An investigation into social vulnerability, due to the impacts of climate change in the London Borough of Lewisham.

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Contents

1 Introduction

After commencing my Climate Change Internship on 21st July 2014 and discussions with the project supervisor, the following aims and objectives were agreed for this project.

1.1 Aim

1. To investigate social vulnerability and buildings at risk in the London Borough of Lewisham (LBL) due to the impacts of climate change.

1.2 Objectives

1. Create a social vulnerability map of the Borough by replicating the methodology presented in the report *Climate change, justice and vulnerability* (2011) published by the Joseph Rowntree Foundation (JRF).
2. Create a map of LBL buildings at risk of flooding and collate an easily accessible list for Emergency Planning.
3. Create a graph showing the relationship between temperature and number of deaths.
4. Present recommendations for future action.

1.3 Personal profile

Final year student studying Bsc Geography at Hull University with a special interest in climate change. Currently researching future storm surge flood risk along the Humber Estuary, East Yorkshire, for my dissertation. This report has been completed

for the London Borough of Lewisham during an eight week Climate Change Internship.

2 Background information

2.1 Geographical overview

Lewisham is a borough of south east London with a high population density, high levels of social vulnerability and at high risk of fluvial and surface water flooding. The total population is 275,000 making it the 12th highest populated borough in London (Lewisham, 2014). It is also the 31st most deprived borough in England (Lewisham Strategic Partnership, 2014). Three rivers, the Ravensbourne, Quaggy and Pool, and their tributaries flow through the Borough. They merge into the Ravensbourne in the Lewisham Town Centre before flowing via Deptford Creek into the River Thames (Fig.1.). Lewisham is considered at high risk of seasonal surface water flooding and is predicted to experience severe 1 in 100 year fluvial flood events. Flood risk and extreme weather events are expected to increase in severity and frequency as a result of climate change which will adversely impact on an already socially vulnerable population.

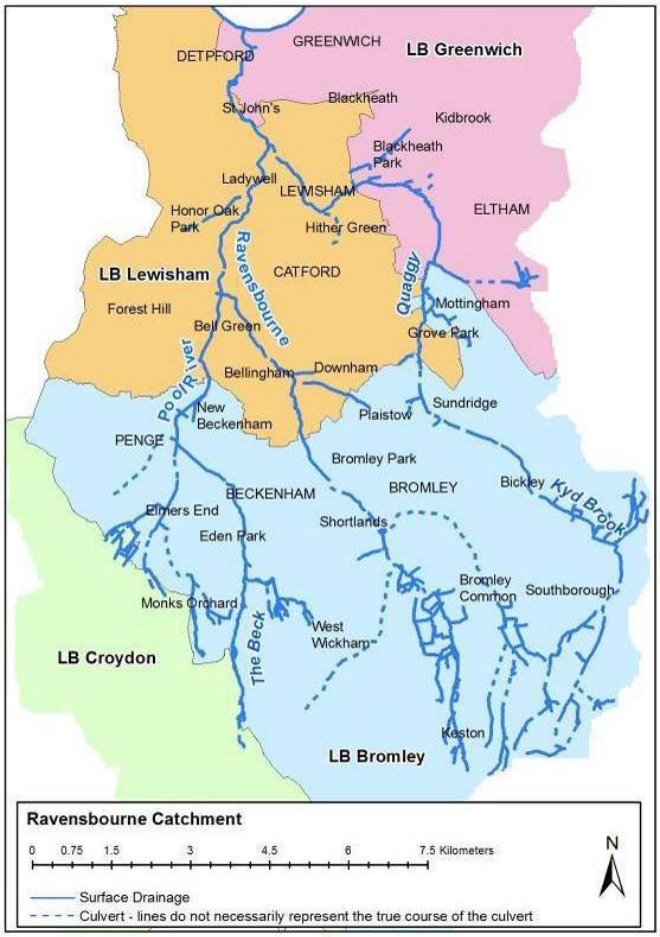

Figure 1: Map of the Ravensbourne catchment (taken from Nature Conservation Lewisham, 2014)

2.2 Climate change and social vulnerability

The policy of the LBL is to ensure that vulnerable residents are not disadvantaged when adapting to the impacts of climate change. The Climate Change Act (2008) legislated for the need to address social vulnerability when considering the risks and opportunities of climate change. Subsequent policy documents from DEFRA such as the Climate Change Risk Assessment (2012) and the National Adaptation Programme

(2013) mandated that Local Authorities must plan for socially just adaptation to the impacts of climate change.

The report *Climate change, justice and vulnerability* provides a methodology for analysing social vulnerability to the impacts of climate change (Lindley et al., 2011). Lindley et al. (2011) and identifies five key dimensions of vulnerability; sensitivity, enhanced exposure, the ability to adapt, the ability to respond and the ability to recover (Fig.2.).

