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Economic Impact Assessment of the Boxing Day Floods (2015) on SMEs in the Borough of Calderdale



Final report

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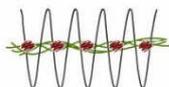
Stephen Curry, Upper Calder Valley Renaissance

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UNIVERSITY OF LEEDS

Sustainability Research Institute
SCHOOL OF EARTH AND ENVIRONMENT

Economic Impact Assessment of the Boxing Day Floods (2015) on SMEs in the Borough of Calderdale



Mytholmroyd 26.12.15

“Christmas was a disaster this year” Never has this statement had more significance than for those business owners along the 20 mile stretch of the Calder Valley, who were woken on Boxing Day 2015 by the sound of wailing flood sirens.

Main impacts of the massive deluge that followed were:

- Over 1600 businesses affected by flooding
- Nearly £47 million losses to the local economy so far
- For every £1 reported in direct losses, another £0.6 on average was lost indirectly throughout the regional economy
- The total economic impact to the Calderdale and Kirklees regional economy amounted to a total of approximately £170 million
- 45% of flooded premises suffered structural damage, 75% of flooded businesses lost stock, 46% of flooded businesses lost office equipment
- Businesses with more than 20 employees experienced higher losses but for businesses with less than 4 employees the losses were twice as costly relative to their income.
- Employees have been laid off and more than a hundred of jobs are at risk in the next 3 months.
- It is taking double the amount of time to recover compared with the 2012 floods, and businesses experienced 1.35 times more damage to their businesses and the losses almost doubled.
- Hundreds of businesses will become uninsurable

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Executive Summary

The unprecedented floods of Boxing Day 2015 had a serious impact on the borough of Calderdale, and the Upper Calder Valley was particularly badly hit. Small and medium sized businesses (SMEs), which make up the majority of the local businesses in the economy, were worst affected. Understanding the situation of SMEs is important, as they represent key drivers in achieving the growth and development needed for economic recovery.

This report presents an economic impact assessment of the flooding on SMEs. This study will support the evidence that the Calderdale Flood Commission collates to make recommendations to Government, the Council, the Environment Agency, the community and businesses, about the effects of recent flooding and lessons for possible future flooding. This report will assist policy makers and local stakeholders to take effective action based on what the community of SMEs needs to recover and continue to provide jobs, products and service for local communities.

Background

- The Calder Valley has a long history of flooding, but the regularity and scale of flooding appears to have increased since 2000. In 2012, a month's worth of rain fell in less than 24 hours, affecting numerous businesses and households.
- On Boxing Day 2015 even higher levels of water were recorded, which deluged a much wider range of properties from Todmorden to Brighouse along the River Calder.
- Over 2,800 houses and 1600 business premises were affected by the flooding
- Calderdale Council's Business & Skills team has been administering the package of Flood Recovery grants for businesses, and has processed almost 900 applications.
- The sector most severely affected by the December 2015 flooding is retail, especially in Hebden Bridge, Mytholmroyd/Luddendenfoot and Todmorden.
- As of 31 March 2016, around 83% of flood affected businesses were back in operation across Calderdale, but the picture is not consistent. Just 61% of Hebden Bridge businesses are open.

Initial scoping by Upper Calder Valley Renaissance (UCVR)

- Immediately after the flooding, the 'UCVR Business Flood Recovery Team' was formed to assess the initial extent of the impact. They conducted a basic online survey.
- 150 businesses in total responded to this initial survey, including those located in Sowerby Bridge and Luddenden/Luddendenfoot.
- The data obtained by the survey was useful to Calderdale Council to assist in their bid for emergency funding from central government. It also helped identify businesses in need of support, as well as contact details of affected businesses.

Economic impact assessment

- The University of Leeds, in conjunction with the Council's Business team and UCVR, conducted an economic impact assessment of the floods on SMEs.
- The data was collected via an online questionnaire administered to businesses in the borough of Calderdale.
- The majority of the respondents are business owners (~80%) and around six in every ten firms have less than 5 employees.
- Half of the sampled businesses have been operating for less than 10 years and approximately 60% rent their premises.
- Almost three quarters of the sampled businesses were in operation at the time of the 2012 floods.
- The estimated value of the overall costs to the business during the 2012 floods was £26,000, and half of the businesses reported having losses for £5,000 or less.
- The greater intensity of the 2015 floods, compared to those of 2012, translated into higher costs. The 2015 flooding was 1.3 times more damaging to businesses, while the total losses suffered by SMEs almost doubled
- Hebden Bridge reported the largest number of cases. However, Mytholmroyd suffered the highest losses per SME.
- The total amount of losses reported by the surveyed businesses is almost £47 million, which represents around 12% of their annual turnover. Excluding a small amount of enterprises that reported total losses above £500,000, the average loss per firm was around £47,000.
- The total reported losses (£47 million) account for 5.4% of the business sector GVA in Calderdale and Kirklees.
- The amount of losses were almost twice as high for businesses with less than 4 employees than for businesses with more than 20 employees.
- On average, businesses with less than 4 employees have recovered 45% of their sales, in comparison to 66% by larger businesses.
- The surveyed firms are considering laying off a total of 124 employees in the next 3 months, which would represent a loss of around £2.3 million or 1.8% of their annual wage bill.
- The total amount of lost sales amounted to nearly £7 million at the time the survey was conducted. The sector worst hit worst is Retail and Wholesale, followed by Manufacturing.
- When taking into account direct and indirect losses, the total economic impact to the Calderdale and Kirklees regional economy amounts to a total of approximately £170 million. This figure represents 1.1% of the total output of the region (Office of National Statistics- ONS). For every £1 reported in direct losses, another £0.6 on average was lost indirectly throughout the regional economy.
- Three out of five businesses have recovered 50% of their normal sales. On average it has taken almost twice the time for firms to recover their monthly average sales, compared to the 2012 floods.
- Three out of five of the surveyed businesses have at least one type of insurance. Nevertheless, around 14% had an insurance excess that was so high it has not been worth submitting a claim.
- 70% of the surveyed forms mentioned they have received grant aid from local or central government, followed by business rebate (43%) and advice from Council or business support organisations (42%).
- Almost half of surveyed businesses do not set aside time for planning for flooding, and less than a quarter monitor free flood warning systems.

Economic Impact Assessment of the Boxing Day Floods (2015) on SMEs in the Borough of Calderdale

Economic overview of the Borough of Calderdale

Calderdale is located in West Yorkshire, to the west of Leeds and Bradford and north east of Greater Manchester. It is the sixth largest of the 36 metropolitan authorities in terms of land areas and seventh smallest in terms of population. Most recent Census information shows that in 2011 Calderdale had a resident population of approximately 204,000. The population has grown steadily since the last census for which statistics are available (2001). The population is now approximately 5% larger than in 2001.

The Calderdale district encompasses the towns of Halifax (which acts as the borough's main commercial, cultural and administrative centre), Brighouse, Elland, Sowerby Bridge, Mytholmroyd, Hebden Bridge and Todmorden. The majority of the district is rural or urban fringe in character, with only a small percentage of the area (13%) that is built-up urban.

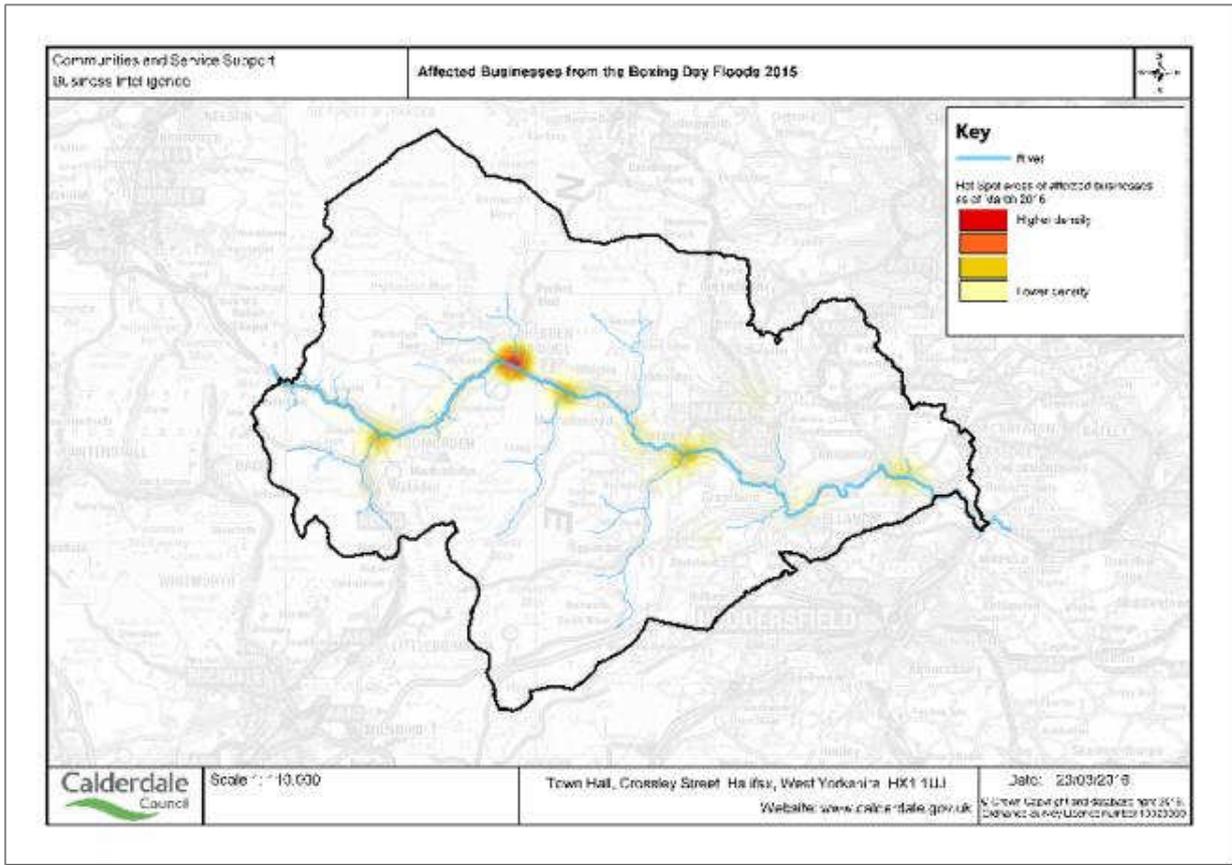
The ONS Business Register and Employment Survey 2014, (BRES) states that, there are 93,318 jobs in Calderdale, which consists of 65,257 full-time and 28,061 part-time jobs. There was a 6.8% increase in the number of total employees in Calderdale from 2013-14; in the same period total public sector employment fell by 36.1% and the number of employees within the private sector increased by 21.9%. Both sectors recorded sizable movement within the last 12 months, indicating perhaps a renewed vigor within the local private sector and effects of decreasing budgets on public services. The number of full-time jobs has increased by 16% since 2009; in the same period part-time employment exhibited a small increase of 1.4%

Background to flooding in the Calder Valley

The Calder Valley has a long history of flooding, but prior to a major flood in June 2000, most people had to be at least 70 to remember the worst flooding in the 1940s. The regularity and scale of flooding appears to have increased since 2000 with several smaller floods between 2000 and 2011. Then on Friday, June 22, 2012, a month's worth of rain fell in less than 24 hours. More than 500 businesses and homes were flooded. Hebden Bridge recorded its highest ever river level at 3.311m, some 0.285m higher than June 2000. Many people affected in 2012 didn't have flood insurance, and it was from then that future insurance cover became a serious concern.

The community had expected that nothing could be worse than the 2012 event, but on Boxing Day 2015 even higher levels of water were recorded which deluged a much wider range of properties from Todmorden to Brighouse along a 20 mile stretch of the River Calder.

Figure 1. Map showing intensity of were businesses were affected on Boxing Day 2015



Over 2,800 houses and 1600 business premises were affected by the flooding. Although the flood water dissipated within a few hours, the impact was devastating, with businesses throughout the Calder valley facing extensive losses of stock, damage to buildings and destruction of machinery and equipment. Businesses have faced significant costs associated with clearing silt, drying out and repairing premises, and disposal of damaged stock, in addition to loss of production. Many other Calderdale businesses, although not flooded themselves, have suffered significant drop in trade due to loss of footfall, restrictions to markets or access difficulties.

Efforts have been undertaken to support SMEs. Since Christmas, Calderdale Council's Business & Skills team has been working almost exclusively on support for flood-affected businesses in Calderdale. Business advisers have been locally based in the various townships that were hit by flooding and have built up in-depth knowledge on the effects of flooding on the business community. The team maintains a database recording details of flood affected businesses which informs reports to the Council, City Region and central Government, and some analysis of the data recorded has been carried out. The team has been administering the package of Flood Recovery grants for businesses and has processed almost 900 applications for the £2,500 grant. The team is also administering the £5k Business Property Resilience grant. There is on-going work to encourage take up of this grant and in the Upper Calder Valley this is being done in collaboration with the UCVR.

The current focus is promotion of the package of Local Enterprise Partnership (LEP) support for flooded businesses and assisting eligible businesses with applications.

