The SESAME project on small businesses:

Understanding flood impacts, evaluating the effects of adaptation and promoting resilience

Dates: 03 Dec 2012 – 02 Jun 2016

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Research motivation, aim and programme

- Cost of flooding to businesses
- Importance of Small and Medium Enterprises (SMEs)
- SESAME
  - Aims to evaluate current and potential SME flood response strategies, to identify which behaviour changes or actions will enable them to better prepare for / respond to future floods and strengthen their resilience
WP1: Modelling and simulation

- **Aim:** To develop a modelling and simulation approach to investigate SME behaviour in the face of flood events.

**Modelling**
- Flood Modelling
- Virtual Geographic Environment

**Modelling and simulation**
- Business Agents
- Agent Interaction Network

**Analysis**
- Employee work schedule creator
- Performance analyser

Time $= t_i$

Water depth

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WP1: Modelling and simulation

- Case study

Sheffield’s Lower Don Valley

Sheffield City Council, Strategic Flood Risk Assessment Area Overview Map

Flood modelling (1 in 1000 year event)

- 5570 organisations
- Manufacturing SMEs
WP1: Modelling and simulation

- Business agents
  - Model existing and potential ‘behaviours’ and ‘attributes’

WP2 & WP4 semi-structured interviews

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Physical & social changes
WP1: Modelling and simulation

Simulation: Example of SME with mutual aid

- \( n_e = 10 \)
- \( n_f = 2 \)
- \( t_{EA}^{alert} = 0:12:00 \)
- \( t_{EA}^{prep} = 0:12:00 \)
- \( EA = \{ S, T \} = \{ 1, 1 \} \)
- \( t_s^{flood} = 1:12:30 \)
- \( t_s^{resp} = 1:12:30 \)
- \( MA = \{ SME_A \} \)
- \( t_e^{flood} = 3:05:30 \)
- \( t_e^{recv} = 3:05:30 \)

\[
PC_{level} = f(\mathcal{R}_l^e, \mathcal{R}_l^m, \mathcal{R}_l^s)
\]

Production capacity level (%)
- Total available machines (%)
- No. of available employees (own site)
- No. of available employees (aid site)

SME without MA
- SME requesting MA
- SME providing MA
WP2: Business continuity processes

- **Aims** to gain an understanding of the behaviours of SMEs when responding to flood events based on their experiences

- **Small and medium-sized businesses**
  - Less likely to be prepared for flooding than their larger counterparts
  - Resources: Limited (time-cash-human), fewer to mobilise in response
  - Less bureaucracy, rapid decision-making, flexibility, adaptability

Research design ➔ Case studies ➔ Findings

ISO 22301 BCM used as basis for exploring flood response behaviours in SMEs

- Sheffield
- Tewkesbury

**Findings**
Limited evidence of formal BC processes/structures

**Key question:**
What enabled SME resilience?
- Social capital
- Path dependence
- Bricolage
Flooding in one location can impact the whole UK economy.

Neglecting knock-on costs means we may be ignoring economic benefits of flood risk management interventions.

WP 3 sets out to gain an improved understanding of the:
- economic impacts of floods on SMEs,
- knock-on effects to the wider economy.

**Flood footprint** is a measure of the total direct and indirect socio-economic impacts caused by a flood to the flooded region and to wider economic systems.
WP3: Economic impact analysis

- **Yorkshire and The Humber**

- **Sheffield City** level ‘Input-Output model’ analysis of 2007 flood
  - **Direct damage** ≈ £282M (≈3.4% of Sheffield City GVA)
  - **Indirect damage** ≈ £172M (≈2.1% of Sheffield City GVA)
  - **Flood footprint** ≈ £454M (≈5.5% of Sheffield City GVA)
  - Approximately 16 months for economic recovery to pre-flood level
Some businesses survive floods… and adapt successfully

But many are unprepared or underprepared, with no:

- Flood protection
- Flood / emergency plans
- Emergency financial reserves
- Data back-ups
- Local support networks
- Strategies for protecting customer relationships

Interviews with flooded businesses suggest possible reasons for this

- Hands-on
- Focus on here-and-now
- Rely on familiar methods
Two contrasting case studies

Building centre
- Owner/manager of a single business
- Little confidence in experts’ advice
- Adaptation viewed as abstract
- Incremental protection based on experience of multiple floods

Tyre fitter
- Owner of several businesses
- Resources used from other businesses to make ‘at-risk’ building more resilient
- Personal relationship with insurance broker
- Systematic adaptation

Owner ‘hands-on’, less strategic

Owner not hands-on, more strategic role
WP4: Adaptive e-learning & behaviour change

- Digital tool to promote long-term adaptation and resilience

  - Learning from the literature, interviews with 40 flooded businesses and from our business/stakeholder researcher partners

  - Developing a tool that will:
    - be interactive
    - facilitate business-to-business discussion
    - include numerous “voices” and perspectives
    - include/invite contributions from businesses
    - include films in which business people
      - interview flooding experts
      - tell their own resilience stories