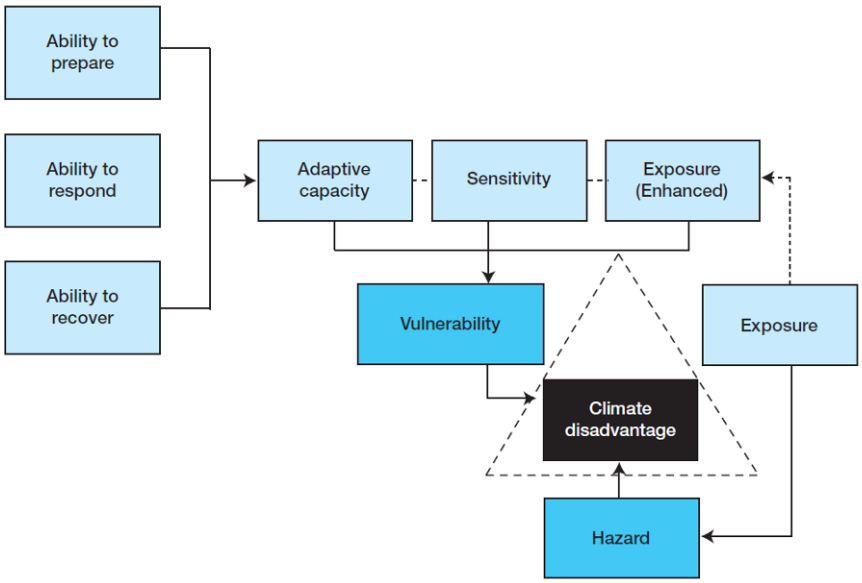

Figure 2: Conceptual framework for assessing social vulnerability (taken from Lindley et al., 2011)

The first dimension, sensitivity, is concerned with age and pre-existing health factors and how these may impact differentially when adapting to the risks of climate change. The second dimension, enhanced exposure, is largely concerned with

physical characteristics which have the capacity to enhance or mitigate residential exposure to the impacts of climate change. These include the proximity and extent of local green space and residency in basement and high rise properties. The factors which affect a person's ability to prepare, respond and recover from the impacts of climate change are covered in the final three dimensions. These include respectively the resources to insure their home, their knowledge to seek assistance if at risk and the support network to help recover from an emergency situation.

2.3 Climate change and LBL buildings at risk of flooding

The LBL currently owns 21,567 building assets, valued at £1.7 billion, of which an estimated 10% is at risk of flooding. These include residential and commercial properties and operational buildings such as schools and leisure centres. The assets subject to flood risk can only be an estimate as presently there is not a complete register of LBL buildings at risk of flooding. Considerable knowledge and expertise about local conditions, flood risk and emergency planning resides with individual departments, and the effectiveness of planning and response may be compromised by this fragmentation.

2.4 Climate change, extreme weather events and excess deaths

As a result of climate change, heatwave and cold weather events will be more frequent and severe which is expected to result in an increase in excess deaths. The highest risk is expected to be from extreme heat which will be aggravated by the urban heat island effect. This phenomenon increases temperatures due to heat

being absorbed in the urban environment by buildings and structures rather than being radiated back out to space.

3 Methodology

3.1 Mapping social vulnerability

For the purpose of this project, one of the five dimensions of vulnerability, sensitivity, was calculated and mapped. The following investigative steps were carried out:

1. Indicators of age and health were sourced from the 2011 Census by Lower Super Output Area (LSOA) using the 'Table Finder' function on the website www.nomisweb.co.uk/census/2011 (Office of National Statistics, 2014). LSOA units have a mean number of residents of 1,500 residents and a minimum number of 1,000 (Lindley et al. 2011). Population aged 60-95+ years was chosen for the age indicator, while population reporting having 'very bad health' was chosen to represent the health indicator.
2. To calculate the sensitivity index, z scores were calculated using the 'standardize' function in Excel. Z scores were calculated as follows (see Section 8.1 of Appendix for full table of results):

i. The mean and standard deviation of the age and health datasets were calculated using the excel functions **=AVERAGE** and **=STDEV**.

ii. In a separate column, the datasets were standardised by using the following formula: **=STANDARDIZE(x, mean, standard_dev)** where **x** is the data value and the mean and standard deviation are as calculated in stage (i) above. For example, using population aged 65-90+ dataset, x=167 (B2), mean=155 (B171) and standard_dev=53.2244069 (B172). The formula to standardise the data is as follows: =STANDARDIZE(B2, B171, B172). This formula was replicated for the complete dataset down by dragging the bottom right hand corner of the formulated cell.

iii. The above methodology was replicated for the health dataset.

iv. In a new column, the population and health Z scores were equally weighted to create a set of index Z scores using the following formula: (agezscore * 0.5) + (healthzscore * 0.5).

v. Finally, these index Z scores were standardised to create the sensitivity index.

3. A LSOA shapefile of the Borough was sourced from Corporate Asset Services (CAS) and imported into the Geographical Information System (GIS) programme DataMap.
4. The sensitivity index values were imported into DataMap using the 'paste table' tool. The imported LSOA shapefile was used as a base layer.