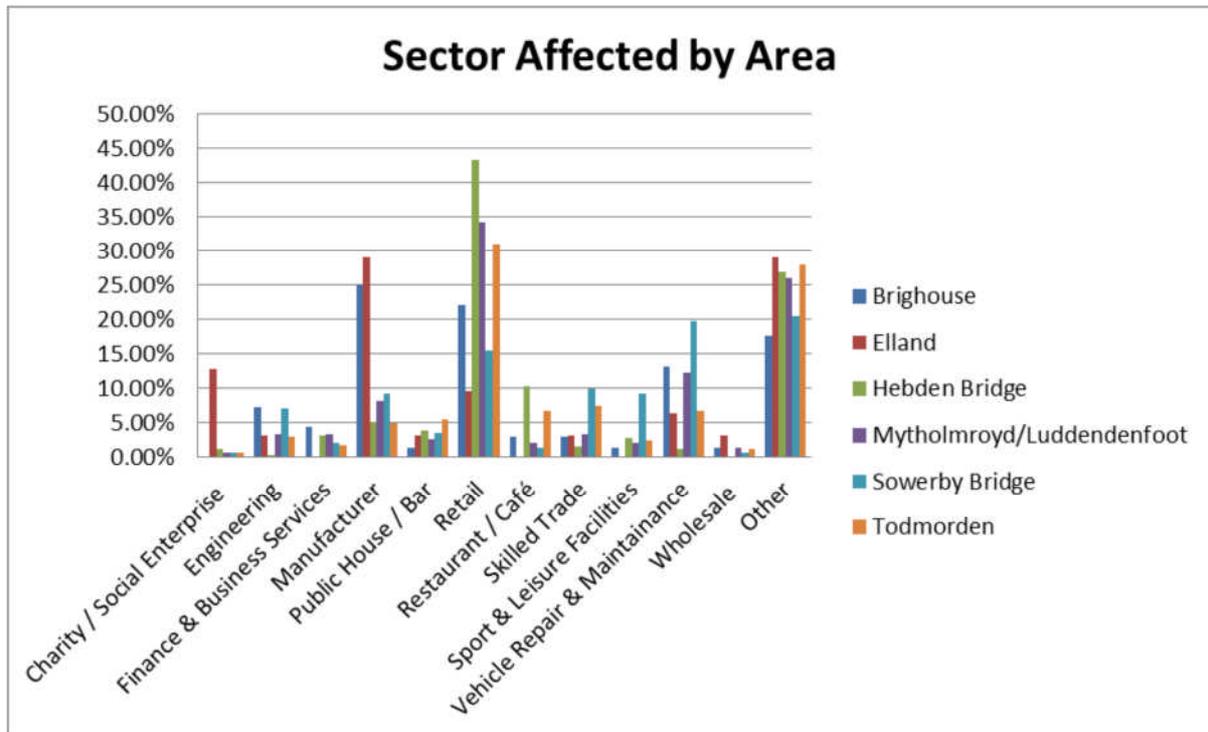
Table 1. No. of businesses affected in each township and % of the total affected

Of the 971 businesses on the database held by the Council's Business team, the highest proportion are located in the Upper Calder Valley with the largest number within the Hebden Bridge area (30.28%), followed by Todmorden (19.05%), Sowerby Bridge (15.96%) and Mytholmroyd (10.3%). Businesses in the Lower Valley were however also severely impacted with Brighouse and Elland together accounting for 11.43% of flooded businesses.		
Affected Areas Share	No. firms	
Barkisland	7	0.72%
Brighouse	77	7.93%
Copley	9	0.93%
Elland	34	3.50%
Greetland	8	0.82%
Halifax	38	3.91%
Hebden Bridge	294	30.28%
Luddendenfoot	59	6.08%
Mytholmroyd	100	10.30%
Ripponden	1	0.10%
Sowerby Bridge	155	15.96%
Todmorden	185	19.05%
Walsden	4	0.41%
Out of Area	7	0.72%
Total	971	

The Business Team database shows that the sector most severely affected by the December 2015 flooding is retail (including department and warehouse stores, speciality and convenience stores, supermarkets etc.), especially in Hebden Bridge, Mytholmroyd/Luddendenfoot and Todmorden where it represents 43%, 34% and 31% of damaged businesses.

Restaurants and cafés have also been severely impacted in Hebden Bridge (by 10%) and Todmorden (6,8%). The manufacturing sector has been highly impacted notably in Elland and Brighouse, at respectively 29% and 25%. In Sowerby Bridge, the most affected sector is Vehicle Repair & Maintenance, representing 19% of affected businesses.

Figure 2. Affected businesses by sector and townships



As of 31st March 2016, around 83% of flood affected businesses were back in operation across Calderdale. The picture is not consistent, with over 90% of businesses in Brighouse, Halifax, Sowerby Bridge and Todmorden back in operation, whilst just 61.2% of Hebden Bridge businesses are open.

Table 2. Status of affected business three months after flooding

	Brighouse	Elland	Halifax	Sowerby Bridge	Luddendenfoot / Mytholmroyd	Hebden Bridge	Todmorden
Open	92.86%	75.00%	95.00%	91.67%	74.07%	61.20%	93.06%
Open with some restrictions	1.43%	10.71%	0.00%	0.00%	0.00%	2.73%	0.69%
Temporarily relocated	0.00%	0.00%	0.00%	2.27%	7.41%	2.19%	0.69%
Planning to Reopen	5.71%	14.29%	5.00%	5.30%	15.56%	30.60%	3.47%
Closed / Moved out of area	0.00%	0.00%	0.00%	0.76%	2.96%	3.28%	2.08%

UCVR Flood Impact Survey Dec 2015/Jan 2016

The immediate response by the UCVR to the Boxing Day flooding in the Upper Calder Valley was to call together the business leaders from the three business networks of Todmorden Hebden Bridge and Mytholmroyd. This formed the 'UCVR Business Flood Recovery Team' with a view to taking a longer-term strategic approach to the post flooding needs of the local economy.

The team devised a basic online survey to discover the immediate impact on the valley's businesses both individually and collectively. This survey was conducted over a period of ten days starting 48 hours after the flooding. It was a difficult ask of businesses under the circumstances, but there was an excellent and co-operative response. In the first week of January the number of businesses known to Calderdale business team to have been flooded in the Upper Calder Valley was 337.

From the three towns of Todmorden (76), Mytholmroyd (62), Hebden Bridge (85) (Total 223), over 60% responded to the UCVR survey. This provided data on what the businesses immediate needs were, future needs and projections about when or whether the businesses would be open again.

A total of 150 businesses responded to the valley wide survey by the deadline (11th January, including Sowerby Bridge and Luddenden/Luddendenfoot. At that time, 31% said they would be open within weeks, 25% said 1-2 months, 23% said 2-6 months 6% said 6 months +, and 15% said "not sure".

The major concerns businesses had were: 1) that they may not be able to continue due to lack of insurance; 2) it would be hard to re-establish business levels making them viable and sustainable; 3) significant loss of income. While the main priorities identified were: a) A capital injection for each business; b) Insurance assistance for future; c) Future flood defence support for each business; d) Clean up and drying out assistance, in particular loss of electrical supply; e) PR to aid regeneration in area and boost trade as businesses re-open.

The statistical data was passed to Calderdale Council to assist in their bid for emergency funding from central government. The UCVR has been able to use the anecdotal content to identify businesses which require specific business support such as mentoring in specialist areas e.g. marketing, finance. The survey also provided contact details to enable the UCVR Business Flood Recovery Team to keep the businesses up to date with funding and other support available.

Demography of SMEs

Calderdale Council commissioned BMG Research Ltd to carry out a District Employer Survey in 2013. This revealed that employers within the Calderdale district are predominantly small employers and single site establishments. The majority operate within the private sector.

One in three employers (35%) have been established in the last 5 years and these newer employers are more likely to be within the information / communication sector. This suggests that the technologically based, media sector is becoming of increasing importance.

The majority of Calderdale employers rely on the local market, with one in four totally reliant on customers based within the district. This highlights the importance of a buoyant local economy to ensure that the level of demand for products and services sufficiently supports local employers.

In 2013, the breakdown of Calderdale / Yorkshire and Humber businesses by number of employees was as follows:

Table 3. % Breakdown of company size by no of employees compared to Yorks/Humber region

Employer size	Number Calderdale	% Calderdale	Number Yorks & Humber	% Yorks & Humber
0-4 employees	5385	67%	121,735	65%
5-9 employees	1170	14.6%	29,500	15.7%
10-19 employees	710	8.9%	17,170	9.2%
20+ employees	740	9.2%	19,120	10.2%
Total	8005		187,525	

Information from the Office for National Statistics (2013) shows that two thirds of Calderdale employers (67%) have up to four employees, slightly more than the percentage for Yorkshire and Humber as a whole, whilst one in six (17%) have between five and ten employees. Employers with more than 10 employees account for just 18% of all employers in Calderdale.

More than four-fifths of employers in Calderdale (81%) are single site establishments. Just 1% of employers in the area have a headquarters based outside the UK.

Table 4. Breakdown of Calderdale businesses by sector compared to York/Humber region (2013)

Sector	Number Calderdale	% Calderdale	Number Yorks & Humber	% Yorks & Humber
Agriculture, forestry & fishing; mining & quarrying; electricity, gas etc; water supply, sewerage, waste management etc	260	3.2%	11,510	6.1%
Manufacturing	800	10%	13,815	7.3%
Construction	880	11%	19,455	10.4%
Motor trades	295	3.7%	6,675	3.5%
Wholesale	460	5.7%	9,735	5.2%
Retail	925	11.5%	23,280	12.4%
Transport & storage	245	3%	7,330	3.9%
Accommodation & food services	545	7%	12,790	6.8%
Information & communication	430	5.3%	8,035	4.3%
Finance & insurance	200	2.5%	4,330	2.3%
Real estate activities	245	3%	6,545	3.5%
Professional, scientific & technical	900	11%	21,620	11.5%
Business administration & support services	455	5.7%	11,455	6.1%
Public administration & defence	70	0.9%	2,335	1.2%
Education (local units)	225	2.8%	5,040	2.7%
Health (local units)	490	6%	11,670	6.2%
Arts, entertainment, recreation & other services	580	7.2%	11,905	6.3%
Total	8,005		187,525	

Manufacturing is still an important employment sector in Calderdale, accounting for around 10% of businesses compared with around 7.3% for the Yorkshire and Humber region. Agriculture, fishing and forestry employs relatively low numbers compared with the rest of the region, whilst the Arts and entertainment sector employs slightly more than other areas within Yorkshire & the Humber.

Table 5. Breakdown of 2011 Census information on work sector of residents

	Total	Primary, Energy, Water	Manuf- acturing	Const- ruction	Whole- Sale & retail	Hotels & Catering	Transport & Comms	Finance Banking	Public, educ, health	other
Brighouse area	17,721	260 1.5%	4,046 22.8%	1,073 6.1%	2,982 16.8%	675 3.8%	768 4.3%	3,184 18.0%	4,005 22.6%	727 4.1%
Elland Area	9,651	135 1.4%	2,317 24%	647 6.7%	1,450 15.0%	388 4.0%	487 5.0%	1,724 17.9%	2,128 22.0%	374 3.9%
Halifax area	34,753	433 1.2%	7,912 22.8%	2,081 6.0%	5,466 15.7%	1,392 4.0%	1,923 5.5%	6,455 18.6%	7,704 22.2%	1,387 4.0%
Hebden Br Area	6,342	129 2.0%	1,130 17.8%	337 5.3%	800 12.6%	247 3.9%	236 3.7%	1,079 17.0%	2,025 31.9%	359 5.7%
Sowerby Br Area	12,946	257 2.0%	2,809 21.7%	850 6.6%	1,813 14.0%	485 3.7%	716 5.5%	2,451 18.9%	2,968 22.9%	597 4.6%
Todmorden area	6,601	97 1.5%	1,615 24.5%	432 6.5%	1,096 16.6%	271 4.1%	311 4.7%	783 11.9%	1,721 26.1%	275 4.2%
Total	88,014									

The Manufacturing sector is particularly important for residents of Elland, Todmorden and the North Halifax area, whilst employment in Public Administration, Education & Health is more important in Hebden Bridge and Todmorden. Finance and Banking is consistently important although with proportionately fewer Todmorden residents employed in this sector.

Calderdale and Kirklees' GVA¹ per head was 18% below the regional average and 27% below the UK average in 2013. Growth in productivity fell behind the rest of the West Yorkshire and regional GVA per head figures between 2000 and 2007. However, from 2010 to 2012, the value increased at a faster rate than regional averages, growing at around 2% per year, eclipsing Bradford. In spite of this, Calderdale saw a smaller increase than expected of 0.5% in 2013 and the gap between the borough's productivity rate and that of Leeds and the UK average continues to widen.

GVA per head in Calderdale and Kirklees was £7,203 less than the UK figure in 2014.

