later, as this may lead to delays in completing insurance claims, tracing orders, filing tax returns, etc (Pitt, 2008). As Whittle et al (2010) noted, flooding may cause indirect impacts; termed as “secondary flooding”, and such hidden damages of flooding sometimes may go unnoticed or may not be covered by insurance policies. Further, in addition to disrupting day-to-day business activities, flooding may create physical and psychological health effects including injuries and stress (Tapsell *et al.*, 2002; Few *et al.*, 2004; Penning-Rowsell *et al.*, 2005) to business owners, employees and customers. In the UK, employers are responsible for the health and safety of employees at work (HSE, 2008). Therefore, business owners may be responsible for any health impacts experienced by their employees due to the business being flooded.

Damaged or lost stock, damage to buildings / premises, damaged or lost building equipment, inability to conduct business, and inconvenience to staff were the main short term impacts

experienced by small businesses in Yorkshire affected by the summer floods of 2007 (EKOS Consulting (UK) Ltd, 2008). Long term impacts included disrupted cash flow and loss of income, psychological effects such as increased staff anxiety due to the effects of flooding, and higher insurance premiums. Table 1 presents a summary of the effects reported in five of the studies that examined the effects of flooding on businesses. However, it has to be noted that some of the effects reported in the studies have been adjusted to fit within a common framework, as the terminology used in the studies were often inconsistent. As the table highlights, the effects ranged from direct effects such as premises being flooded, damage to premises/stocks and equipment to indirect effects such as those due to suppliers being affected by flooding and increases in insurance premiums.

Over and above the short term impacts, flooding presents other challenges to the victims, including that of recovery. Whittle et al (2010) discussed how flood recovery involves new and psychologically demanding work for residents, as the residents often tend to oversee the repair and reinstatement works themselves. This could be particularly challenging for SME owners who work from home and owners who are local residents. That is, some SME owners are likely to be local residents, and thus are affected both as a business owner and a local resident (Runyan, 2006; Tierney, 2007). The psychological stress associated with confronting unfamiliar work; e.g. flood damage, repair and reinstatement procedures, insurance claims, etc, can be substantial. Such psychological effects of flooding can often be more pronounced than the physical health effects (Tapsell et al, 2002).

In addition to floods causing damages to businesses, this in turn is likely to have an effect on the wider communities and local economies. As Tierney (2007) discussed, impacts of disasters like flooding on businesses gives rise not only to direct business losses, but also indirect losses and economic ripple effects. Damage to business premises and resultant temporary and permanent business closures may result in loss of jobs, negatively affecting incomes and further hindering recovery efforts of local communities (Tierney, 2007). Such wider economic and social impacts are not normally accounted for in monetary terms; as opposed to direct physical damages, in relation to flooding and other natural disasters.

Molinary and Handmer (2011) while differentiating between direct and indirect, tangible and intangible, and potential and actual damages of flooding noted that the evaluation of flood impacts tend to be limited to quantification of just direct tangible impacts. However, it has to be noted that such criticism is not limited to flooding alone, but seems to be common across other natural hazards. For example, Ciavola et al (2011) conducting a desktop study concluded that end-users tend to evaluate only the direct costs after storms. From a business perspective, Wedawatta et al (2011) have demonstrated how construction SMEs tend to underestimate the indirect impacts of weather extremes, such as those related to their supply chains.

Identification of the whole range of impacts of flooding on a business is important, as this could have a direct effect on the realisation of the true costs of flooding. Consequently, costs may be underestimated, negatively affecting any cost/benefit evaluation of flood protection measures, and thus limiting the uptake of such measures. For instance, Joseph et al (2011) emphasised that one of the reasons for the very low level of uptake of resilient reinstatement by property owners at risk of flooding was the lack of understanding of the costs and benefits of adopting such measures. It was concluded that more needs to be done in order to encourage the uptake of resilient reinstatement by individual property owners (Joseph *et al.*, 2011). Further, whilst the studies covered in Table 1 have looked at the occurrence of the effects, only the study on businesses affected by flooding in Yorkshire (EKOS Consulting (UK) Ltd, 2008) provides an indication of the extent of the effects or the impact they have had on the business. That is, there seems to be a gap in the existing knowledge as to the extent of the effects and their significance to flood affected businesses. Enhancing the knowledge base on potential impacts of flooding on SMEs is likely to enable them to recognise the benefits of flood protection; in other words, the benefits of avoiding such impacts. This in turn could contribute towards an increase in the uptake of flood protection measures, specifically during the reinstatement process. This study will therefore help contribute towards this broad agenda, by documenting the nature and impacts of flooding on SMEs, using the Cockermouth flood event of 2009 as a case study.