3.2 Mapping LBL buildings at risk of flooding

In order to identify buildings owned by the LBL at risk of flooding, the investigative following steps were carried out:

1. A shapefile of LBL buildings was obtained from Corporate Asset Services.

2. Flood risk maps supplied by JBA Consulting illustrating flood zone 3 (1 in 100 year fluvial flood event) and surface water flooding (1 in 30 year flood event) were imported as separate layers.
3. An interrogation function in DataMap was used to identify LBL buildings at risk of a 1 in 100 year fluvial flood event.
4. The results generated were exported as an Excel spreadsheet of addresses.

3.3 Analysing extreme weather events and excess deaths

1. Daily minimum and maximum temperature data over the past ten years was sourced from Stark (www.stark.co.uk/index.aspx).
2. Daily number of deaths data over the past ten years was requested from Lewisham's Register Office (glynn.harris@lewisham.gov.uk).
3. Modelled localised urban temperature data for Lewisham requested from ARUP and University College London.

4 Results

4.1 Social vulnerability to the impacts of climate change

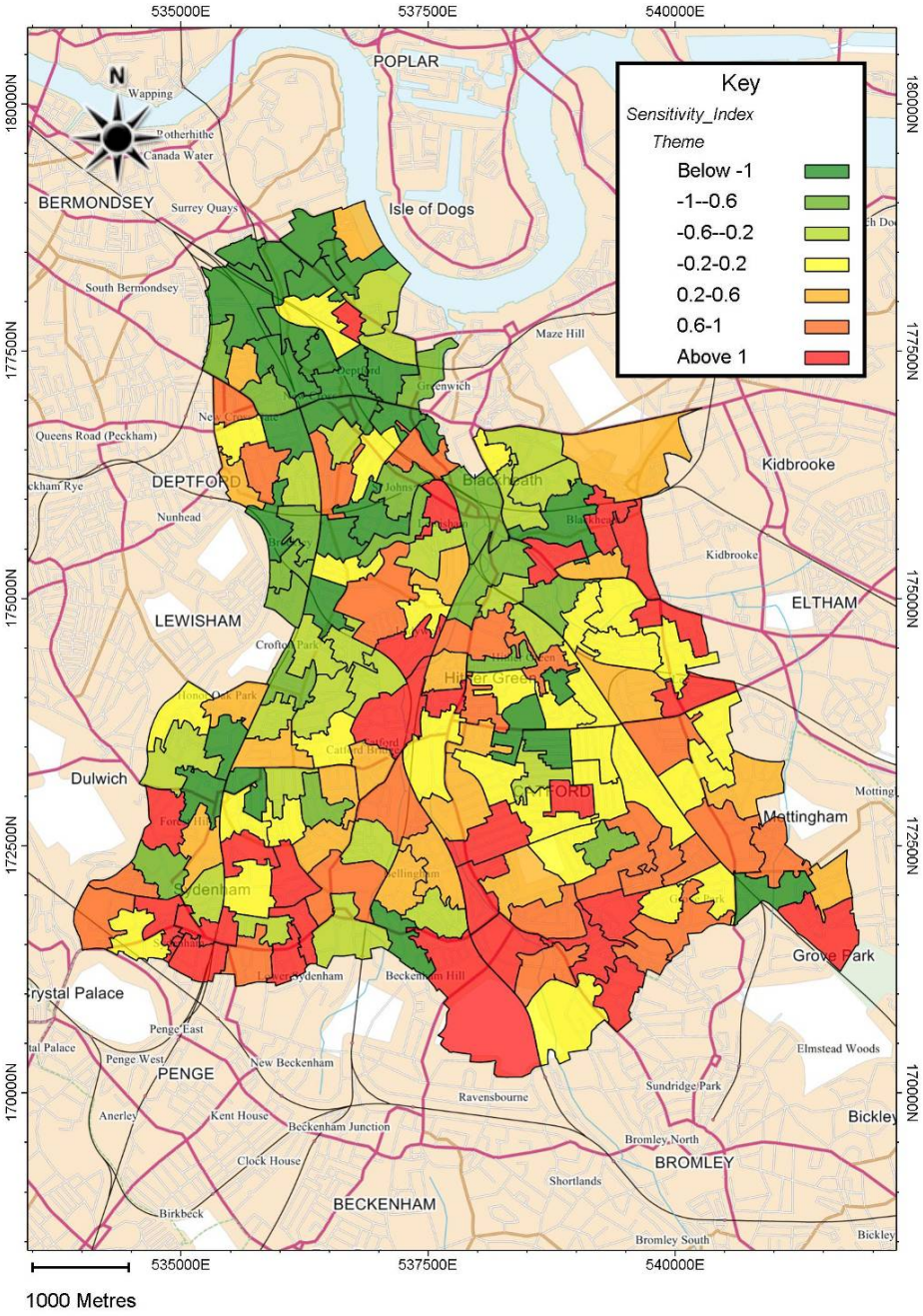

Figure 3: Map of social vulnerability of LBL by LSOA. Red indicates high vulnerability to the impacts of climate change while dark green indicates low vulnerability.

