Heath and Social Care Socio-spatial Analyses of Flood Risk:

Methodology

Sustainable Business & Communities

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SUPPORTING THE KENT ENVIRONMENT STRATEGY

Kent County Council kent.gov.uk

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1. Introduction

Through the Interreg Vb North Sea Region's Flood Resilient Areas by Multi-layEred Safety (FRAMES) project, Kent County Council's (KCC) Sustainable Business and Communities Team worked with the Adult Social Care and Health's Business Delivery Unit and the Flood Risk and Water Management team to better understand the risk flooding poses to Kent's vulnerable populations and health and social care services through a socio-spatial analyses.

The 2014 Adaptation Sub-Committee Progress Report indicated that nationally, "Between 10 – 14% of emergency service stations and 6 – 8% of hospitals, care homes and surgeries are located in areas that are potentially susceptible to river and coastal flooding". It is already widely accepted that there is a significant flood risk to Kent, as demonstrated by the severe flooding events which have occurred over the last few decades. Most notably, the events over winter 2013/14, which are estimated to have cost at least £4.4m.

However, there is still a need to understand risk at a local level, and what the impacts of severe flooding may be on vulnerable communities, such as older populations, and key assets upon which the public depend, such as Care Homes or Rest Centres. This is particularly important to Kent County Council as it has a legal duty of care for residents. Using data from the Kent SHAPE Atlas and the Climate Just online vulnerability mapping tool, the key questions the socio-spatial analyses addresses are:

- How many and what proportion of health and social care services and properties are at risk of flooding and to what level of risk?
- How many and what proportion of care beds are located in services and properties at risk?
- What primary client types are cared for in services and properties with flood risk?
- Who are the service providers or business owners for services and properties with flood risk?
- What are the key factors impacting social vulnerability to flooding in Kent?
- Which areas of Kent are more socially vulnerable to the impacts of floods?

This report outlines the methodology that was used to undertake the health and social care socio-spatial analyses of flood risk in Kent, conducted over the spring of 2019. The results of these analyses are compiled in separate reports:

- Flood Risk to Health and Social Care Infrastructure in Kent and Medway: Spatial Analysis
- Community Flood Vulnerability and Disadvantage in Kent and Medway

2. Spatial Analysis of Flood Risk to Health and Social Care Infrastructure

In this analysis, health and social care infrastructure, including services and properties (assets), were mapped and their risk assessed using the Kent Shape Atlas.

2.1 Kent SHAPE Atlas

The SHAPE (Strategic Health Asset Planning and Evaluation) Atlas is an evidence based online mapping application designed and managed by Public Health England to support strategic planning of services and assets across the health economy. It is aimed at professionals in the NHS and Local Authorities who have a role in Public Health or Social Care. The national system links data on public health, primary care and demographics with information on facility locations and healthcare estate performance. As SHAPE is maintained by Public Health England, health data is robust and regularly updated in line with publication of relevant national datasets. The volume and breadth of data available through the SHAPE Atlas is summarised in Table 1.

The primary aim of the application is to facilitate scenario planning and options appraisal in support of Sustainability and Transformation Partnerships (STPs). Specifically, SHAPE helps organisations and stakeholders evaluate the impact of service configurations on population and assess the optimum location for services by providing:

- an accessible online tool for STP stakeholders
- key indicators and data about the STP with a focus on health inequalities and equity of service
- flexible geographies including STP, CCG, LA, ward and LSOA scale
- a comprehensive overview of the STP's NHS estate
- functionality to enable users to flexibly evaluate and test the impact of plans

Sites	Layers	Access catchments
• **Primary Care:** GP surgeries & branch practices; Health Centres & Clinics; Pharmacies; GP Dispensing practice • **Secondary Care:** acute, community and specialist hospitals; treatment and intermediate care centres • **Other:** Care homes; children's centres; dentists; mental health facilities; non-clinical	• **Base maps:** Ordnance Survey Open Data & Satellite • **Demographics:** Output Area classification; Workplace Zones; fuel poverty • **Environment:** Risk of Flooding from Rivers and Sea; Nitrogen Dioxide, Particulate Matter and Sulphur Dioxide levels • **Boundaries:** LSOA;	• Travel times and distance for one or more sites • Walking time • Walking distance • Cycling time • Car (including rush hour option) • Public transport – options to and from sites, and times from weekday morning, afternoon or evening travel time.