**Table 1 – Impacts of flooding on businesses (percentage of businesses experiencing each impact)**

Impacts	Woodman (2008) <sup>1</sup>	EKOS consulting (UK) Ltd (2008)		Norrington & Underwood (2008) <sup>2</sup>	Ingirige and Wedawatta (2011) <sup>3</sup>	BMG Research (2011) <sup>4</sup>
		Small businesses <sup>5</sup>	Medium/ large <sup>6</sup>			
Premises flooded	38%	80% - 100%	80% - 100%			5%
Damages to premises (structural or otherwise)		80% - 100%	80% - 100%	38%	32%	3%
Damaged or lost stock		80% - 100%	80% - 100%		16%	
Damaged or lost business equipment		60% - 80%	80% - 100%			
Moved to temporary business premises						1%
Loss of trade, production		60% - 80%	100%		46%	10%
Loss of income, reduced profit		80% - 100%	100%	13%	32%	
Supplies to the business delayed (due to travel difficulties)		60% - 80%	80% - 100%			24%
Suppliers affected by problems other than travel	27%					7%
Deliveries to customers delayed (due to travel difficulties)		60% - 80%	60% - 80%			14%
Travel difficulties to customers to access the business				22%	19%	27%
Customers affected by problems other than travel difficulties						8%
Staff unavailable for work	53%				49%	
Travel difficulties for staff						25%
Forced reduction of number of employees		60% - 80%	80% - 100%			
Other problems for staff, including anxiety		60% - 80%	80% - 100%		19%	15%
Decided to move premises		60% - 80%	80% - 100%			
Loss of power, telecommunications	18%					11%
Loss of water supplies	11%					
Increase in costs					16%	
Increase in insurance premiums		60% - 80%	80% - 100%			
Increase in trade/demand for services, positive impact	24%			8%		
Other adverse impacts						6%

<sup>1</sup> n=255 flood affected businesses in the UK

<sup>2</sup> n = 101 rain/flood affected SMEs in South East England

<sup>3</sup> n= rain/flood affected SMEs in Greater London

<sup>4</sup> n= 1731 businesses (not only flood affected) in Cumbria

<sup>5</sup> n=293 flood affected small businesses in Yorkshire

<sup>6</sup> n = 25 flood affected medium/large businesses in Yorkshire



### **3 Research method**

#### **3.1 Study area**

In order for these questions to be answered, it was necessary to identify a suitable flood event from the recent past. For this purpose, the November flood event of 2009 in Cockermouth was selected. Data were collected from businesses located in the Cockermouth area through a questionnaire survey, involving both flood affected and not affected businesses, with the intention of addressing the broad objectives of the research. Cockermouth is a small market town located within the Borough of Allerdale in North West England.

Cockermouth was affected by severe flooding in November 2009. About 700 residential properties and 225 businesses were directly affected (Cumbria County Council, 2010; Tickner, 2011), whereas many others were indirectly affected. The Cumbria Intelligence Observatory (2010) stated that 80% of businesses in Cockermouth were affected by flooding. Cockermouth was the worst affected area in Cumbria, where flood depths in excess of 1.5m were reported (Environment Agency, 2009c). The event was estimated at between a 1 in 600 and 1 in 700 year event; i.e. 0.17% - 0.14% annual probability event (JBA Consulting, 2011). Although Cockermouth has been flooded previously; for instance, in December 2003 and January 2005, the scale and impact of the flooding in 2009 was seen as unprecedented. The study of the 2009 flood event in Cockermouth would provide a useful case study of how major flood events affect SMEs in a rural market town and their subsequent experiences of the repair and recovery process. Further, risk of flooding in Cockermouth is expected to increase in the future, placing more properties at risk. For example, approximately 174 properties are estimated to be at risk in a 1% annual probability event, and it is predicted that this could increase to around 364 (Environment Agency, 2009b).

#### **3.2 Data collection and analysis**

The questionnaire survey technique was employed to collect data from businesses. In line with one of the major characteristics of questionnaire survey research, this allowed the collection of information from a relatively sizeable number of respondents (Creswell, 2003; Easterby-Smith

*et al.*, 2008), in order to sufficiently investigate the research questions identified. Questions asked were mainly of the “what” type, with the objective of gathering information from a sizeable sample. Therefore, the questionnaire survey method was deemed appropriate (Yin, 2003). As Curran and Blackburn (2001) noted, a structured approach combined with some unstructured questions is often used in small business research. A similar approach was adopted in the study.

The questionnaire survey template was developed drawing from existing studies on the issues being investigated, including previous work of the authors (Ingirige and Wedawatta, 2011; Wedawatta *et al.*, 2011; Wedawatta and Ingirige, 2012). Comments on the questionnaire survey template were first obtained from experts including academics and personnel who had worked with SMEs following the 2009 flood event. The survey template was then piloted with five flood affected SMEs. Feedback obtained in these exercises was used to refine the survey template. The questionnaire survey covered a range of issues on business impacts of flooding on SMEs, in relation to the 2009 flood event. These included whether the 2009 flood event was the first experience or whether there were earlier experiences of flooding, Types of impacts ranging from direct, indirect to latent impacts due to flooding, significance / extent of the impacts, and how flooding affected the cost of insurance. It was also possible to obtain the data on impacts on SMEs based on the type of business, size and whether they were occupying rented, freehold, leasehold premises or whether adopting working from home arrangements.