In the combined Calderdale and Kirklees area, GVA has grown consistently year on year from 1997, contracting only during the recession of 2008/9. The combined area's return to

¹ Gross value added (GVA) is a measure of the value of goods and services produced in an economy. It is the measure preferred by the Office for National Statistics (ONS) to monitor the overall economic wellbeing of an area. GVA is a component of Gross Domestic Product (GDP), the main measure used at a national level to show the health of the economy. In general, GVA + taxes on products – subsidies on products = GDP. This measure allows for benchmarking and comparison between different areas.

growth in 2010 indicates the strength of Calderdale's core industry. In 2014, Calderdale and Kirklees' total GVA increased by 3.6%, 0.3% higher than recorded regional growth.

Within Calderdale there are approximately 600 SME's engaged in export.

Survey research

Dr. Paola Sakai at Sustainability Research Institute, School of Earth and Environment, University of Leeds conducted survey research to examine more closely the economic losses identified by the Council's Business team and UCVR.

The unit of analysis are small and medium sized enterprises (SMEs). These were identified and classified according to their number of employees. In this manner, a small business is understood as that type of organisation that employs up to 10 workers, and a medium one up to 250 employees. It is acknowledged here that SMEs are numerous and they exist in every sector of the economy.

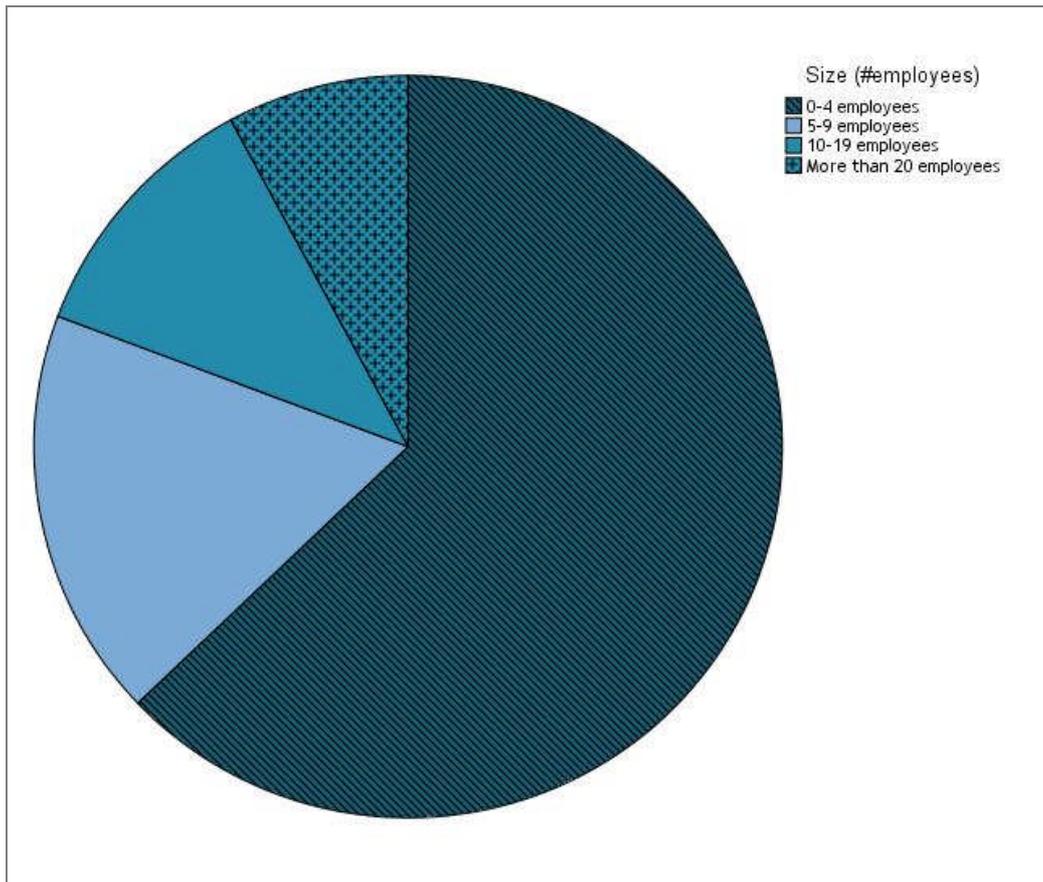
As stated before, according to the Office for National Statistics, there are 8,005 businesses in the Calderdale borough, and according to the Department for Business Innovation & Skills, SMEs, businesses with less than 250 employees account for 99.9% of the total organisations in 2015. In this sense, we estimate that the population of SMEs is 7,925, and 80 businesses have more than 250 employees. After applying the sample size formulas corrected for finite population (See Appendix), we are left with a sample of 367 firms to cover a confidence interval of 95%. We achieved a significant sample comprised of 280 responses having then a 90% confidence interval with 5% margin error. Not all the surveyed businesses were directly affected (flooded), which provides more accuracy to our results.

The data collection consisted in an online questionnaire designed and copyrighted by CCCEP. The survey was publicised by CMBCBT and UCVR, which also were in charge of data collection and encouraging SMEs to participate voluntarily in the study. (See Appendix for more details on ethics compliances).

Sample demography

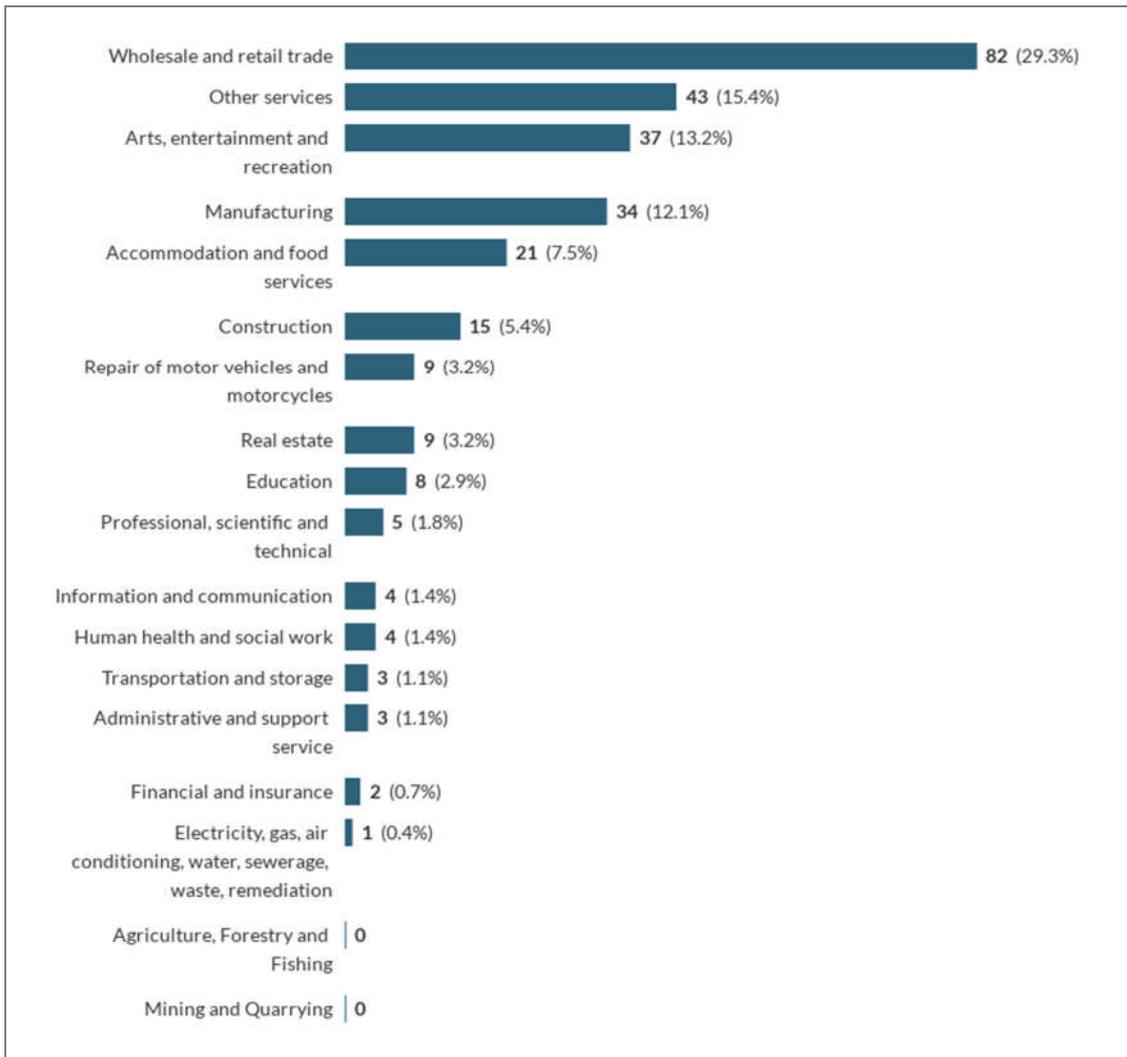
More than half (58.6) of the surveyed SMEs are owned by men, and the majority of the respondents were the owners of the company (80.6%). Regarding the size, measured according to the number of employees, there are four categories: more than half of the firms (62.9%) have less than 5 employees, 17.9% have between 5 and 9 employees, 11.4% have between 10 and 19 employees, and only 7.9% have more than 20 employees. Just 3 firms surveyed have more than 100 employees.

Figure 3. Breakdown of size of businesses by number of employees



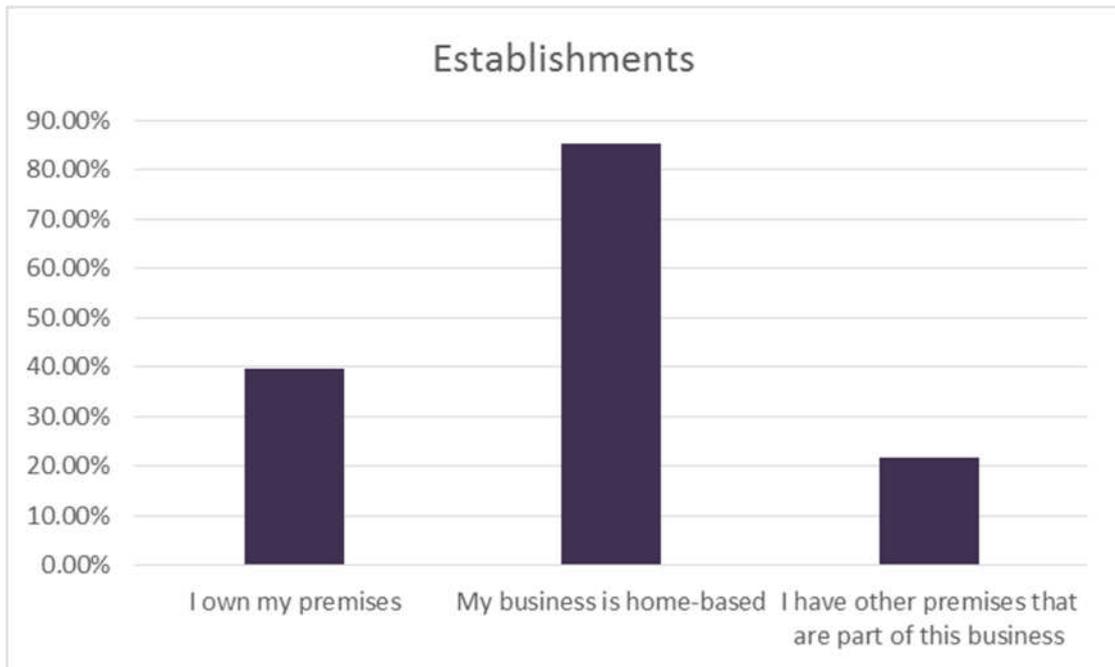
The highest proportion of the sample is concentrated in the retail and wholesale trade sector (29.3%), followed by other services (15.4%), and arts, entertainment and recreation (13.2%), with manufacturing sharing a 12.1%. The rest of the economic activities are in the graph below:

Figure 4. Breakdown of businesses by sector



Half of the sampled businesses have been operating for less than 10 years. 30.3% of the surveyed businesses have less than 5 years of operation, and 21.5% have between 11-20 years. 19 businesses had more than 50 years in the market. 39.6% (N=111) of the surveyed businesses own their premises, thus 60.4% rent them. This means that 169 landlords were directly affected. For 4 out of 5 businesses (85.4%) their premises are home-based. And, only one fifth (21.80%) have other premises that are part of the business.