It is evident that residents in the south of the Borough are more vulnerable to the impacts of climate change than in the north (Fig.3.). Two main clusters of high vulnerability in the south are Sydenham, Bellingham and Downham (Fig.3.). A cluster of high vulnerability is also identifiable across areas of Catford, Ladywell and Hither Green in the centre of the Borough, and in Lee Green, to the east (Fig.3.).

27 of the 169 LSOAs in the Borough are categorised as most vulnerable to the impacts of climate change (Fig.3.). This represents an estimated 40,500, or approximately 15% of residents. The most vulnerable LSOA is E01003331 which is located in Sydenham with an index score of 2.378 (3sf).

4.1.1 ClimateJust

During the research, a new initiative, ClimateJust, was identified which is jointly funded by the Environment Agency and the Joseph Rowntree Foundation and delivered by the University of Manchester. It is a set of web-based decision support resources for practitioners to assist them in delivering socially just adaption to climate change. This tool will supply practitioners with the data in order to map the full vulnerability index developed by the JRF and is expected to be available in 2015.

4.2 LBL buildings at risk of flooding

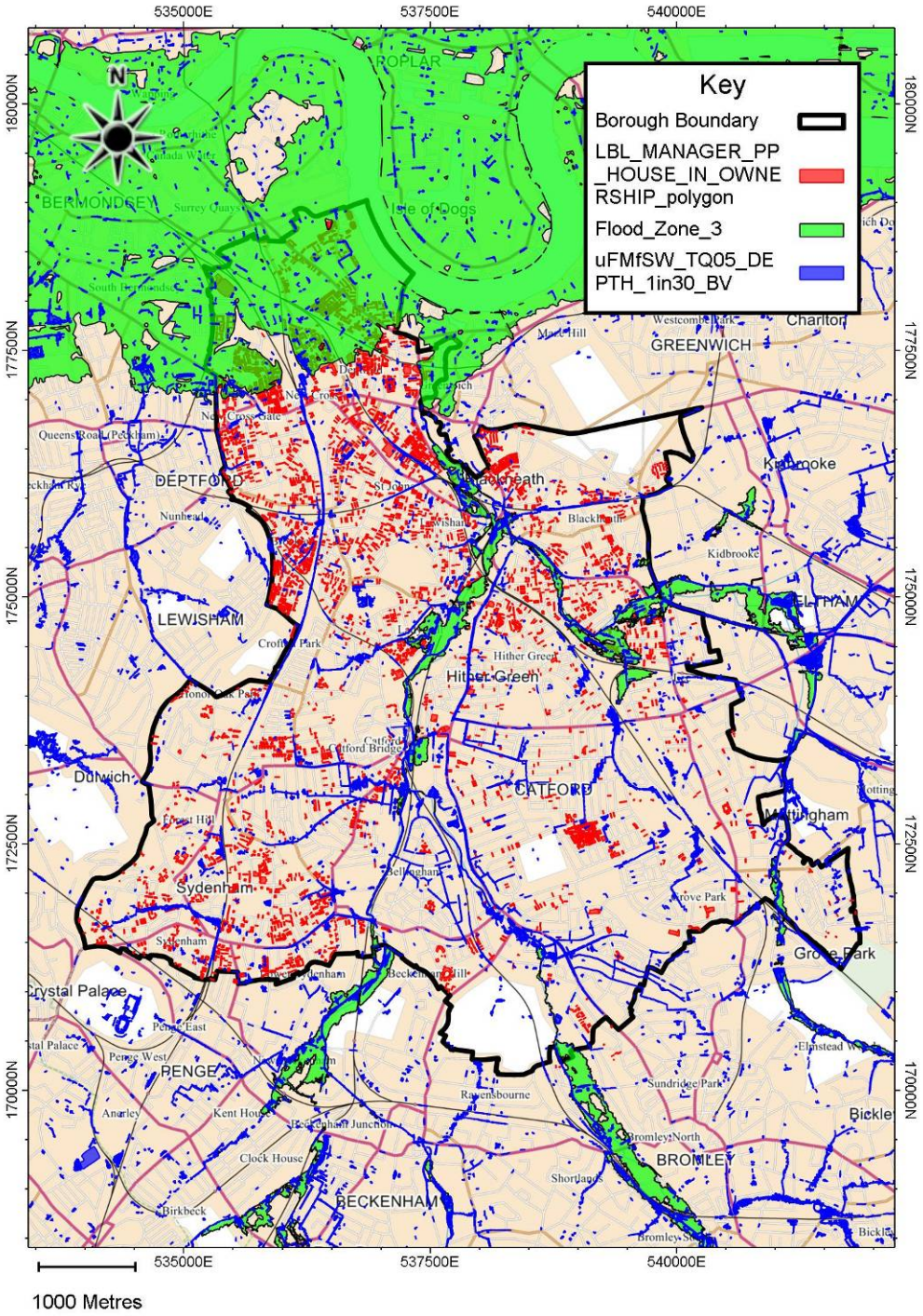

Figure 4: Map of LBL buildings at risk of a 1 in 100 year fluvial and a 1 in 30 surface water flood event. Buildings are represented in red, fluvial flood is in green and surface water flooding in blue.