The survey was conducted in association with the Allerdale Borough Council as a combination of web-based and postal survey, allowing the respondents to select their preferable response method. Survey respondents were mostly the senior management of the businesses, including managing directors, owners, sole proprietors, partners, and directors, who are responsible for decision making in their businesses. In total, 190 questionnaires were distributed. From this sample, 48 completed questionnaires were received, amounting to a response rate of 25%. The response rate can be considered satisfactory, given the similar levels of response rates reported in previous studies on flooding/extreme weather and businesses. For instance EKOS Consulting (UK) Ltd have reported a response rate of 33% in a postal survey of flood affected businesses

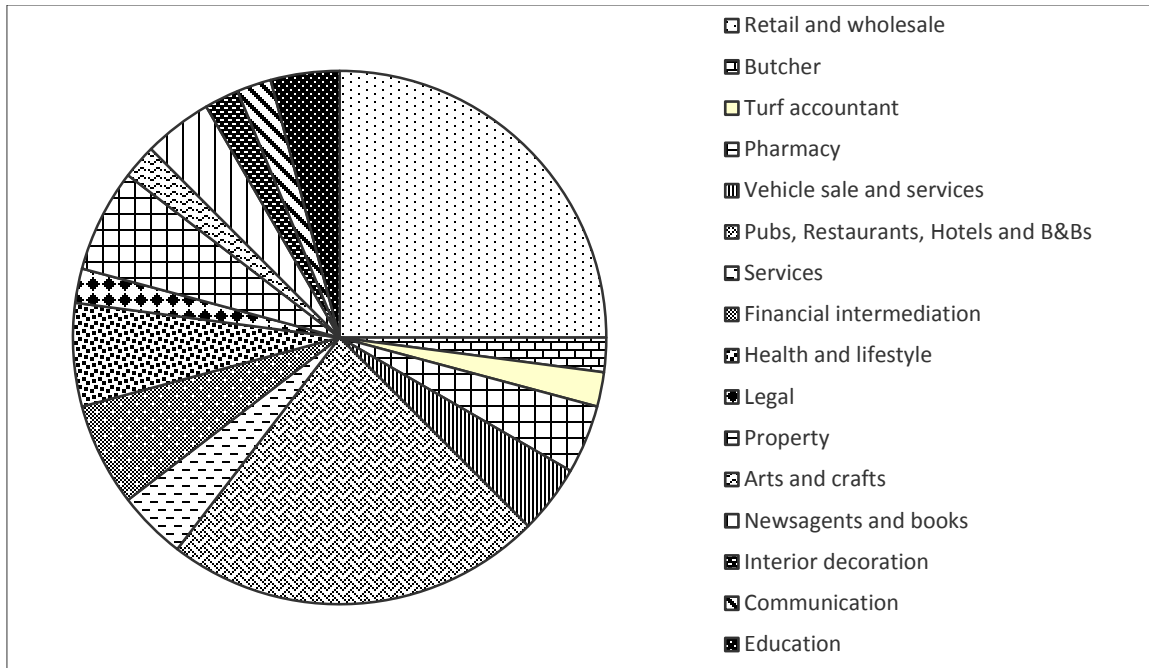
(2008), whereas a response rate of 21% was achieved in a study of a similar nature conducted by Heliview Research (2008).

## **4 Findings**

### **4.1 Demographics of the respondent businesses**

A range of industry sectors were represented in the survey, dominated by retail and wholesale (25%) and pubs, restaurants and hotels (23%) (The full classification appears in Figure 1). A significant majority of the businesses were micro (0-9 employees) businesses (75%), whilst 21% were small (10 – 49 employees) and 4% were medium (50 – 249 employees). The dominance of micro sized businesses within the sample can be attributed to the size distribution of businesses in the area. According to the Office of National Statistics (2011) data, 85% of the VAT/PAYE registered private businesses in Allerdale area (within which Cockermouth town centre is located) are micro businesses, whereas 13% are small and 2% are medium sized. Therefore, the sample can be considered as largely representative of businesses in Cockermouth town centre, in terms of their size. 33% of businesses owned their business premises, 35% were in leased business premises, and 23% were in rented premises, whilst 6% worked from home.

75% of businesses surveyed were flooded in the 2009 November flood event. Therefore, via the survey, they were able to recount first hand their experience of facing the effects of flooding. 17% of the sample said that they experienced indirect flood impacts such as impacts on their sales and turnover, supply chain, customers etc, although their premises were not physically flooded. 92% (n=44) of the sample who experienced flood impacts (direct or indirect) were used for further analysis.



**Figure 1 – Types of the businesses represented in the survey**

## 4.2 Impacts of flooding

Information on the impact of flooding on businesses and the extent of these was gathered using a five-point Likert scale ranging from “very much affected” to “not affected at all”. A weighting was allocated to each extent; where “very much affected” = 4, “much affected” = 3, “somewhat affected” = 2, “affected a little” = 1, “not affected at all” = 0. The relative importance index method was used to rank the responses obtained from the Likert scale questions. Relative importance index (RII) is a method used to evaluate the comparative importance of a single item to others (Yang and Wei, 2010), and has been used successfully to rank factors according to their relative importance. For an example of this see Kometa et al (1994), Akintoye et al (1998), and Yang and Wei (2010).