Figure 5. Ownership of premises by businesses

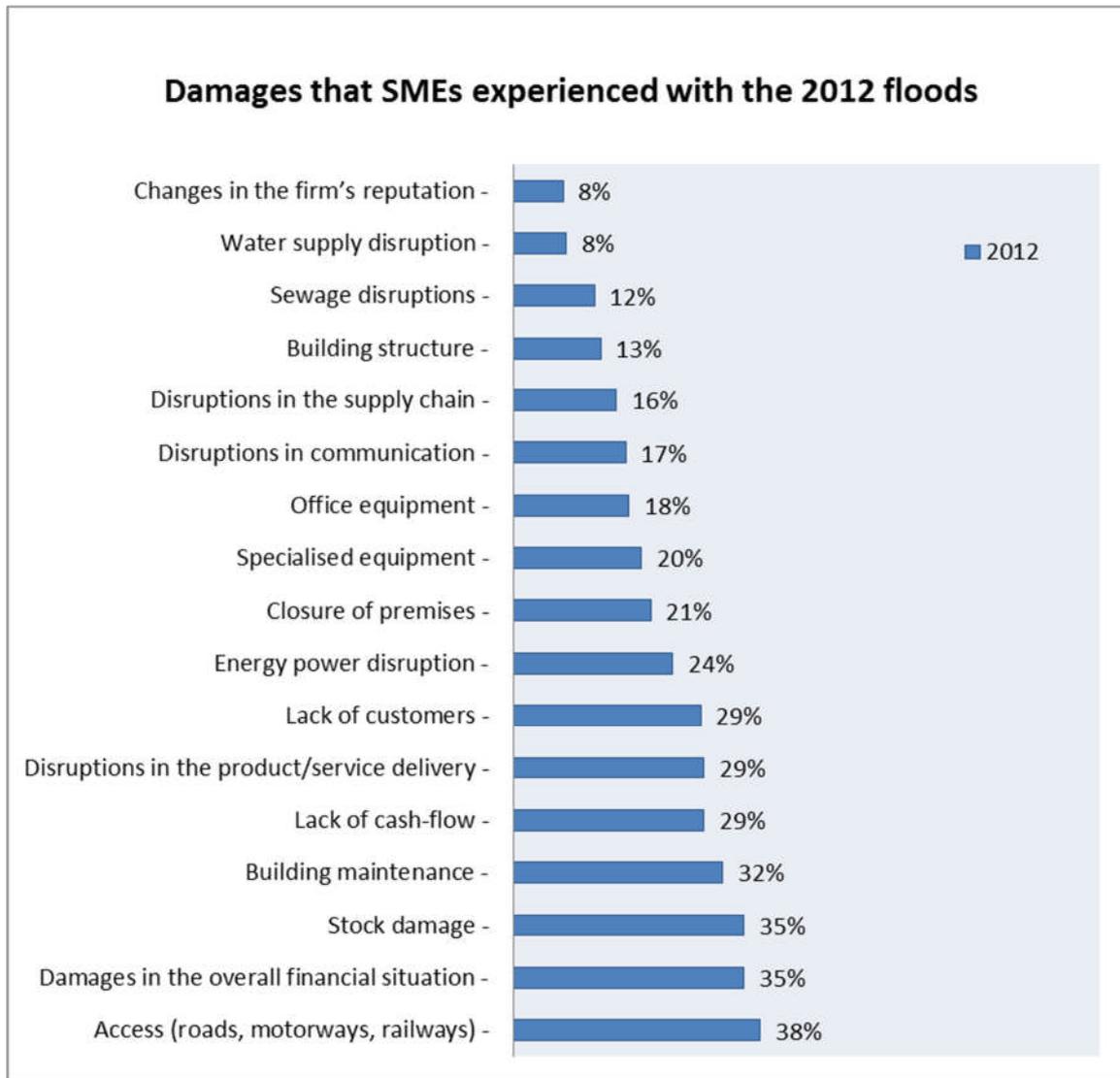


Previous experiences: the floods of 2012

Three quarters of the sampled businesses (74.6%) were in operation at the time of the 2012 floods. 22.49% of those firms had to close for an average of 3.05 months (Trimmed: 2.16). 48.94% closed for 1 month or less, and 42.55% closed between 1 month and 6 months. 8.5% of firms took more than 6 months to recover, with just one business reporting having had to close for 36 months.

In terms of the type of damage SMEs experienced with the floods of 2012, the majority (38%) reported damage as a result of access to public infrastructure, followed by damage in the overall financial situation (35%), in stock (35%) and building maintenance (32%). The rest of reported damages are shown in the graph below.

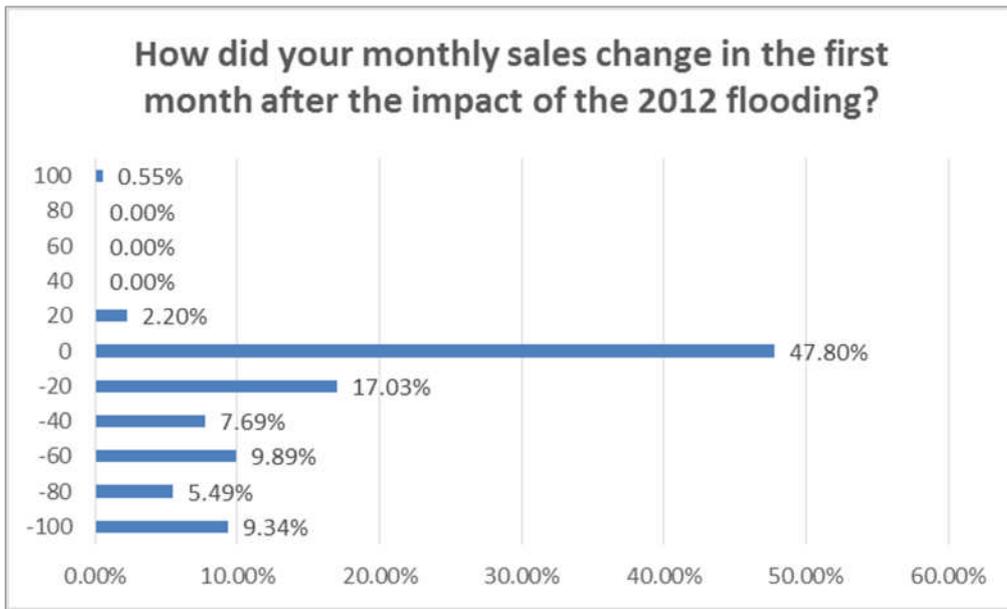
Figure 6. Specific Impacts on Businesses affected in 2012



The estimated value of the overall costs to the business that were in operation in the 2012 flood was £26,098.35 with a trimmed mean of £17,507.63, with half of the businesses (50.5%) reported having losses for £5,000 or less.

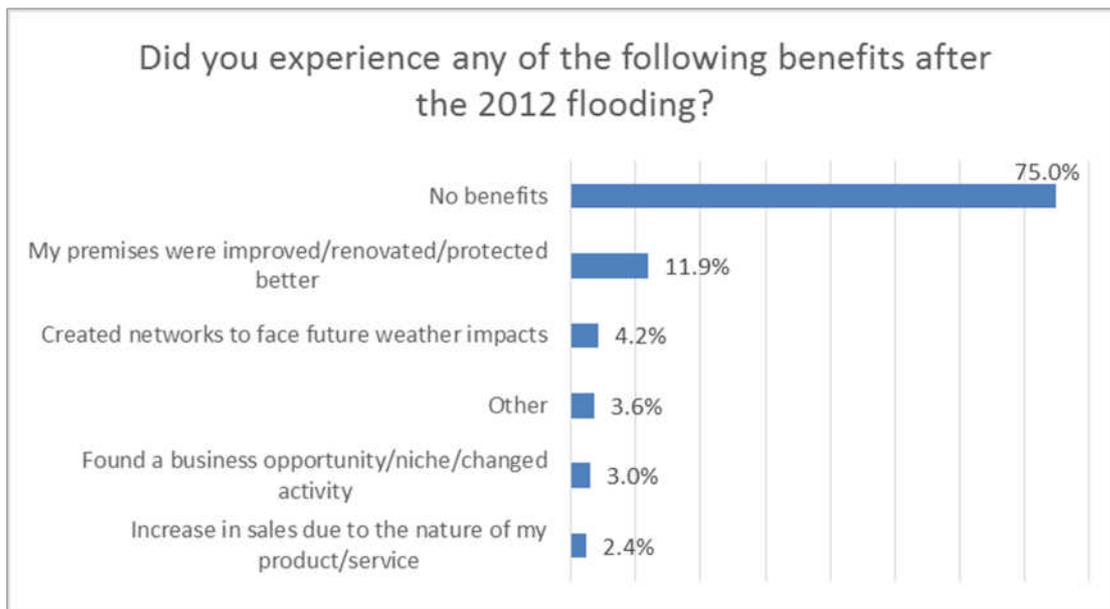
In terms of judging the experience, the majority of the respondents (91.7%) mentioned that on average, experiencing floods have been damaging to their business, while 1% said that it had been beneficial and 8% stated that it had been neither damaging nor beneficial. When businesses were asked how their monthly sales changed in the first month after the 2012 flooding, almost half of the surveyed businesses (47.80%) mentioned that in the first month after the flooding their sales did not change, suggesting they got back to their business and usual trend. While 17.03% of the businesses experienced a 20% decrease of sales, 7.69% a decrease in 40% of sales, and 24.73% reported a decrease in sales of 60% or above.

Figure 7. Negative impact on monthly sales following 2012 floods



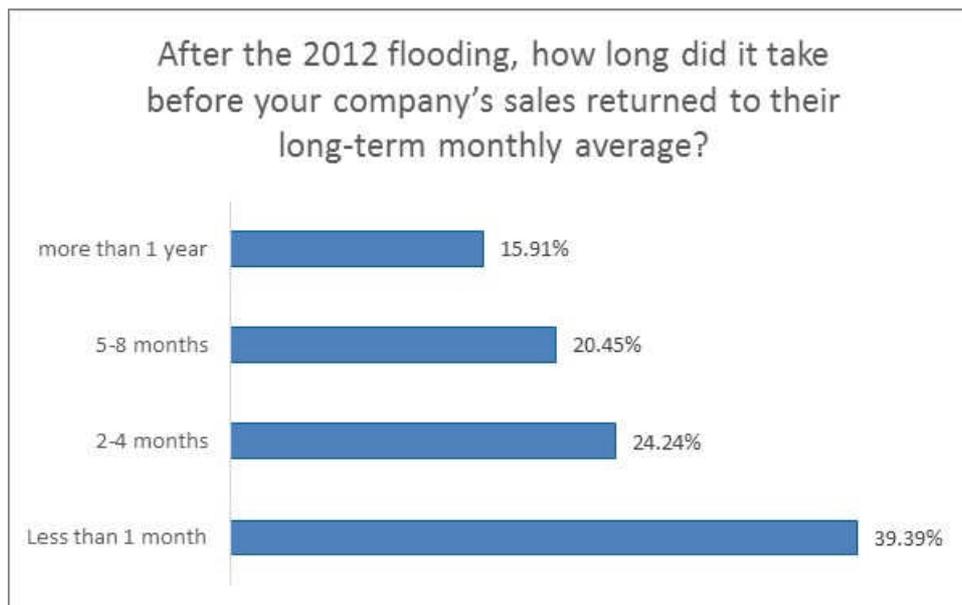
Some businesses have seen certain benefits associated with flooding, however 3 out of 4 of the surveyed SMEs did not derive any benefit, while 11.9% mentioned that their premises were improved or renovated or they are protected better. 4.2% of the firms created networks that could help them to face future weather impacts. A handful of firms (N=5) found a business opportunity or changed activity, 2.4% increased sales due to the nature of their product/service; and a few firms mentioned other “benefits” associated with the floods they have experienced. Among those are: *“As a new business at the time, our competitors were flooded and we weren’t. So increased public awareness of our business and services”*; *“Publicity for business and raising profile in my industry”*; *“Made arrangements to store some of our expensive equipment away from our site particularly in the winter months when flooding risk is higher”*.

Figure 8. Benefits derived after 2012 floods



Out of the businesses that experienced the 2012 floods, 39.39% reported that it took less than one month before their company's sales returned to their long-term monthly average. Meanwhile, 32 businesses (24.24%) mentioned that it took between two and four months. For 20.45% of the firms it took between five and eight months, and 15.91% took more than one year to recover their monthly sales.