It is evident that surface water flooding is widely distributed throughout the Borough (Fig.4.). This type of flooding is a particular problem because of its high frequency and intensity over a short period of time which can be especially damaging to buildings. Fluvial flood risk however is more concentrated (Fig.4.). Areas of high fluvial flood risk include Catford, Ladywell, Lewisham High Street and Lee Green (Fig.4.). Except for Lee Green, the flooding is associated with the confluences of the River Pool and Ravensbourne and the River Quaggy and Ravensbourne respectively. It is important to note that the extensive area of fluvial flooding in the north of the Borough is a modelled from data based on an undefended 1 in 100 year flood event which is very unlikely to occur due to protection provided by the Thames Barrier. Approximately 1,300 LBL buildings have been identified at risk of fluvial flooding.

By overlaying the flood risk and social vulnerability maps, it was observed that the areas of highest flood risk correlate with LSOAs of highest social vulnerability.

The map below illustrates the ability of the GIS programme to present flood data by street and building plot (Fig.5.). This is particularly useful for the purpose of response planning by showing more clearly where fluvial and surface water flooding impacts LBL buildings, for example, north of Ladywell Fields and in the neighbourhood around Ladywell Train Station (Fig.5.).

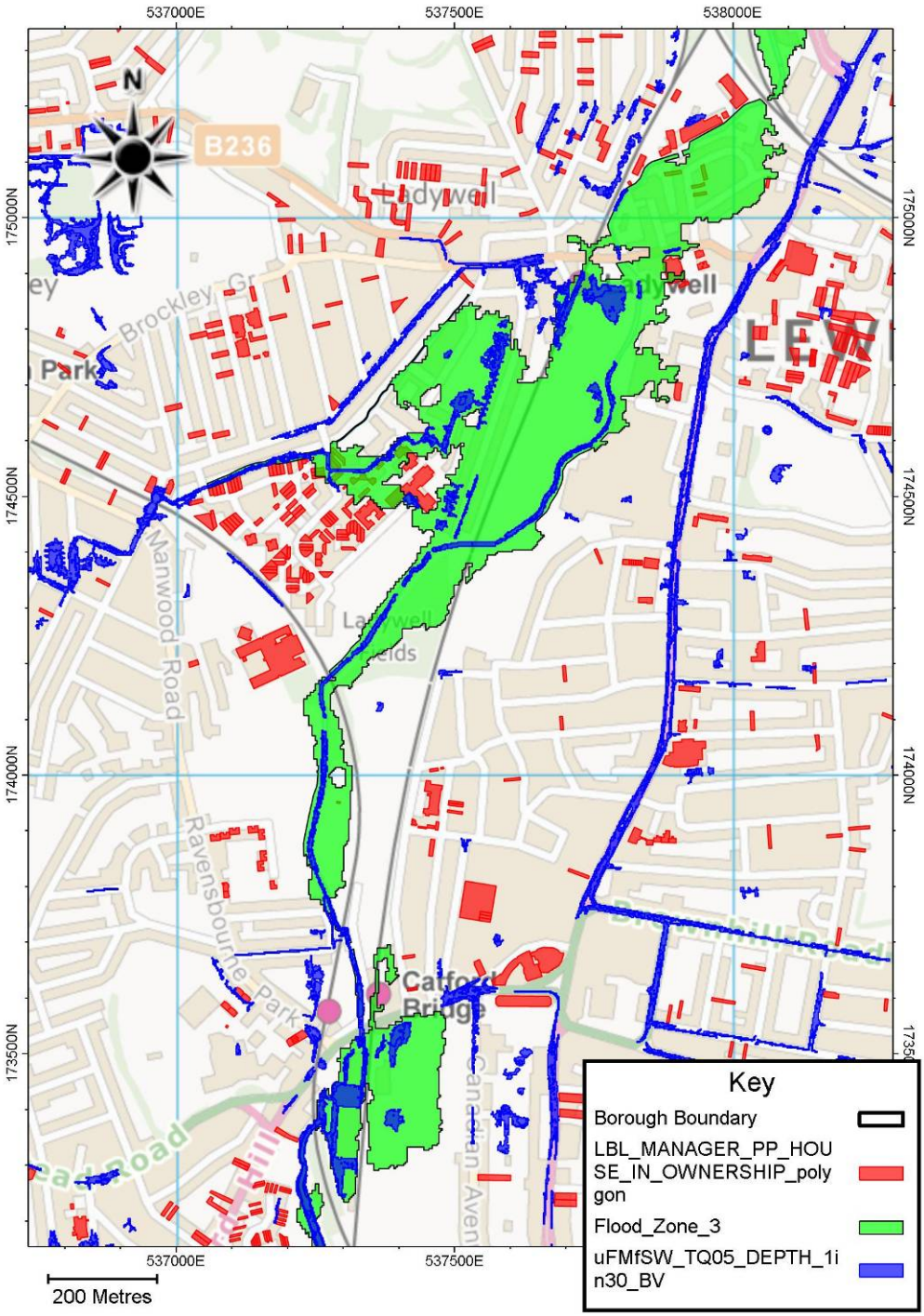

Figure 5: Enlarged map of Catford and Ladywell illustrating in more detail fluvial and surface water flooding and LBL buildings at street and building plot level.