Accordingly, RII is calculated as;

$$RII = \frac{\sum w}{A \times N}$$

Where, “w” is the weighting given to each impact by the respondents (in this instance ranging from 1 to 4), “A” is the highest weighting (4 in this research), and “N” being the number of respondents.

RII values for effects and the consequent ranking of factors are shown in **Error! Reference source not found.** Accordingly, “travel difficulties for customers” was the top ranked impact, closely followed by additional costs and stocks / products being damaged or spoiled.

**Table 2 – Ranking of impacts according to RII values**

Impact	Nr of responses with the highest weight	Nr of responses with no impact	Mean impact weight	RII	Rank <sup>7</sup> (Based on RII)
Travel difficulties for customers	28	1	3.16	0.79	1
Additional costs	28	2	3.14	0.78	2
Stocks / products damaged / spoiled	29	7	3.07	0.77	3
Decrease in sales / production	27	1	3.05	0.76	4
Loss of trading for some time	29	3	3.00	0.75	5
Premises flooded	29	8	2.98	0.74	6
Suppliers / customers affected by flooding	22	2	2.98	0.74	7
Loss of electricity, other services	26	3	2.89	0.72	8
Loss of access to business premises	23	6	2.70	0.68	9
Increased property insurance premium	26	10	2.68	0.67	10
Increased property insurance excess	23	9	2.64	0.66	11
Travel difficulties for employees	20	7	2.57	0.64	12
Loss of business records	20	16	2.27	0.57	13
Damages to IT and other equipment	21	16	2.23	0.56	14
Delay in receiving supplies from suppliers	14	7	2.09	0.52	15
Delay in providing supplies to customers	12	5	2.02	0.51	16
Structural damage to premises	11	13	1.73	0.43	17
Had to move to a temporary premises	13	21	1.32	0.33	18

Travel difficulties for customers was ranked top as the impact experienced by the businesses surveyed. Although Cockermouth town centre had limited access during the immediate

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<sup>7</sup> - Equal RII values ranked according to the number of responses with the highest weight

aftermath of the flood event; due to access roads being flooded, bridges being damaged etc, travel difficulties due to flooding often tend to be short term. Businesses have however, attached more significance to this over and above the medium and long term effects such as loss of trading and increases in the costs of insurance. The presence of businesses within the sample who experienced only indirect impacts of flooding; whose premises were not flooded but business was affected indirectly, may have contributed to this. It could also be due to many of the businesses in Cockermouth town centre being heavily dependent on trade with visitors to an area where tourism is significantly important. As Peck et al (2010) note, tourism in the Cumbrian region was significantly affected during the immediate aftermath of the flooding. This was because prospective visitors were deterred from visiting the region due to the impression that the region was inaccessible (Peck *et al.*, 2010). Further, this also seems to provide evidence to the claims made by Ciavola et al (2011) and Molinary and Handmer (2011), that the businesses tend to recognise customer access as significant during the immediate aftermath of a flood event.

Although commonly experienced, delays in providing supplies to customers and delays in receiving supplies have not had a significant impact on businesses, possibly due to these delays being short term as well as customers being aware of the difficulties faced by the flood affected businesses. The importance of indirect effects of flooding is affirmed by the relatively high percentage of incidences of effects such as travel difficulties for customers, suppliers/customers affected by flooding, and loss of services. Further, it can be seen that flooding has resulted in loss of trading, decrease in sales, and additional costs even for the businesses whose premises were not flooded. Travel difficulties for customers; ranked as the highest impact, could have had a knock-on effect on loss of trading and decrease in sales.

Although premises were flooded, this has not always resulted in structural damage to premises, loss of business records, or damage to IT and other equipments (listed as number 17, 14, and 13 respectively in the rank order). However, premises being flooded have always resulted in stock or products being damaged or spoiled. This could be due to the size and nature of most of the businesses, which are largely micro and small and rely on over-the-counter sales. Such

businesses are likely to store stock on the premises, but less IT, other equipment and business records, making it easier for them to move and salvage the latter; but making it harder to salvage the former.

#### **4.3 Inter-impact relationships**

Knowledge on relationships between flood impacts may be useful for policy makers and business support organisations alike, in providing flood related guidance for businesses. The Confederation of British Industry (CBI) for instance which lobbies the Government policymaking machinery to sustain business opportunities will find this knowledge beneficial when making informed judgments in the future. Further, such analysis may provide valuable information for businesses, as to what impacts are likely to arise in combination (of effects) rather than in isolation and what impacts may trigger others, and thus make future flood plans accordingly.

Likert scale responses for the effects of flooding were thus subjected to correlation analysis, with the intention of developing a correlation matrix identifying possible relationships that may exist between them. Soetanto and Proverbs (2004) used correlation matrix to investigate the relationships between building surveyors' levels of experience and their perceived levels of importance towards flood characteristics. In this research, Spearman's rank order correlation was used to arrive at the correlation matrix, as the data used were ordinal. Similarly, Gothmann and Reusswig (2006) have used Spearman's correlation to construct a correlation matrix for the factors affecting flood protective responses of residents at risk of flooding.