administrative & support centres; opticians • **Organisation:** NHS Trust, NHS property services; LIFT • **Infrastructure:** Ambulance services; prisons; rail stations; schools	Postcode; Ward; Local Authority; CCG, Westminster Constituency, STP • **Usage Boundaries:** Education sites; Medical Care sites; Open green space and access points • Driving routes to nearest sites • Index of visible sites and cross reference to listing • Distance and boundary buffer visualisation	• Ability to export catchment with deprivation and population details by LSOA
Indicators	**Linked data**	**Functionality**
• **ONS population estimates:** Population density and age profile • **DfT Journey times:** GP surgeries and hospitals • Census 2011: ethnicity • **Deprivation:** IMD and nine domains • QOF recorded prevalence (21 diseases) • Dementia prevalence: 0-64 and 65+ • Hospital episode statistics: elective and non-elective activity by HRG, ICD 10 and OPCS.	• **GP registered patients:** Location catchment and age profile • **GP surgery commissioning body** • **GP surgery workforce:** broken down by age and role • **NHS providers CQC registration:** latest service definition and quality assessment	• Export map pages to PDF documents in Chrome and Safari • Export site list as Excel spreadsheet • Bookmark map configuration to return to previous views • Extensive inline help panels • Online chat help during the working day.

Table 1: Data available on the national SHAPE Atlas

On license to Kent County Council from Public Health England, the Kent SHAPE Atlas includes data from national datasets on health and social care assets, demographics, local authority boundaries and environmental issues, including air quality and fluvial, tidal and surface water flood risks. For analysing the risk to health and social care infrastructure, SHAPE has several key strengths:

- Flood risk is derived from Environment Agency (EA) flood maps and regularly updated
- Health and social care asset data is maintained by KCC and updated regularly
- Data is geographically presented and analysed, and results are downloadable
- Follows nationally consistent methods for comparing risk in different places

During the health and social care socio-spatial analyses of flood risk, the Kent SHAPE Atlas used the EA's the flood risk from rivers and seas dataset updated in December 2018, and tidal flood risk in September 2015. The risk level for each zone is determined by the EA based on local water level and flood defence data. The risk of flooding from rivers and seas each year is categorised into four levels:

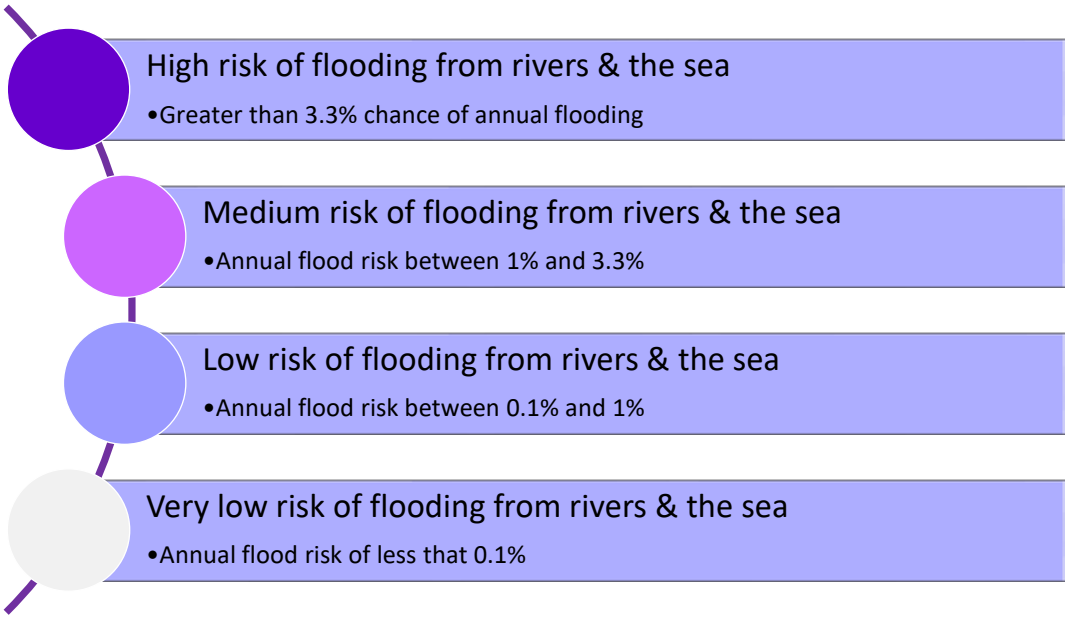

Figure 1: EA flood risk classifications

The risk of tidal flooding is specifically related to 'wave overtopping' as a result of strong winds during storm surges combined with high tides. 'Still water' flooding (the base level of sea-water at any given time), is not deemed to be a risk to Kent at present as this risk is generally greater than 1 in 1000 years (<0.1%).

However, SHAPE has some limitations when used at a property scale to assess flood risk, as the EA states that its flood risk maps "can only provide an indication of the likelihood of flooding and further information is required to determine the actual impact on a specific property." Despite this limitation, SHAPE is an appropriate tool to assess likely impacts of future flooding at property, local and reginal scale.

2.2 Spatial Analysis Methodology

Using the Kent SHAPE Atlas, analysis of the flood risks to health and social care services and properties was conducted, including both primary and secondary care assets. Community services such as day care centres and emergency response centres were included, with consideration given to their proximity to other 'at-risk' assets. Schools and council offices were also assessed. The full breakdown of all infrastructure types assessed is given in Table 2

Infrastructure Group	Asset/Service type
Accommodation	Care Homes
	Children's residential
	Extra Care
Community	Day Care
Local Authority	Office locations
Education	Primary School
	Secondary school
Emergency response	Rest centres

Table 2:Type of services and properties assessed

It is important to note that in this analysis, building outlines (shapes) were used to assess flood risk to the service or asset. In addition, a 10m 'buffer zone' was added around each building outline. This allows analysis to take account of all sites within or near an area at flood risk, and to identify those sites that may be at risk from secondary impacts of flooding, such as roads that become impassable preventing access or egress (Figure 2).

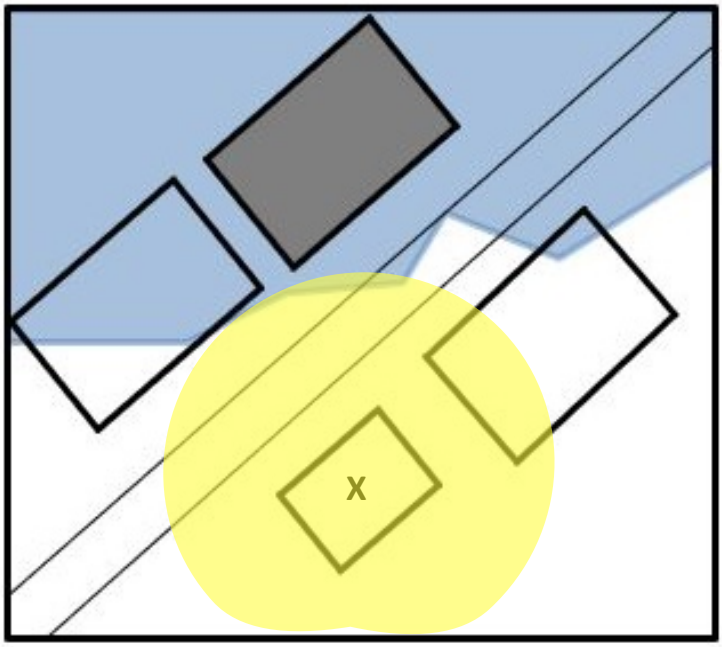

Figure 2: Buffer zone around property outline depicting 4 buildings identified as being within or near and area with flood risk

For each service or asset, addition information, such as the number of beds, occupancy and service provider, was also captured to enable full analysis of the site and its impact on the

wider picture around Kent (Table 3). For infrastructure where no flood risk is identified, no further information was gathered.