4.3 Extreme weather events and excess deaths

It was not possible to complete a full analysis of the data on extreme weather events and excess deaths within the timescale of the project. Daily minimum and maximum temperature data over the past ten years was sourced from Stark and monthly data of deaths in the Borough over the past three years was sourced from Lewisham's Register Office. Modelled local urban temperature data for Lewisham was sourced from University College London.

Primary observation of monthly data of deaths showed no obvious seasonal pattern or correlation with extreme weather events. An explanation for this might be the low average age of Lewisham residents compared with other London boroughs. The well-being of younger residents is less likely to be adversely affected by extremes of temperature. Also, deaths are registered up to five days post-mortem and there is therefore a lag effect to consider in any analyse of the data.

5 Recommendations

As a result of the investigation into the social vulnerability and buildings at risk of flooding due to the impacts of climate change in the LBL, the following recommendations are being proposed (Table 1).

A colour coded scheme has been devised to help the reader focus on important and actionable recommendations. Recommendations that can be easily implemented and deliver an immediate benefit are coded green, while less actionable and immediately beneficial recommendations are coded amber and red respectively.

Table 1: Summary of recommendations

		Action category			
Risk	**Recommended action**	**Knowledge sharing**	**Communications**	**Data sourcing**	**Data analysis**
Social vulnerability	**1.** Share map of social vulnerability with relevant LBL departments.	X			
	2. Create a vulnerable person register to capture individuals not already on the existing registers.	X	X	X	
	3. Source data and map remaining four dimensions of the vulnerability index for the Borough.	X		X	X
LBL buildings at risk of flooding	**4.** Share map of LBL buildings at risk of flooding with relevant departments.	X			
	5. Create registers of LBL buildings at risk of fluvial and surface water flooding.	X		X	
	6. Map recorded local flood incidents.	X			X
	7. Ensure that the flood mapping exercise is used to inform Lewisham's Flood Risk Management Strategy.	X			
Extreme weather events	**8.** Map modelled local urban temperature data provided by UCL.	X			X
	9. Source daily data of deaths and create a graph of the relationship between number of deaths and temperature over time.	X		X	X

The following is a more detailed explanation of the proposed recommendations and actions.

5.1 Social vulnerability

1. Map of social vulnerability (using sensitivity index) to be shared with Sustainable Resources, Emergency Planning, Adult Social Care and Policy and Partnerships with explanatory notes and training as necessary.
2. Create a vulnerable person register for use in Emergency Planning and Climate Change Adaptation Planning activities. This will capture individuals not already on the existing registers (list of lists). This will be achieved by producing a leaflet for front-line agencies to distribute to vulnerable individuals encouraging them to sign up for extra support. A Lewisham Life editorial could be published at the same time as the leaflets are distributed. Leaflets should be distributed in the first instance to areas of high social vulnerability.
3. Source data and map the other four dimensions of the vulnerability index and use this information to support future climate change adaptation and emergency planning activities. Alternatively, wait for the release of the ClimateJust website in 2015.

5.2 LBL buildings at risk of flooding

4. Share map of LBL buildings at risk of flooding with Sustainable Resources, Emergency Planning, Policy and Partnerships and Corporate Asset Services, with explanatory notes and training as necessary.

5. Create registers of LBL buildings at risk of fluvial and surface water flooding. Use GIS interrogation function to identify LBL buildings in areas of flood risk and export the generated data to an Excel spreadsheet for further analysis.
6. Establish a process for mapping the already recorded local flood incidents in order to monitor changing patterns of flooding in the Borough. This knowledge should be shared with other LBL departments to inform flood management and decisions about future building. Local flood incidents are recorded by LBL departments and London Fire Brigade, however it was not evident how this information was collated and shared and there may be an opportunity to improve this process.
7. Ensure that the flood mapping exercise is used to inform Lewisham's Flood Risk Management Strategy and the Catford and Lewisham Flood Alleviation Scheme. JBA Consulting has been appointed to work collaboratively with LBL to develop the Strategy.

5.3 Extreme weather events and excess deaths

8. Map the modelled local urban temperature data provided by UCL to show temperature variation across the Borough. Share this map with Emergency Planning and link it with the social vulnerability mapping exercise.
9. Source daily data of deaths and, using daily minimum and maximum temperature data sourced from Stark, create a graph showing the relationship between number of deaths and temperature over time. Share this graph with Emergency Planning.