Table 3 shows the Spearman's rank correlation values for the flood impacts experienced by the businesses. Significant correlations can be seen among a range of combinations. Although some of these are obvious; e.g. premises being flooded having a strong relationship with structural damage and stocks / products being damaged, some of the correlations warrant contemplation. Out of the possible 153 correlations, 102 reported strong positive correlations, suggesting that impacts are very much related to one another and that a flood affected business is likely to experience a range of impacts.

**Table 3- Correlation between flood impacts**

Effect		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Premises flooded	Correlation coefficient Sig. (2-tailed)	1.000 .																	
2. Structural damage to premises	Correlation coefficient Sig. (2-tailed)	.755** .000	1.000 .																
3. Had to move to a temporary premises	Correlation coefficient Sig. (2-tailed)	.379* .011	.327* .030	1.000 .															
4. Stocks / products damaged / spoiled	Correlation coefficient Sig. (2-tailed)	.766** .000	.621** .000	.302* .046	1.000 .														
5. Loss of business records	Correlation coefficient Sig. (2-tailed)	.698** .000	.618** .000	.307* .043	.765** .000	1.000 .													
6. Damages to IT and other equipment	Correlation coefficient Sig. (2-tailed)	.739** .000	.639** .000	.295 .052	.713** .000	.698** .000	1.000 .												
7. Loss of trading for sometime	Correlation coefficient Sig. (2-tailed)	.611** .000	.341* .023	.212 .168	.525** .000	.541** .000	.503** .001	1.000 .											
8. Decrease in sales / production	Correlation coefficient Sig. (2-tailed)	.337* .025	.241 .115	-.128 .409	.363* .015	.333* .027	.309* .042	.673** .000	1.000 .										
9. Additional costs	Correlation coefficient Sig. (2-tailed)	.450** .002	.397** .008	.054 .726	.525** .000	.433** .003	.427** .004	.693** .000	.670** .000	1.000 .									
10. Loss of access to business premises	Correlation coefficient Sig. (2-tailed)	.641** .000	.609** .000	.291 .055	.662** .000	.709** .000	.550** .000	.627** .000	.502** .001	.611** .000	1.000 .								
11. Travel difficulties for employees	Correlation coefficient Sig. (2-tailed)	.349* .020	.352* .019	.019 .903	.360* .016	.518** .000	.264 .083	.404** .007	.452** .002	.424** .004	.619** .000	1.000 .							
12. Travel difficulties for customers	Correlation coefficient Sig. (2-tailed)	.094 .543	.163 .291	-.141 .361	.249 .103	.269 .077	.150 .332	.273 .073	.527** .000	.464** .002	.487** .001	.613** .000	1.000 .						
13. Suppliers / customers affected by flooding	Correlation coefficient Sig. (2-tailed)	.296 .051	.323* .032	-.061 .693	.378* .011	.525** .000	.261 .087	.359* .017	.468** .001	.551** .000	.696** .000	.727** .000	.729** .000	1.000 .					
14. Delay in providing supplies to customers	Correlation coefficient Sig. (2-tailed)	.248 .105	.368* .014	-.034 .828	.316* .037	.357* .017	.246 .108	.364* .015	.429** .004	.442** .003	.471** .001	.426** .004	.396** .008	.551** .000	1.000 .				
15. Delay in receiving supplies from suppliers	Correlation coefficient Sig. (2-tailed)	.267 .079	.497** .001	.033 .832	.254 .096	.350* .020	.281 .065	.229 .135	.335* .026	.429** .004	.414** .005	.426** .004	.574** .000	.585** .000	.731** .000	1.000 .			
16. Loss of Electricity, other services	Correlation coefficient Sig. (2-tailed)	.526** .000	.559** .000	.322* .033	.551** .000	.574** .000	.482** .001	.398** .007	.351* .020	.465** .001	.607** .000	.312* .039	.284 .062	.304* .045	.484** .001	.491** .001	1.000 .		
17. Increased insurance premium	Correlation coefficient Sig. (2-tailed)	.335* .026	.407** .006	.138 .370	.486** .001	.404** .007	.265 .082	.156 .311	-.016 .917	.081 .602	.241 .116	.228 .136	.175 .255	.077 .619	.230 .134	.256 .094	.366* .015	1.000 .	
18. Increased insurance excess	Correlation coefficient Sig. (2-tailed)	.300* .048	.377** .012	.197 .200	.411** .006	.378* .011	.237 .122	.151 .329	-.039 .801	.068 .662	.266 .081	.147 .342	.118 .447	.053 .731	.135 .383	.181 .240	.278 .068	.880** .000	1.000 .

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).



Many of the transport and access related impacts were found to be strongly related to one another, as well as to decreases in sales and additional costs. This suggests that 'transport and access' to a business premise is a factor that can have a significant impact on businesses in relation to a flood event. This is further confirmed by the fact that travel difficulties for customers were ranked as the highest impact of the flood event. Thus, the results affirm that even the businesses which are not directly flooded are likely to experience such impacts, resulting in loss of trade and additional costs.