Service or Asset	Additional data
Adult residential and nursing homes	• number of beds • provider • primary client group
Extra care housing	• number of beds • provider • primary client group • secondary client group
Primary School	• total capacity
Secondary School	• total capacity
Day-care	• provider • primary client group • secondary client group

Table 3: Additional data collected for each at-risk services and properties type

This analysis and addition data enabled us to accurately determine the total number of services and assets within or near areas of flood risk in Kent, the level of risk to the properties identified, and how likely each is to be affected by either river and sea or tidal flooding. Further investigation of data includes:

- An assessment of the spatial distribution of those assets
- Which client groups would be most affected
- The number of residents or clients that may be affected
- The proportion of Kent's total this represents
- Which providers are responsible for the assets at risk

3. Communinity Vulnerability Analaysis

3.1 Climate Just

Developed by the Joseph Rowntree Foundation in collaboration with the University of Manchester, the web-based Climate Just tool enables mapping of flood risk against social vulnerability factors to LSOA (Lower Super Output Area) level (approximately 3000 people). Research indicates that the more socially vulnerable an individual is (old age, disability, low income, etc.), the more likely they are to become dependent on state provided health and social care as a result of a flood or other severe weather event.

What makes Climate Just a unique and vital resource for understanding flood risk and vulnerability in Kent is the development of two new indices to measure social vulnerability to flooding and how this relates to potential exposure to flooding. The first, the Neighbourhood

Flood Vulnerability Index (NFVI) indicates the susceptibility of a community to suffer a loss of wellbeing if a flood were to occur. The second, the Social Flood Risk Index (SFRI) combines the vulnerability score (NFVI) with exposure to flood risk to give a measure of where flooding is likely to have a greater impact on the community, and therefore the flood disadvantage experienced in that community (Climate Just, 2017; Sayers *et al* 2017).

The Climate Just tool was used to identify neighbourhood vulnerability and social flood risk to flooding in Kent, so that the impacts of flooding on the wider health & social care system can be better understood. Key indicators of flood vulnerability on Climate Just include:

- Age profiles
- Overall health indicators
- Physical environment (e.g. green vs. urban spaces)
- Housing characteristics (e.g. basements, urban areas)
- Ability to prepare for a flood event
- Ability to respond to a flood event
- Flood (un)insured properties
- Income
- Mobility

3.2 Community vulnerability analysis methodology

Data from Climate Just was downloaded and analysed to give a better understanding of the Social Flood Risk Index (SFRI) values. Each of the 27 variables that contribute to the Neighbourhood Flood Vulnerability Index (NFVI) were assessed to identify they unique combination of social factors that influence how each area may be affected due to flooding – this included how likely someone is to experience a loss of wellbeing because of a flood; people's ability to prepare for, respond to and recover from a flood event, and the amount of community support available. As such, vulnerability profiles for each community were established. When combined with flood exposure maps, the analysis identified priority communities at higher levels of risk and vulnerability across Kent.

4. Conclusion and next steps

Outputs of these analyses will be used to inform future development of flood plans, emergency response plans, and community plans. In addition, these data and results will aid decision-makers to effectively target their efforts and resources towards the most vulnerable areas of Kent in a way that reflects their unique risk and vulnerability profiles. This work will also allow health and social care providers to assess the risk to their asset(s), and to better incorporate climate change and flooding into their business and emergency plans.

The results of the community vulnerability analysis data will be used to inform future integrated assessments with the results of the Health & Social Care infrastructure spatial analysis. As well as giving a more in depth understanding of the risks to Kent communities and why they are at risk, examining the NFVI and SFRI gives an indication of the additional burden that a flooding event may place on Health & Social Care services and assets nearby.

Data will also be used to target and engage those sites identified as at risk through the analysis work in order to raise awareness of the potential risks of climate change and flooding with asset managers and senior staff. This will stimulate action to adapt to climate change, which could include installing flood doors, making changes to ensure power supply or working with nearby homes to safeguard continuity of care.

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