6 Conclusion

All the project objectives were achieved except for analysing extreme weather events and excess deaths following a delay in acquiring data. The results and recommendations have been presented to the South East London Flood Risk Group including representatives from the Environment Agency and senior colleagues within relevant LBL departments. These presentations helped to clarify understanding and refine the recommendations to ensure they are relevant and actionable. The project also delivered details of important contacts and identified sources of appropriate data.

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8 Appendix

8.1 Results of the sensitivity index calculations

Cell	A	B	C	D	E	F	G
1	**LSOA**	**Population aged 65-90+**	**Population Z scores**	**Population reporting having 'very bad health'**	**Health Z scores**	**Index Z scores**	**Sensitivity Index**
2	E01003189	167	0.2321309	13	-1.006671007	-0.387270052	-0.536841509
3	E01003190	112	-0.8012296	24	0.363315378	-0.218957113	-0.303522738
4	E01003191	124	-0.57576913	11	-1.255759441	-0.915764285	-1.269450806
5	E01003192	167	0.2321309	35	1.733301763	0.982716333	1.362261077
6	E01003193	214	1.11518442	21	-0.010317272	0.552433576	0.765794496
7	E01003194	204	0.9273007	22	0.114226944	0.52076382	0.721893245
8	E01003195	180	0.47637975	11	-1.255759441	-0.389689846	-0.540195875
9	E01003196	177	0.42001463	24	0.363315378	0.391665004	0.542933879
10	E01003197	160	0.10061229	26	0.612403812	0.356508052	0.494198607
11	E01003198	214	1.11518442	24	0.363315378	0.739249901	1.02476303
12	E01003199	152	-0.04969469	7	-1.753936308	-0.901815499	-1.25011472
13	E01003200	184	0.55153324	20	-0.134861489	0.208335875	0.288799366
14	E01003201	156	0.0254588	14	-0.88212679	-0.428333995	-0.593765168
15	E01003202	279	2.33642866	19	-0.259405706	1.038511476	1.439605423
16	E01003203	164	0.17576578	23	0.238771161	0.207268472	0.287319711
17	E01003204	105	-0.93274821	26	0.612403812	-0.160172201	-0.222033915
18	E01003205	124	-0.57576913	25	0.487859595	-0.043954767	-0.060930979
19	E01003206	153	-0.03090632	16	-0.633038357	-0.331972337	-0.460186707
20	E01003207	116	-0.72607611	14	-0.88212679	-0.804101451	-1.114661548
21	E01003209	139	-0.29394354	17	-0.50849414	-0.401218838	-0.556177595
22	E01003210	88	-1.25215055	30	1.110580679	-0.070784936	-0.098123497
23	E01003211	96	-1.10184357	22	0.114226944	-0.493808312	-0.684526979
24	E01003212	190	0.66426348	25	0.487859595	0.576061536	0.798548047
25	E01003213	97	-1.0830552	7	-1.753936308	-1.418495752	-1.966347242
26	E01003214	114	-0.76365286	10	-1.380303658	-1.071978257	-1.485997746
27	E01003215	80	-1.40245753	16	-0.633038357	-1.017747945	-1.4108226
28	E01003216	170	0.28849602	20	-0.134861489	0.076817266	0.106485633
29	E01003217	197	0.79578209	10	-1.380303658	-0.292260785	-0.405137758
30	E01003218	157	0.04424717	36	1.85784598	0.951046577	1.318359827
31	E01003219	208	1.00245419	14	-0.88212679	0.060163699	0.083400125
32	E01003220	187	0.60789836	16	-0.633038357	-0.012569999	-0.017424785
33	E01003221	225	1.32185653	16	-0.633038357	0.344409085	0.477426776
34	E01003222	174	0.36364951	16	-0.633038357	-0.134694422	-0.186716108
35	E01003223	240	1.60368212	21	-0.010317272	0.796682423	1.104377142
36	E01003224	168	0.25091927	3	-2.252113175	-1.00059695	-1.387047547
37	E01003225	152	-0.04969469	15	-0.757582573	-0.403638632	-0.559531961
38	E01003226	135	-0.36909703	14	-0.88212679	-0.625611909	-0.867235768
39	E01003227	175	0.38243788	15	-0.757582573	-0.187572344	-0.260016543