Strong positive correlation is observed between property related damages and costs of insurance. Premises being flooded, structural damages, damages to stocks and equipments reported strong correlations to increases in property insurance premiums and excess values. Further, a strong, positive correlation is observed between increases in property insurance premiums and excess values ( $r_s = 0.88, \rho = 0.00$ ), suggesting that businesses which experienced an impact on property insurance is likely to experience the same for its insurance excess. Increases in the cost of insurance is likely to have a significant impact on businesses, especially small and medium-sized enterprises (SMEs), in the event of a future flood event. These will be further discussed in a subsequent section. A negative correlation was observed between moving to a temporary business premises with decrease in sales, travel difficulties for customers, and delays in providing supplies to customers. Although the relationship is not strong, this suggests that moving to temporary premises has helped businesses to avoid such difficulties.

#### **4.4 Increase in property insurance excess and premiums**

Although ranked 10<sup>th</sup> and 11<sup>th</sup> respectively in terms of impact, over 70% of the businesses have seen increases in their property insurance premium and excess following the 2009 flood event. Whilst the businesses have not associated a relatively higher significance in comparison to the other impacts of flooding, the fact that over 70% have experienced increases in property premium/ excess, and that a strong correlation was observed between the two (see Table 3), suggest that it is an issue for concern. Although the 2 factors do not seem to be highly

significant in isolation, in combination with an inter impact analysis they seem to portray a grave problem facing the flood affected SMEs.

There were significant differences between the extent of increase of premium and excess of insurance. In most cases, the respondents highlighted that there is an increase, but failed to identify its significance. It is worth noting explicit comments by two of the respondents in terms of insurance premium. They reported that their premiums rose by 300% and 100% respectively (as a percentage of the premium before flooding). In some cases, this increase was as low as 10% (See Table 4). The average increase in property insurance premiums as a percentage of the pre-flood premium was 46% (n=15). Only 15 of the 44 businesses surveyed (35%) commented on this question; although over 70% said that their insurance premium has risen, which may be due to their lack of knowledge in terms of property insurance schemes.

**Table 4 – Number of SMEs citing percentage of increases in property insurance premium and excess**

<b>Property insurance premium (n=15)</b>		<b>Property insurance Excess (n=18)</b>	
Increase of property insurance premium (as a % of pre-flood premium)	Nr. of SMEs	Increase of property insurance excess (as a % of pre-flood excess)	Nr. of SMEs
≤ 25%	9	≤ 100%	6
26% - 50%	3	101% - 500%	5
51% - 75%	1	501% - 2000%	2
76% - 100%	1	2001% - 5000%	4
> 100%	1	> 5000%	1

The average increase in excess clauses was more significant than the increase in premiums. Variation of increases was also significant. Excess clause rises of between £1,000 to £15,000 and £100 to £10,000 were quoted. However, in some cases, the percentage increase was only about 20% - 25%. On average, the percentage increase of excess clauses cited was approximately 1750% (n=18). Whilst the smaller number of responses for the question limits the ability to make a strong generalisation, the results suggest that the insurance industry is using excess clauses as a risk avoidance/transfer strategy in terms of flood risk, more so than increases in insurance premiums.

Significant increases in insurance excess is likely to make property insurance less valuable for businesses at risk of flooding, and could significantly limit the damages claimable in the event of a future flood event. The issue is further escalated by non-betterment clauses and inactivity of insurers when it comes to property-level flood protection (Douglas *et al.*, 2010), leading to less undertaking of resilient reinstatement and property-level flood protection by businesses. This could have a significant detrimental impact on businesses, as the previous evidence suggests that businesses; especially SMEs, rely heavily on insurance to recover from flood damage (Crichton, 2006).

#### **4.5 Temporary business premises**

Correlation analysis in Table 3 suggested that moving to temporary business premises is likely to minimise the decrease in sales, travel difficulties for customers, and delays in providing supplies to customers as a combined effect. This combined effect is likely to contribute towards retaining the customer base and maintaining business continuity. However, it can be noted that although premises were flooded in 82% of the businesses, only 34%, n=15, (47% of the businesses whose premises were flooded) moved to temporary business premises. With the exception of one case, all the businesses that moved to temporary business premises have said that they were “very much affected” by the issue of “premises flooded”. In total, out of the 225 flooded businesses in Cockermouth town centre, 34 businesses had continued to conduct their business in temporary premises in January 2010; nearly 2 months after the flood event (Tickner, 2011)

Businesses that moved to temporary business premises (subjected to the survey) were satisfied with this in terms of cost and time involved with relocation, retaining their customer base and the impact this had on their business survival (See Figure 2). However, their level of satisfaction was low in terms of the level of sales / production in the temporary premises. This may be due to customers not being aware that business had relocated to temporary premises and the level of economic activity in the township following the flooding. Overall, the level of satisfaction expressed by businesses in temporary relocation suggests that this could be a very good initiative to implement in similar situations in the future. All the businesses that moved to

temporary premises returned to their original business premises within 12 months, whilst more than half returned approximately 4-6 months after the flood event. Effectively, businesses would not have been able to trade for this period if they had not moved to temporary premise.