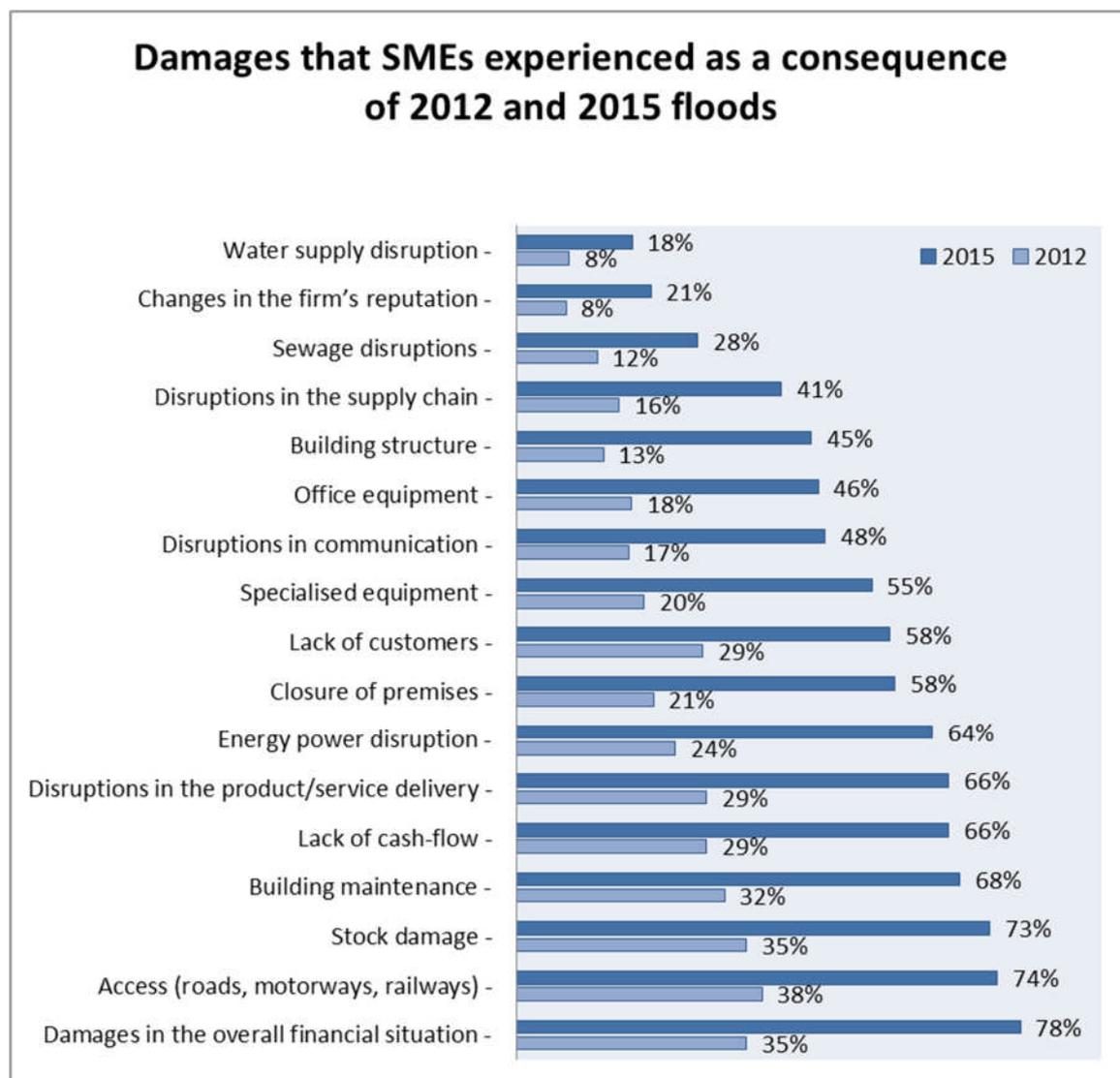
Figure 9. Duration before sales recovered following 2012 floods



Economic impacts of 2015 Flooding

The experience of surveyed businesses following the 2015 flood has been consistent with that of 2012, with the three most common damages reported by businesses being damage to the overall financial situation of the business, damage to public infrastructure, and damage to stock. The rest of the damage types can be seen in the Figure below, where the damage experienced by businesses in 2012 and in 2015 are shown. Differences in the type and the amount of damage can be noted, with the flooding of 2015 showing higher percentages. This reflects the greater intensity of the floods of 2015 compared to those of 2012. The difference in intensity translates as having been around 1.35 times more damages to businesses.

Figure 10. Comparison of negative impacts between 2012 and 2015 floods



The total amount of losses reported by the businesses surveyed is £46,961,625. The average loss per firm (N=254) was £184,888.29. However, this is taking into account 8

businesses which reported total losses above £500,000. Excluding them, the average loss per firm was £46,786 (Std. Dev. of £78,968).

Comparing the average losses reported with the 2012 flooding (£26,098.35), we found that it almost double (49.4%) the average losses with the 2015 flooding.

Table 6. Breakdown of losses by type

Concept	N	Mean	Trimmed	Std.Dev	Total value
Business interruption/loss in trade	206	£ 27,967	£ 13,563	£ 76,523	£ 5,761,204
Business equipment	190	£ 33,167	£ 10,789	£ 159,805	£ 6,301,807
Stock	174	£ 20,740	£ 8,206	£ 75,649	£ 3,608,709
Work in progress	50	£ 10,827	£ 5,964	£ 29,449	£ 541,340
Structural building	86	£ 333,023	£ 26,100	£ 2,591,445	£ 28,640,010
Staff wages	76	£ 9,373	£ 7,339	£ 13,822	£ 712,325
Utilities repairs	64	£ 2,827	£ 2,317	£ 3,711	£ 180,906
Cleaning up	181	£ 4,042	£ 1,962	£ 15,818	£ 731,692
Legal professional fees	26	£ 4,099	£ 1,635	£ 12,626	£ 106,580
Other estimated monetary losses	43	£ 8,769	6225.27	16015.458	£ 377,052

The total annual turnover of the surveyed firms is £399,158,352. If we consider that the total losses reported are £46,961,592.11, this represents a loss of 11.8% of their annual turnover.

Losses by size of the business

In terms of the losses by size of the business measured by the number of employees, results show that the average total losses were higher for those firms that have more than 20 employees. The more employees, the bigger the business and the bigger the losses. However, looking at the average monthly sales for each cohort we found that the amount of losses are almost twice as high (1.95 times) for businesses with less than 4 employees than for businesses with more than 20 employees. Similarly, in terms of sales recovered after the 2015 Boxing Day flood, on average businesses with less than 4 employees have recovered only 45% of their sales, in comparison to 66% of sales recovered by businesses with more than 20 employees.

Table 7. Losses of the floods by size of the business

	Monthly turnover and wage bill			
	Turnover		Wage bill	
0-4 employees	£	5,972	£	1,450
5-9 employees	£	341,756	£	158,962
10-19 employees	£	186,031	£	15,363
More than 20 employees	£	478,640	£	100,387

Amount of losses vs. monthly turnover		Recovery of sales and total losses		
0-4 employees	271%		Recover of	Total losses
5-9 employees	20%		sales	(trimmed
10-19 employees	61%		(mean)	mean)
More than 20 employees	75%	0-4 employees	45%	£ 16,173
		5-9 employees	54%	£ 70,013
		10-19 employees	62%	£ 112,637
		More than 20 empl.	66%	£ 358,332

Losses by economic activity

12.5% of the surveyed businesses have laid off employees as a result of a flooding event, and 11.8% firms (N=33) mentioned they are considering laying off a total of 124 employees in the next 3 months. This would represent a loss of around £2,265,001.65 which is 1.8% of their annual wage bill.

Table 8. Breakdown of losses by economic sector

Sector	N	Sum of all losses by sector	
Agriculture, forestry & fishing; mining & quarrying; electricity, gas etc; water supply, sewerage, waste management etc	1	£	65,000
Manufacturing	30	£	7,885,918
Construction	12	£	431,100
Retail and Wholesale	77	£	6,715,643
Repair of motor vehicles and motorcycles	9	£	278,250
Transportation and storage	3	£	94,800
Accommodation & food services	17	£	1,254,510
Information & communication	3	£	6,270
Financial & insurance	2	£	16,380
Real estate activities	8	£	564,200
Professional, scientific & technical	5	£	149,200
Administrative & support service	3	£	279,800
Education (local units)	7	£	129,054
Health (local units)	4	£	127,750
Arts, entertainment, recreation & other services	73	£	28,963,717
Public administration & defence			

We calculated the amount of lost sales to the businesses that had not fully recovered at the time of responding the survey as: £7,087,948. As seen in table below, the sector that has been hit worst on average is the Retail and Wholesale sector, followed by the Manufacturing sector. The only sector that reported net gains is the construction sector. This is understandable as demand for reconstruction is high in the aftermath of a disaster (See case study).

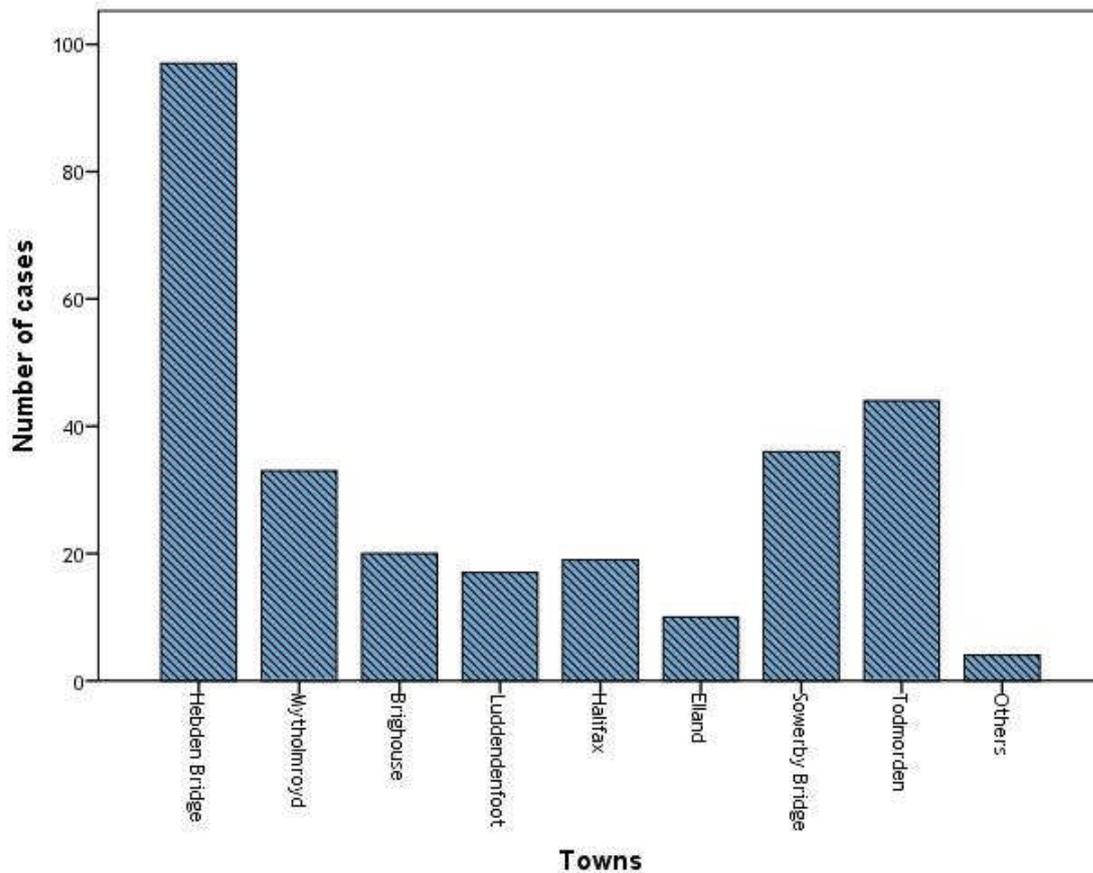
Table 9. Mean of losses in sales by economic sector

Sector	Total loses in sales (mean)	Total losses in sales (per month)
Manufacturing	£ 222,395	£ 2,446,346
Construction	-£ 27,283	-£ 136,413
Retail and Wholesale	£ 151,349	£ 3,985,533
Repair of motor vehicles and motorcycles	£ 5,869	£ 15,650
Transportation and storage	£ 58,350	£ 58,350
Accommodation & food services	£ 21,609	£ 144,058
Information & communication	£ 397	£ 529
Financial & insurance	£ 4,375	£ 2,917
Real estate activities	£ 22,146	£ 59,057
Professional, scientific & technical	£ 25,500	£ 42,500
Administrative & support service	£ 30,167	£ 30,167
Education (local units)	£ 3,238	£ 5,396
Health (local units)	£ 88,750	£ 118,333
Arts, entertainment, recreation & other Ss	£ 12,293	£ 315,525
Total	£ 619,155	£ 7,087,948

Losses by town

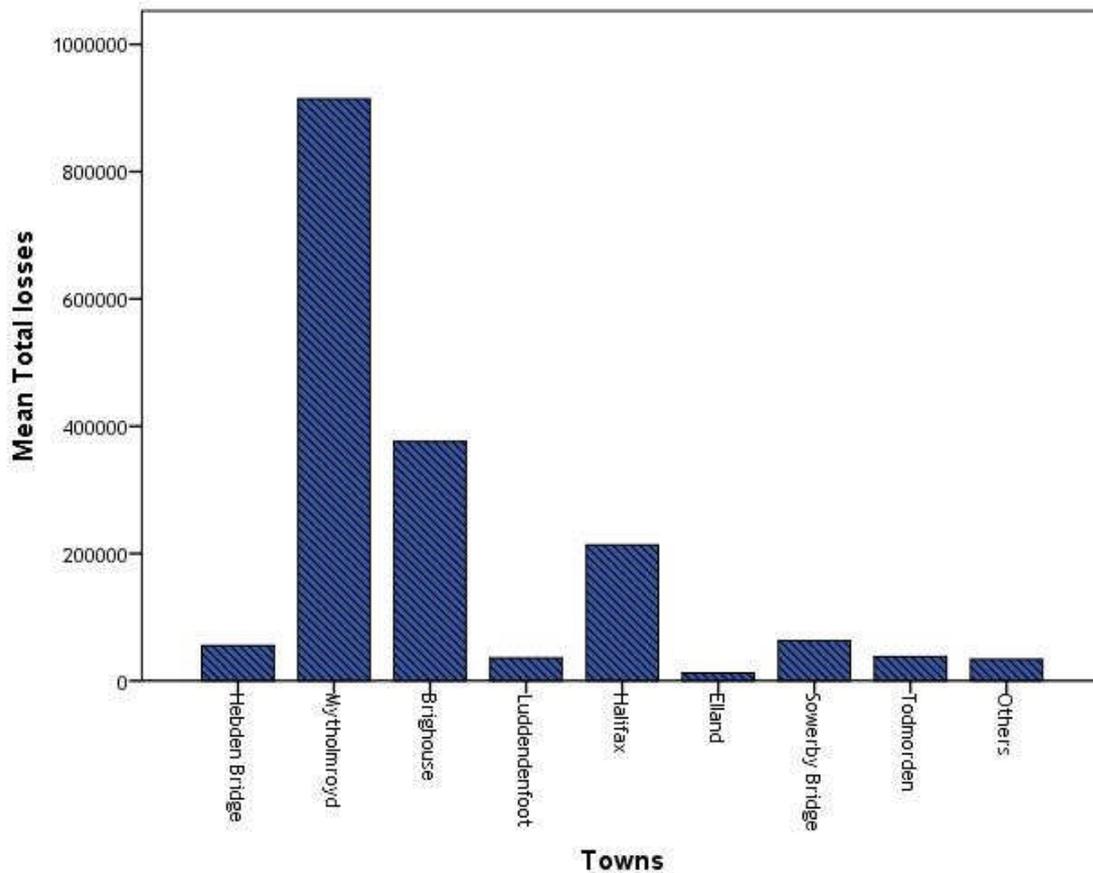
Looking at the total number of cases by the surveyed businesses by town, results show that the sample has more cases reported in Hebden Bridge (N=97), followed by Todmorden (N=44), Sowerby Bridge (N=36), and Mytholmroyd (N=33). The rest show a smaller number of cases.