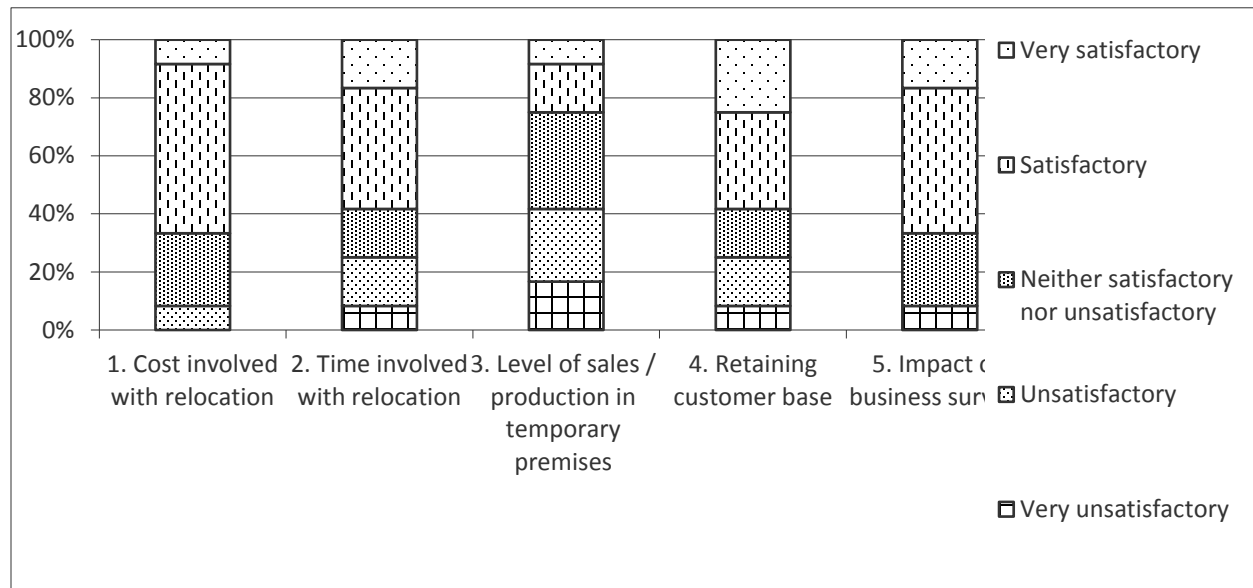


Figure 2 – level of satisfaction with temporary business premises

## 5 Discussion

Based on the findings presented above, several key lessons can be learned in relation to business impacts of flooding.

- **Indirect impacts of flooding can often be substantial**

It can be seen that the impacts of flooding had been felt even by the SMEs who were not physically flooded. Impacts like travel difficulties for customers, increased costs, and decreased sales have affected many SMEs in Cockermouth irrespective of whether they were flooded or not. Although not flooded, SMEs in a rural town centre like Cockermouth might not be able to function if many of the other properties are flooded, and if the access is limited as a result. Loss of critical “lifeline services” such as water, electricity and telephones could also limit their ability to function. Tierney (1994b; 1994a) reported that loss of critical lifeline services were an important cause of business closure relating to a flood event, as loss of utilities can affect a

significantly larger number of businesses than those actually flooded. This information can be taken forward in policy making related to flood risk management, in assessing the benefits of community level flood management strategies. Such strategies could prevent disruptions not only to those at risk of flooding, but also to other businesses and households in that locality, especially in rural areas like Cockermouth.

- **Impacts of flooding are multifaceted and a flooded SME is likely to experience a range of impacts**

As the inter-impact analysis (see Table 3) revealed, most of the flood impacts are related to each other and SMEs are likely to experience a range of flood impacts simultaneously, rather than in isolation. The knock-on effect or secondary impacts may further disrupt business activities and complicate recovery, endangering business survival. As a result, flooding may result in impacts that SMEs do not normally associate with flooding. Some of these may be classed as latent effects of flooding (Whittle *et al.*, 2010). Although some of the current guidance available for businesses on flooding; for example, Business Resilience Healthcheck (2011) and Environment Agency guidance, recognise and prompt businesses to consider the broad range of impacts associated with flooding; SMEs may often only consider the direct, tangible impacts (Wedawatta *et al.*, 2010; Molinari and Handmer, 2011). As a result, SMEs are likely to under estimate the multifaceted nature of flood impacts which might therefore provide a barrier to their decision to invest in flood protection. The main emphasis and the contribution made by this research is to bridge this gap by enhancing the current understanding of SMEs on preparedness for flooding by considering both the direct and the latent impacts of flooding. Accordingly, guidance available for small businesses regarding flood protection should also highlight the multifaceted nature of flood impacts, their inter-connections and benefits of flood protection.

- **Inability to rely solely on insurance in the future**

The findings of the study reveal that flood affected SMEs are likely to experience increases in their insurance premiums and excess clauses for their property. As these two impacts were

found to be largely inter-connected, this means that SMEs will not receive a similar level of protection from their insurers in the future, even at a higher cost. Further, there is much uncertainty over the future provision of flooding insurance in the UK, as the agreement between the Association of British Insurers and the UK government (known as the statement of principles) is set to expire in 2013 (ABI, 2008; ABI, 2010). This is likely to further limit the ability of SMEs to rely solely on insurance to recover from the impacts of flooding in the future. Therefore, SMEs, particularly those which are located in areas under very high risk of flooding, will have to recognise preparedness as a necessity and consider it more strategically within their ongoing business planning.

- **Importance of protection measures in addition to insurance**

As the ability to rely on insurance decreases, at-risk SMEs will need to address the risk via other means. Whilst protection for flooding might be provided by community level flood defenses and flood management measures in some places, some of the SMEs may still be left without adequate protection. In the Environment Agency's first national flood risk assessment for England, it was highlighted that "it is impossible and impractical to reduce all flood risk, or to defend against all possible floods in all places" (Environment Agency, 2009a: 17). Accordingly, the use of property-level flood resistance and resilience measures was identified as an important element of flood protection. The Pitt review recommended the take-up of property flood protection by businesses (Pitt, 2008). Further, the National Flood and Coastal Erosion Risk Management Strategy for England (Defra, 2011) highlights the importance of managing the flood and coastal erosion risk using the full range of options available in coordination with individuals, communities and organisations. One of the ways it seeks to manage the risk of flooding is by "increasing public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face and to make their property more resilient" (Defra, 2011: 14). Further, the higher cost of insurance as observed in the study is likely to make property-level flood protection more beneficial for SMEs. In this regard, this study contributes towards the evidence base for benefits of adaptation by providing an account of the impacts of flooding on SMEs.

## 6 Conclusions

The analysis of information gathered from the effects of flooding on businesses in the Cockermouth area in Cumbria, UK provides an account of impacts of a major flood event on SMEs in a rural town centre. Although Cockermouth may not be a typical town, it is a small market town worthy of investigating flood risk due to its unique characteristics; such as strong reliance on tourism, and the significant impact that the 2009 flood event had on SMEs in Cockermouth. The unprecedented scale of the floods that affected Cockermouth in November 2009 meant that many businesses were unprepared to face a flood event of that scale. Direct and indirect effects of flooding could be gauged based on this extreme event, to link the overall impact to the vulnerability of small businesses. Although the results presented here might be biased towards micro sized businesses due to their superior presence in the sample, this can be considered representative of a typical rural market town, often dominated by micro businesses. The Cockermouth area being subjected to a very high risk of future flooding means that lessons learned from this single case study of a rural town could be contextualized to such other typical rural town settings within UK and elsewhere. The study was conducted as a multifaceted impact study looking into impacts and inter-impacts of flooding on SMEs. The lessons learned from this exercise; discussed in the previous section, could inform policy making and small business decision making with regard to future flood preparedness and protection.

The results highlighted both the direct impacts such as property damage and damage to stock as well as indirect ones such as supply chain and logistics issues appertaining to customers and suppliers. Impacts related to transport and access were identified as significant and correlated to 'reduced sales' and 'additional costs' under the subsequent inter-impact analysis, suggesting that such impacts may not be limited to flooded businesses alone. The findings related to travel difficulties and loss of access also highlights the importance of reinstating the transport infrastructure as soon as possible following a flood event, so as to minimise disruptions to day-to-day business operations. Therefore, the results of this study show how the effect of flooding cascades down to other supply chain partners who may not necessarily be directly affected by flooding. If this scale is mapped as a holistic process, the effect of the Cockermouth flood

cascades down into the entire fabric of the community living in the area. The results of this study could, therefore, form an early blue print for a detailed study into small business resilience and to contribute to making more informed judgments about the most appropriate adaptation measures.

It is important that insurance cover is available for businesses at reasonable cost, and is able to provide adequate protection especially for SMEs. The results of the study showed significant increases in 'insurance excess' of property insurance policies and to the degree to which such insurance schemes become irrelevant and unsustainable in areas at very high flood risk. The results of this study can be generalised into other areas in the UK which have a very high risk of future flooding. This finding may be significant to the Confederation of British Industry (CBI) and the Federation of Small Businesses in understanding and lobbying policy making initiatives. Unless such insurance risks are addressed by adopting various alternative means, such a situation could amount to considerable costs and widespread business failure. Lack of protection by insurers highlights the importance of businesses undertaking other flood adaptation measures, involving property-level flood protection and other risk management / business continuity measures. Whilst the responsibility for implementing community-level flood protection measures rests mainly on policy makers, the responsibility for implementing property-level flood protection measures rests with the property owners. Hence, the range of impacts experienced by businesses underlines the importance of implementing such protection measures to protect at-risk business properties. This information can be taken forward by institutions such as the Royal Institution of Chartered Surveyors (RICS) in providing property-level flood adaptation advice for SMEs through their practicing members. However, it has to be seen whether the flood impacts have actually resulted in such adaptation measures. The research will be further developed to study in detail the response of businesses to flood risk.

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