Figure 11. Number of businesses reporting losses by township



Regarding the total losses reported by the SMEs, the figure below shows that Mytholmroyd had on average the highest losses, followed by Brighouse and then Halifax, reflecting the location of the larger industrial employers within the borough.

Figure 12. Average total losses by SMEs by township



Impact of the losses on the economic area

We used an input-output table of the Calderdale and Kirklees region to calculate effects on the wider economy associated with the losses suffered by businesses across the area. Input-output analysis is useful when conducting an impact assessment, as it allows the estimation of the multiplier effects caused by such losses throughout the economy. We calculated the trimmed means of the losses reported by the surveyed businesses (in order to exclude outliers), including their losses in sales. In order to estimate the total losses of the 1,000 firms which were assumed to be affected², we multiplied these means to the sector shares of the existing business population. Based on the results of the input-output analysis, we found that the total economic losses rose to a total of £169.54 million including direct and indirect effects. This figure represents 1.06% of the total output of £15,978 million for the Calderdale and Kirklees region (ONS). It is worth noting that for every £1 reported in direct losses, another £0.62 were lost indirectly throughout the economy in the area.

² Our assumption of having 1,000 affected businesses in the whole area follows the updated information provided by Calderdale Council’s Business Team, which by 31st March had received 971 grant applications from flood affected businesses.

The GVA of the business sector in Calderdale and Kirklees in 2012, according to the ONS, was £867 million. Thus, the total reported losses (£46.96 millions) account for 5.4% of this GVA in Calderdale and Kirklees.

Business recovery

76.79% of the surveyed businesses mentioned that they have recovered two quarters of their sales (39.97%) compared to the same period last year (N=215, Std. Deviation=35.55). Three out of five businesses have recovered 50% of their normal sales. With the floods of 2012, for 24.2% of the surveyed businesses took between 2 and 4 months to recover their long-term monthly average sales; if we consider that 46.4% of the surveyed businesses are not fully operational yet, then it is taken the double amount of time to the businesses to recover their monthly average sales with the 2015 flooding.

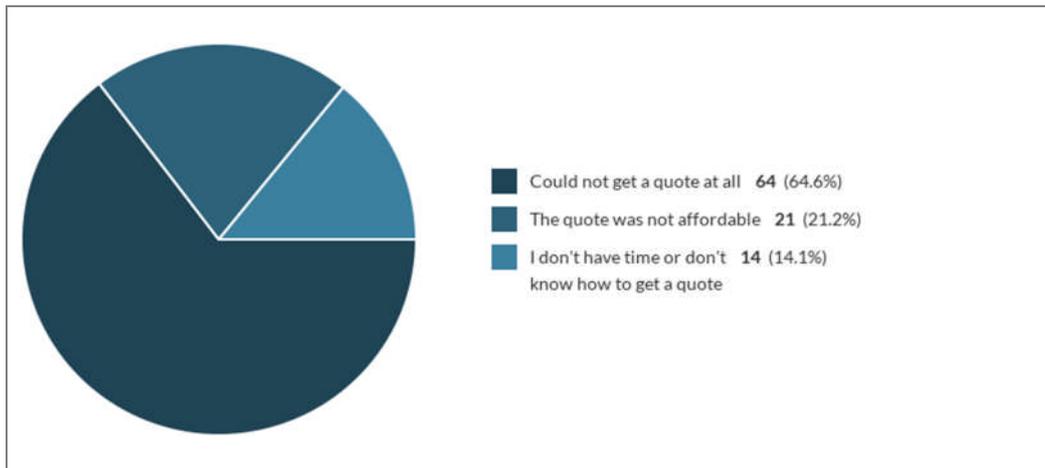
Three out of five businesses (59.6%) have at least one type of insurance. The items that are more insured are: business equipment, stock, and business interruption. The rest is shown below.

Figure 13. Type of items insured by businesses



13.6% of the surveyed businesses (N=34) had an insurance excess that was so high it has not been worth submitting a claim. The main reasons stated for insurance being unaffordable were what businesses considered excessive or very high premiums. The average insurance quote which was not affordable for 7.1% of the surveyed businesses was £7,576 (excluding one firm which stated that the quote was around £1,000,000). Businesses were given the opportunity to state if they wanted to say something about issues with insurance, the box below portrays those concerns.

Figure 14. Reasons stated for lack of insurance



Businesses were asked if they have been damaged by the flooding, which type of external support have received to recover. 70% of the responses (N=195) mentioned have received a grant aid from local or central government, followed by business rebate (43%) and advice from Council of business support organisations (42%).

Figure 15. Details of external support received to help with business recovery

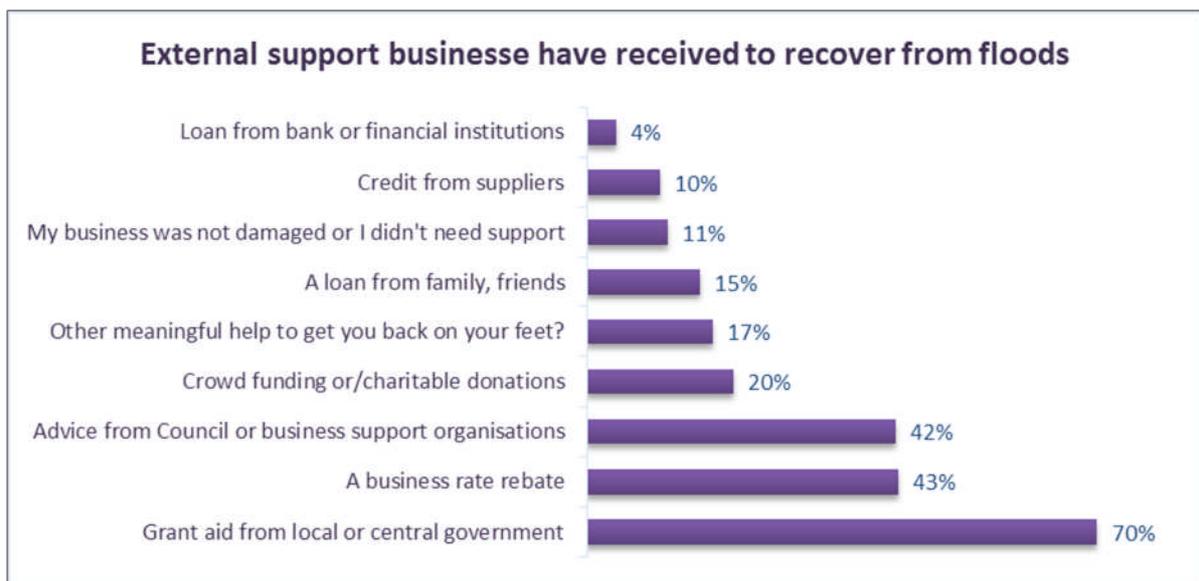


Table 10. Summary of businesses' concerns in relation to insurance

Respondents were asked to say something about their insurance issues. The general summary from the responses to this question is that there is a mixture of emotions surrounding how insurance companies have dealt with businesses in the debatable flood zones. Those emotions range from outright anger at the treatment by insurers, due to either not offering flood insurance, hiking up the premiums or excesses beyond viability, through to surprise at not getting paid out despite having paid higher premiums.

"I think it's disgusting that in this day and age you can't get insurance on a property because it's in a flood zone - I paid extra because it's in a flood zone and still floods are not covered"

The overriding concern throughout this and the previous survey by the UCVR is of the likelihood of not being able to get any flood insurance in the future. This of course has a number of effects: The uninsured have to become self-insured, which for many experiencing further flooding could mean the loss of the business altogether. It also means that trying to sell on a business that can't get insurance is likely to be at a loss, if not impossible.

"Inability to get insurance devalues my business and will close my business if my premises is affected again"

"I have been informed that going forward we may not be able to get flood insurance. If this is the case then this may seriously jeopardise our ability to continue in business at our site"

Business owners have also expressed their frustrations at the time in which it takes for insurance companies to address their claims. 6 weeks for one and 9 weeks for another. Some have also found that having waited so long, exclusion clauses were implemented, denying payments.

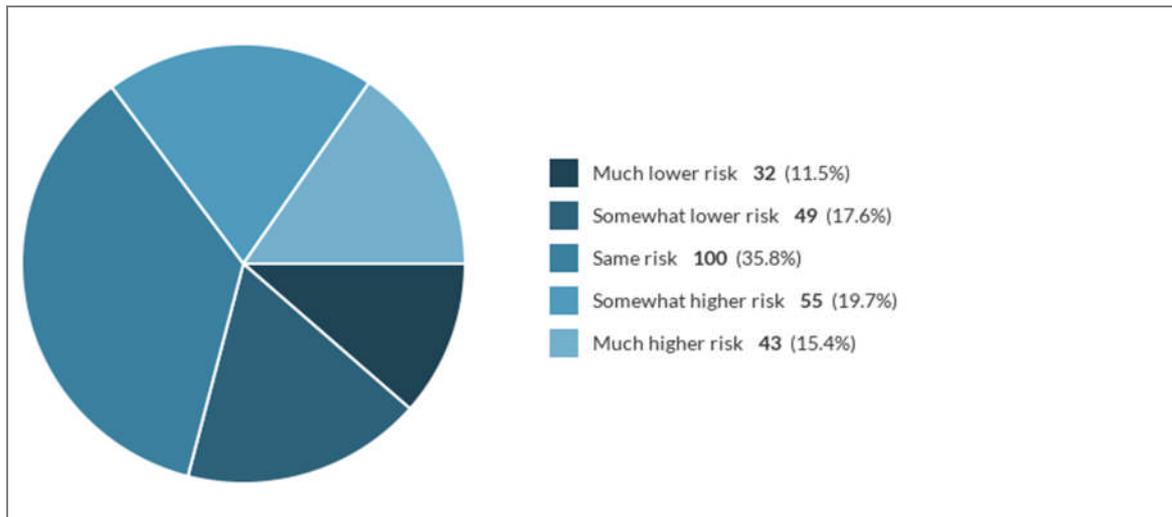
There are a number of respondents who say that even though they have had no flooding or minimal flooding, that they too have either been denied insurance or loaded with higher or excessive premiums.

"I think it is deeply unfair that even though our business was not flooded, i.e water did not enter the property apart from a small amount in the cellar, and we have been told by our landlords it did not flood in 2012, our postcode is black listed"

Of all of the comments made in this section we can only find one which stated satisfaction with their treatment by insurers. It's fair to say that people used to feel insurance meant security, but the sentiments expressed by respondents here suggest much more of a strong feeling of insecurity now for businesses, jobs and therefore the local economy.

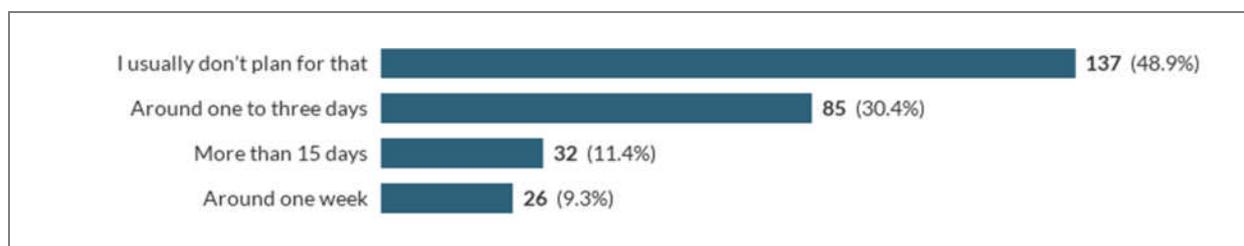
When asked firms to assess the probability of going out of business because of the impact of a flood. Around a third of businesses surveyed (35.8%) estimated that their business was at the same level of risk as similar businesses to their own. Around 15% think they are a much higher risk of going out of business following a flood event, and just 11.5% consider themselves at much lower risk.

Figure 16. Risk of insolvency following flooding as assessed by each business



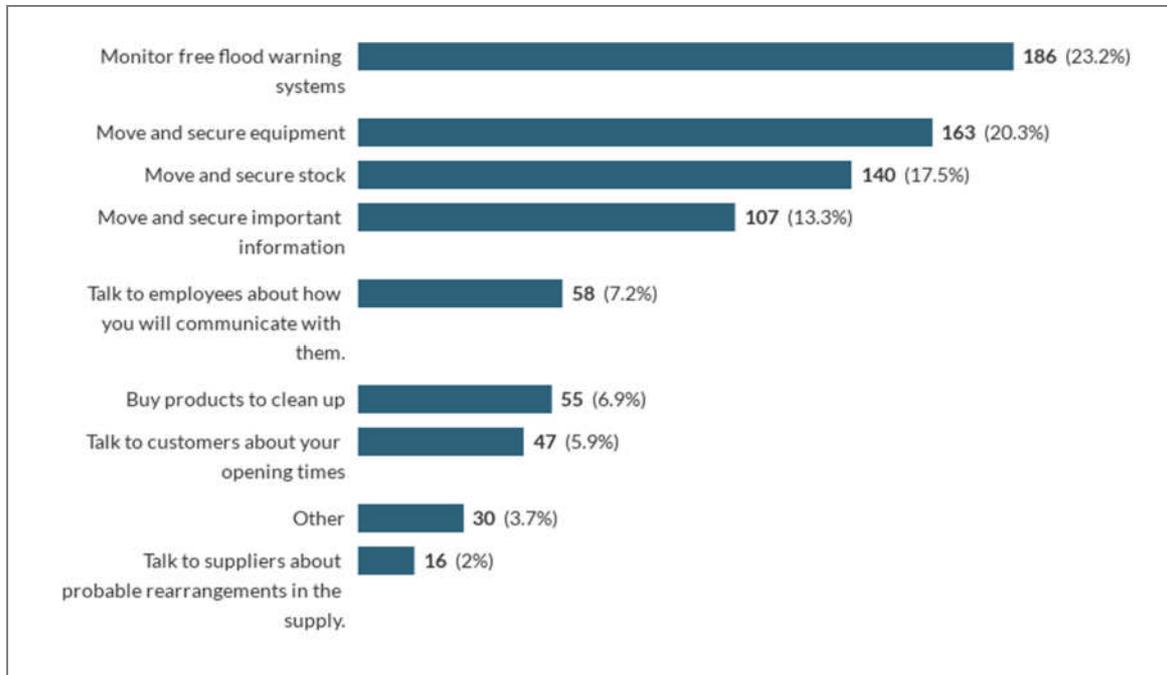
Almost half of surveyed businesses (48.9%) do not set aside time for planning for flooding. 30.4% spend between one and three days per year on flood planning, with just 9.3% investing around a week on planning for future flood events.

Figure 17. Level of businesses planning for a flooding event



Businesses surveyed tend to take limited measures to protect their business before a flood, with less than a quarter (23.2%) monitoring free flood warning systems and just 13% moving and securing important information in advance of a flood. Slightly more take steps to move and secure equipment (20.3%) and stock (17.5%), but less than 10% of businesses take other measures such as discussing arrangements with employees, customers or suppliers.

Figure 18. Actions taken by businesses in preparation for flooding



Case studies

The following section presents some examples of SMEs worst affected by the flooding and how they have reacted, coped, or not. No case study can convey all the human emotions involved or the psychological effect many business owners and staff have had to deal with following such an event. This has been especially difficult and worrying for many businesses experiencing serious flooding for the second time in 3½ years. Staff from several agencies speaking to business owners have become acutely aware of the need for some level of support and possibly counselling to be available following such events.

Direct Economic Effects - Case study

Sue Slater, Proprietor, Hairdressers

Sue's Salon "Headquarters" in Mytholmroyd was deluged by 8 feet of water. This case study was taken from "Business as Usual?" on the UCVR website <http://floodstories.ucvr.org.uk/>

"Town revival must start now", says Mytholmroyd business

“While customers are sympathetic to businesses affected by the floods, they can’t always wait for normal service to be resumed. When they start buying elsewhere, it can be hard to win them back”.

“If you can’t respond to their needs very quickly you may permanently lose your customers”, explains Sue Slater, who opened Headquarters Hairdressers in Mytholmroyd 33 years ago.

“It’s given me a good living and I’ve met some wonderful people,” she says. “Many of my clients have stayed with me from the beginning. They’re now in their 80s or 90s and their hair appointments are part of life. For some of them coming once a week to me is the only contact they have with the outside world.”

“The salon was flooded in 2012 but this time was different. The damage was totally devastating,” explains Sue. “More than five feet of water. There’s structural damage, and the water had taken a window out. Everything is contaminated. The community spirit has been fantastic. People have cleared out everything they can – but there is nothing to save. This time I seriously doubted I could open up again.”

With an estimate of up to three months for repairs, Sue cast around for options. The owner of Hair World, a larger salon up the road, offered Sue a chair there as a temporary measure.

With a comb and a pair of scissors, Sue can operate from just about anywhere, but it’s the effect on her overall business that’s worrying her.

“I lost my client database and appointment book,” she says. “I’m having to try to remember what services my clients have because all those records are gone. Keeping in touch with as many of my clients as I can is my priority. If not, they will go elsewhere. There’s absolutely no point opening the salon again if 30 years of clients go elsewhere.”

For many businesses in flood-devastated Mytholmroyd, things are no better at home.

“While trying to sort out my shop, we were also helping a 94-year-old relative whose home was under water. We took her in for a couple of nights, but our stairs are too much for her, so we had to sort out other accommodation for her. We’re also clearing out the flood-damaged stuff from her house. I know I’m not alone with this because so many other businesspeople are coping with flooding that affects their homes and families too.”

As a member of Royd Regeneration, Sue was instrumental in setting up the Mytholmroyd Business Networking Group. The group had a well attended launch and follow-up meeting last autumn.

“We have to do everything we can to keep these businesspeople working together,” Sue says. “We probably have more businesses in Mytholmroyd than anywhere else in the valley, but they’re not so visible, as many are on trading estates.”

Sue believes it’s vital to do everything to show that the town is surviving and will find a way through.

“There’s a real risk we will be left with derelict buildings. Mytholmroyd will become a ghost town and people will drive straight through. If people see boarded-up empty premises, they won’t stop here. So we have to get our high street up and running as soon as possible.

“We’ve survived flooding before, but this time was such a shock. You can’t blame anyone who decides to give up, but that would be such a shame because the community spirit is amazing and people are trying their hardest to revive our town,” she says. “But we can’t do this properly without a very serious injection of funding.”

Indirect Economic Effects – Case Study

Fitton & Co, Accountants.

We have seen that one in four SMEs are totally reliant on trade within the borough of Calderdale. The following case study is just the proverbial tip of an iceberg, showing how businesses not directly affected by flooding can have their income disrupted by being reliant on local business to business trade.

Fitton & Co are a small firm of Chartered Certified Accountants based in Hebden Bridge. The senior accountant, Richard Fitton, responded to the original UCVR survey expressing his concerns that, whilst they were not directly affected by the flooding, he expected there to be a cost to his business from lost clients.

Since then Richard says they have “not yet lost any clients but some are clearly struggling and they may well lose some during the next financial year. The average cost of lost income from one end of year accounts could be around £800”.

Fitton & Co also felt that they should help to share the financial burden of their directly affected clients and other local businesses. They are generously offering a 25% flood victim discount off their annual cost of accountancy services for one year to assist clients and prospective clients in need. Several clients have already taken up the discount.

Clearly there is a financial impact to discounting as well as potentially losing clients.

As a result of flooding elsewhere, another accountant has moved closer to Fitton & Co and this may also have an effect on their local client base.

In summary this is an example of how many businesses that are not directly affected by the flooding can also suffer an economic impact on their trade.

Positive Economic Effect – Case Study

Mytholmroyd Builders Merchants, proprietor Ken Giles

The business supplies building materials to householders and small businesses locally, with a store located on Burnley Road in Mytholmroyd. The premises were badly flooded on Boxing Day, but Ken’s team were back at work the next day, clearing mud and debris from the store, disposing of damaged stock and salvaging what could be cleaned and dried out. Customers immediately started calling at the store, needing supplies of sand bags and building materials, tools and equipment to start the clean-up and repair of their homes and businesses. As well as helping customers where they could, Ken’s team helped with the clean-up of several premises nearby and provided materials and vehicles for the army who were shoring up nearby flood walls.

The business suffered some losses in stock and lost all their IT equipment leading to problems initially with accounts information etc. The business was insured but the claim is still awaiting settlement.

Since the flooding business has been very busy, with turnover in the first 3 months of 2016 roughly double its normal level for this time of year, as the store continues to meet the local demand for building materials from local builders and householders working hard to repair their flooded properties. This business is therefore unusual as despite having suffered major flooding, it experienced little loss in trade and a substantial growth in sales since Boxing Day.

Ken commented “We were keen to support the local community and our customers however we could, which is why we had to get up and running straight away. Business has been good since New Year, but we are worried about the long-term future of Mytholmroyd and our local customer base.”

Anonymised Case Studies

Below are a range of companies, mainly in manufacturing which employ significant numbers of people in the borough, some of which are at serious risk or have already folded.

<p>Company A Manufacturing – Employees c30 Already paying 5 million in insurance, this company’s premises were totally under water. All production equipment was put out of action. This firm predicted weeks of lost production whilst machinery is repaired or replaced. The Management are confident they will recover but concerned about further flood risks and the increased cost of insurance premiums. They are looking at the Local Enterprise Partnership’s flood recovery funding.</p>	<p>Company B Equipment Installation – Employees 10-15 This company was severely flooded with structural damage to their building leaving no storage for stock. The flooding has put this business at severe risk together with the jobs of its employees. They are considering redundancies.</p>
<p>Company C Textiles – Employees 10-15 This company was severely flooded with most machinery damaged. Continuing production from temporary site with associated rental costs. Whilst the management are confident of being able to recover. They have serious concerns about their own site being flooded again in the future.</p>	<p>Company D Textiles – Employees c20 This firm was severely flooded and was unable to get flooding insurance since 2012 flooding. Management are confident they can recover but expect to have to lay off staff or make redundancies. Stock losses c£200k. There are serious concerns about future flooding due to proximity to river.</p>
<p>Company E Manufacturer - Employees c100 This firm was severely flooded with serious damage to machinery. The premises suffered structural damage. The</p>	<p>Company F Importer, Manufacturer and distributor - Employees c65 Another severely flooded business at risk of full recovery. Total stock losses but</p>

<p>management resolved to adapt and were back in production by the end of January. Insured damages amounted to around 1 million pounds. However, as with others in Calderdale there is concern that becoming uninsured or having to meet much higher premiums may become the critical success factor in long-term recovery and sustainability of this business. The total element of their uninsured losses amounts to c£120K</p>	<p>management and staff working hard to rebuild a future for the company. Once again this is a company that fears the potential for not getting insured at the current site.</p>
<p>Company G Manufacturer – Employees c80 Their site was completely flooded with all production machinery lost and administration departments destroyed. Machinery is a specialist type and will take six months plus to replace. This time the insurers will pay but as this could be several millions, this is another firm which is seriously concerned about getting insurance cover for flooding. They already fear losing clients to competitors during the period of recovery. At the moment they are looking at minimal job losses. The management are seeking to apply to the LEPs flood grants.</p>	<p>Company H Manufacturer – Employees c100 Flooding destroyed all plant on site and most of the stock in hand. Insurance will cover this running at around 2 million pounds. The management are considering possible relocation of the business within the borough.</p>
<p>Company I Manufacturer – Employees c20 Flooding caused major structural damage to premises. Part demolition has been undertaken. The whole site is under review, and may not be reusable. The risk to this business continuing is severe as they can't find an alternative site. Management are seriously considering whether they can continue in this business.</p>	<p>Company J Food Processing – Employees c100 This firm's site is unoccupiable and their insurance claim will run to several million pounds. Some production has been moved out of Calderdale and the management are considering the long term viability of staying in Calderdale.</p>
<p>Company K Warehousing and Distribution - Employees c100 This company has suffered major financial losses from damage to machinery and buildings amounting to over half a million pounds at the end of January. Once again there is considerable concern about the potential to be uninsurable putting the business viability at serious risk. 10% (Temporary staff) have been laid off.</p>	<p>Company L Training provider – Employees c55 Their main building was flooded by around 4" of water which contaminated their offices and training room which are still drying out. Another site was flooded by around 6 feet of water which has damaged the inside of their building. Local infrastructure problems caused by flooding is causing access issues and loading and unloading. This firm has been assessed as being at medium risk of closure.</p>

<p>Company M Manufacturer – Employees c 30 The entire ground level site of some 3 acres was submerged in 2-3ft of water both inside all factory buildings, offices and outside in the yard. The sludge and residues left behind on the floors, walls and plant & equipment had to be professionally cleaned and sanitised. All affected plant, machinery, electrical panels and IT equipment submerged in water have had to be refurbished, replaced or restored by specialist companies. All damaged stocks of finished product, packaging and raw materials has had to be disposed of and replaced where possible. They are back into full production now after weeks of outsourcing.</p>	<p>Company N Fabricator – Employees c10 This firm were severely flooded with up to 5 feet of water. This company has shown impressive resilience, taking immediate steps to ensure continuation with various resilience measure put in place, such as hoists for stock and raising electrical supplies. They were at 95% production within weeks. They are however still considering relocation.</p>
<p>Company O Trade Supplier – Employees c70 This firm was badly flooded and they lost vehicles, equipment and 80% of their stock. The premises also has water damage. Whilst they will get the majority of their stock losses and machinery covered by their insurance it will take time to replace equipment. Vehicles were not insured new for old so this will be a large expense. Insurance was taking time to be settled but estimates were that they would be back to normal by mid-April.</p>	

Conclusions

This report presents an economic impact assessment of the Boxing Day 2015 floods on SMEs. The level of flooding was unprecedented and caused a considerable impact on the regional economy. The total estimated cost to the region amounted to nearly £170 million, with average losses per firm of around £47,000. Moreover, approximately 17% of businesses are still unable to open three months later.

The effects of the flooding have been felt by all sizes of business, with the smallest businesses (mainly in the retail sector) suffering heaviest losses as a proportion of turnover, whilst larger (mainly manufacturing) firms, employing significant numbers of local people, having suffered major financial losses. Some businesses have closed permanently as a result of the flooding, and with many others facing an uncertain future, the impact of the Boxing Day flood will continue to be felt for some time.

Now, a window of opportunity has emerged to ensure that we can limit the impact of similar disasters in the future. This research highlights areas where assistance is needed: direct efforts to smallest firms; additional support for a swifter recovery; government intervention to ensure affordable insurance is available to all businesses at risk; help with the implementation of measures to protect businesses from future impacts; and incorporate measures into core development planning and investment decisions to reduce risks.

Action needs to be taken to minimise the risks particularly in the face of climate change. Extreme weather events, like the December 2015 floods, are predicted to become more frequent, intense and uncertain. The Calder valley is prone to those risks. Our research shows that with a more intense flood event, like the 2015 flooding, direct losses doubled as well as the time businesses take to recover. If businesses cannot cope with climate related events, then it is more likely that damages across society will escalate and capacities will erode. More research is urgently required to be able to provide specific recommendations to make businesses more resilient and sustainable in the long run.

Annex A: Project design and methods

Ethics:

The work presented here complies with the individual professional requirements and codes of practice of CMBCBT, UCVR and University of Leeds. Likewise, it complies with the Social Research Association's Ethical Guidelines. The University has research and data management policies, particularly in relation to personal data and stakeholder engagement. The research was undertaken following those guidelines and all its work also comply with the University of Leeds policy on research ethics.

Sample size formulas applied:

$$n = \frac{Z^2 p(1-p)}{c^2}$$

Where n is the sample size, p is the percentage of participants picking a choice, and c is the confidence interval. The value of p is usually set at 0.5 to ensure a general level of accuracy.

The sample size is often corrected for finite populations, according to the following formula:

$$n_{corr} = \frac{n}{1 + \frac{n-1}{pop}}$$

Calculations of the losses:

The direct losses to the surveyed businesses were calculated as a sum of the losses reported in the survey. These figures represent the sampled businesses. We used these figures to estimate the losses suffered by 1,000 firms which matches the numbers in the database collected by the Calderdale Council regarding businesses that had requested a recovery grant. We took into account the sectoral distribution according to the ONS.

Losses in sales were also calculated using the percentages reported by businesses in the survey (how much of their sales have recovered so far) and their annual turnover (also reported). Once again we used these numbers to estimate the loss in sales for the 1,000 businesses.

Finally, we also took into account the losses derived from laying off employees, as reported by businesses in the survey.

Input-Output Analysis:

Input-output analysis (IOA) has been broadly used as a methodological tool to conduct economic impact assessments. It is a useful method to examine the wide economy implications of changes that take place in any area of the economic system. In the context of this research, IOA can help us estimate the economic impact on total output derived from the losses suffered by businesses due to flooding.

IOA is based on the use of an input-output table, which shows the structure of an economy. The columns represent the inputs into each economic sector, while the rows represent the various outputs from such sectors. In its standard form, final demand is exogenous, so a change in demand would lead to a change in output.

In order to produce an IO table for the Calderdale region, the national IO table for the UK was scaled down using GVA data for the Calderdale and Kirklees area as provided by the ONS. Additionally, it is assumed that the regional economic structure is similar to the national structure.

In standard IO notation, total output (X) is given by:

$$X = (I-A)^{-1}Y$$

Where the A matrix shows the structure or technological arrangements of the economy, I is an identity matrix and Y stands for final demand. The term $(I-A)^{-1}$ is known as the Leontief inverse, otherwise expressed as L. Each coefficient in this matrix constitutes a multiplier, which indicates how much output is required directly and indirectly to satisfy one unit of Y for each sector. Hence, if Y changes then X also changes according to the weights given by the Leontief matrix (L), as seen in the following equation:

$$\Delta X = L \Delta Y$$

In relation to this particular study, the floods caused losses in business via damages or lost revenue, which consequently influenced final demand. These losses, in turn, had an indirect effect on the rest of the economy. IOA, in this sense, allowed determining the magnitude of the wide economy effects (direct and indirect) in the Calderdale region.

Annex B: UCVR 20145/16 Survey and graphs

Upper Calder Valley Renaissance Business Flood Impact Survey (immediate needs) Conducted between Dec. 28th 2015 – Jan. 9th 2016

Please Provide Business contact details below

Name, Business, Email Telephone No.

How have you been impacted by the floods?

Loss of:

Income?

Staff?

Premises?

Stock?

Records?

IT Equipment?

Other_____

What are your immediate needs?

e.g. Insurance advice, workmen, data recovery, legal advice. Please tell us your priorities

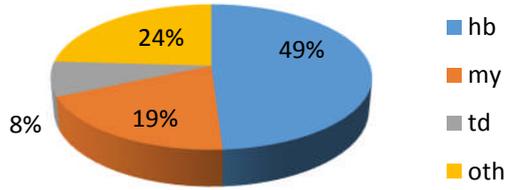
How long will it take to re-establish your business?

(Weeks? Months? Won't be able to?)

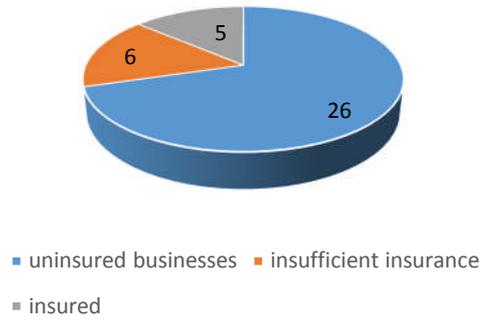
Please tell us anything else you think will help you recover from the floods.

Graphic representation of results:

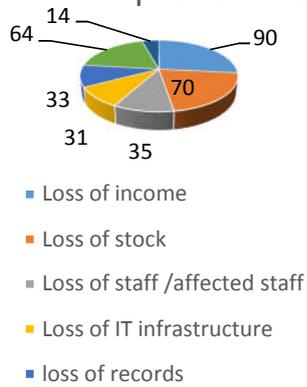
Breakdown of responses received



Insurance gap



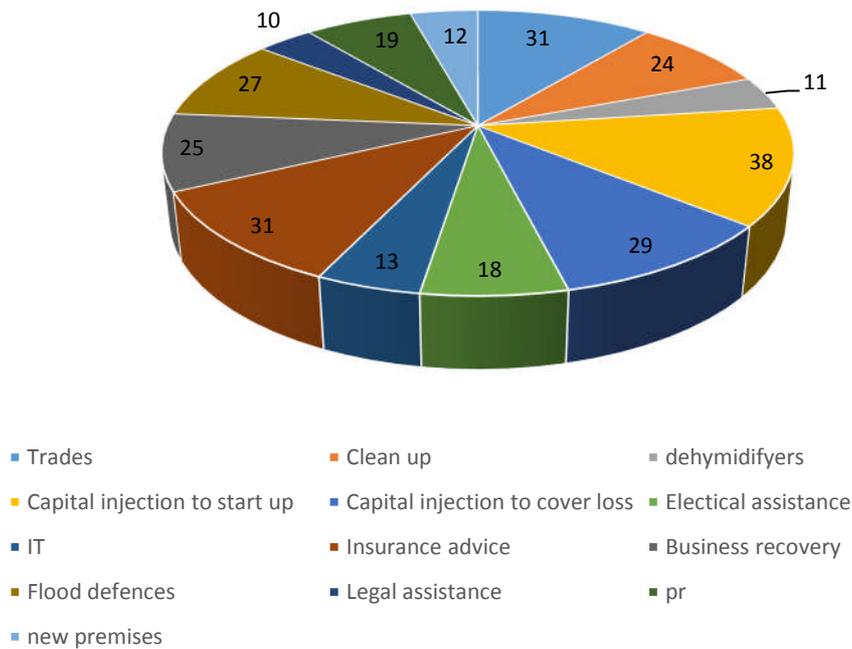
Impact of flood



Est length of time businesses to re-establish



Identified requirements



Annex C: Acknowledgements

The support of the Economic and Social Research Council (ESRC) is gratefully acknowledged. This work was part funded by the ESRC Centre for Climate Change Economics and Policy. We would also like to thank Marco Sakai from the Centre for Industrial Energy Materials and Products (CIEMAP) for providing the input-output tables. Leah Bennett of Leeds University Business School for her support and diligence in assisting the UCVR to approach the University for research time and personnel.

Photos:

On Front Cover - Stephen Curry

In Introduction - Jade Smith

Annex D: About the authors

About Paola Sakai

Paola is a research associate of the Climate Change Economics and Policy (CCCEP) and a research fellow at the Sustainability Research Institute at the University of Leeds, where she obtained her doctorate degree. She obtained a BSc in Business Administration and second BSc in Economics. She also has a Diploma in Stock Finance and another one in Budget and Planning. Paola's work focuses on climate change resilience, adaptation and mitigation issues. Paola's PhD investigated the extent to which small and medium size enterprises (SMEs) are able to face climate change. She assessed the vulnerability and resilience of this type of organisations by combining a mixture of quantitative and qualitative methods. Since completing her PhD, Paola has been involved in the ICAD project, investigating climate change adaptation and resilience of the UK water sector, and also the use of climate information for adaptation in this sector. In addition, she is part of the Climate Smart Cities team, led by Prof. Andy Gouldson, where she was a contributor of the study 'The Economics of Climate Change for Lima, Peru' where she modelled the transport and waste sectors and proposed measures to reduce CO2 emissions at a city scale. Paola has a wide experience in the private and public sector, having previously worked for the Mexican government and for private consulting companies. She has been a teaching fellow at the Faculty of Economics in the National Autonomous University of Mexico since 2004. E-mail: P.H.M.D.Oca@leeds.ac.uk

About Upper Calder Valley Renaissance (UCVR)

The Upper Calder Valley Renaissance is a community based social enterprise with a history of regeneration projects going back over 12 years. The UCVR works by creating and supporting teams for specific projects. The current chair, and lead for the UCVR on this

impact survey project is Stephen Curry, who runs a small business in the Upper Calder Valley. He has been the link with all the business networks involved in the flood recovery team. Stephen's understanding of the needs of SMEs come from establishing and running four small businesses in 35 years. He is active in the community on a number of levels. As well as the UCVR, he has been a director of the Hebden Bridge Partnership since 2013, and a member of the Todmorden Civic Society. In line with the remit of the UCVR, Stephen initiated and has led the valley wide Business Flood Recovery Team which brokered this collaborative project between Calderdale council and Leeds University, where he is currently doing his Master in Business Administration.

About Calderdale Council Business Development team

Fiona Thurlbeck is Head of Business and Skills in the Directorate of Economy & Environment for Calderdale Metropolitan Borough Council.

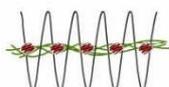
The Business Development team provides a variety of services to all types of business in Calderdale, from start-ups to large established enterprises. A small team of business advisers is dedicated to providing help and advice on a range of issues from funding and grant opportunities to trading standards, export and business premises. The team supports local businesses who are aspiring to grow, become more competitive and develop new products by advising on support packages for business to help them achieve their ambitions. Businesses planning to recruit apprentices are also supported to find and retain the right candidate.

Since Boxing Day 2015 the Business team has been working hard to help flood affected businesses in Calderdale. The team has built an in-depth knowledge of flooded businesses and the problems they face, and is administering a range of grants to aid flood recovery and promote flood resilience. The team is now targeting support on the hardest-hit businesses at greatest risk of closure.

Contributions for this report have been compiled by Anne Holdsworth, Luke Doran and Chris Whitaker from this business team.

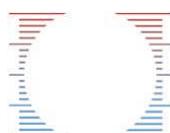


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