40	E01003228	149	-0.10605981	19	-0.259405706	-0.182732757	-0.253307811
41	E01003229	179	0.45759138	22	0.114226944	0.28590916	0.396333008
42	E01003230	133	-0.40667377	24	0.363315378	-0.021679198	-0.030052139
43	E01003231	125	-0.55698076	10	-1.380303658	-0.968642207	-1.342751242
44	E01003232	147	-0.14363655	18	-0.383949923	-0.263793239	-0.365675475
45	E01003233	163	0.15697741	14	-0.88212679	-0.36257469	-0.502608302
46	E01003235	167	0.2321309	17	-0.50849414	-0.138181619	-0.19155013
47	E01003236	176	0.40122626	18	-0.383949923	0.008638167	0.011974401
48	E01003237	182	0.51395649	27	0.736948029	0.625452261	0.867014461
49	E01003238	131	-0.44425052	23	0.238771161	-0.102739679	-0.142419802
50	E01003239	156	0.0254588	42	2.605111281	1.315285041	1.823274486
51	E01003240	219	1.20912629	29	0.986036462	1.097581376	1.521489301
52	E01003241	279	2.33642866	26	0.612403812	1.474416235	2.043865336
53	E01003243	203	0.90851232	22	0.114226944	0.511369634	0.708870836
54	E01003244	71	-1.57155289	18	-0.383949923	-0.977751406	-1.355378596
55	E01003245	63	-1.72185987	13	-1.006671007	-1.364265439	-1.891172095
56	E01003246	99	-1.04547845	29	0.986036462	-0.029720994	-0.041199837
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60	E01003250	123	-0.5945575	13	-1.006671007	-0.800614255	-1.109827526
61	E01003251	122	-0.61334587	20	-0.134861489	-0.374103682	-0.518590022
62	E01003252	106	-0.91395984	53	3.975097666	1.530568913	2.121705304
63	E01003253	139	-0.29394354	19	-0.259405706	-0.276674621	-0.383531906
64	E01003254	209	1.02124256	10	-1.380303658	-0.179530548	-0.248868845
65	E01003255	89	-1.23336218	13	-1.006671007	-1.120016593	-1.552589449
66	E01003256	197	0.79578209	20	-0.134861489	0.330460299	0.458090689
67	E01003257	315	3.01281008	16	-0.633038357	1.189885862	1.64944363
68	E01003258	109	-0.85759472	35	1.733301763	0.437853521	0.606961326
69	E01003259	175	0.38243788	11	-1.255759441	-0.436660778	-0.605307922
70	E01003260	166	0.21334253	18	-0.383949923	-0.085303697	-0.118249694
71	E01003261	128	-0.50061564	30	1.110580679	0.304982521	0.422772883
72	E01003262	103	-0.97032496	12	-1.131215224	-1.050770091	-1.456598561
73	E01003263	241	1.62247049	19	-0.259405706	0.681532392	0.944753862
74	E01003264	269	2.14854493	15	-0.757582573	0.695481178	0.964089949
75	E01003265	116	-0.72607611	13	-1.006671007	-0.866373559	-1.200984393
76	E01003266	249	1.77277747	12	-1.131215224	0.320781125	0.444673225
77	E01003267	197	0.79578209	31	1.235124896	1.015453491	1.407641982
78	E01003268	177	0.42001463	28	0.861492245	0.640753438	0.888225258
79	E01003269	172	0.32607277	19	-0.259405706	0.03333353	0.046207607
80	E01003270	167	0.2321309	21	-0.010317272	0.110906815	0.15374125
81	E01003271	254	1.86671934	10	-1.380303658	0.24320784	0.337139582
82	E01003272	141	-0.25636679	23	0.238771161	-0.008797815	-0.012195708
83	E01003273	141	-0.25636679	17	-0.50849414	-0.382430466	-0.530132776
84	E01003274	133	-0.40667377	25	0.487859595	0.040592911	0.056270706
85	E01003275	249	1.77277747	27	0.736948029	1.254862751	1.739515896
86	E01003276	156	0.0254588	28	0.861492245	0.443475523	0.614754659
87	E01003277	107	-0.89517147	17	-0.50849414	-0.701832803	-0.972894699
88	E01003278	182	0.51395649	33	1.48421333	0.999084912	1.384951529
89	E01003279	178	0.438803	20	-0.134861489	0.151970757	0.210664909
90	E01003280	189	0.6454751	29	0.986036462	0.815755783	1.130817017
91	E01003281	205	0.94608907	16	-0.633038357	0.156525356	0.216978586

92	E01003282	172	0.32607277	8	-1.629392091	-0.651659662	-0.903343685
93	E01003283	190	0.66426348	14	-0.88212679	-0.108931657	-0.151003246
94	E01003284	179	0.45759138	16	-0.633038357	-0.08772349	-0.12160406
95	E01003285	187	0.60789836	14	-0.88212679	-0.137114216	-0.190070474
96	E01003286	274	2.24248679	18	-0.383949923	0.929268436	1.288170531
97	E01003287	192	0.70184022	17	-0.50849414	0.096673041	0.134010108
98	E01003288	283	2.41158215	14	-0.88212679	0.76472768	1.060080837
99	E01003290	135	-0.36909703	18	-0.383949923	-0.376523476	-0.521944388
100	E01003291	161	0.11940067	28	0.861492245	0.490446455	0.679866706
101	E01003292	134	-0.3878854	32	1.359669113	0.485891856	0.673553029
102	E01003293	110	-0.83880635	17	-0.50849414	-0.673650244	-0.93382747
103	E01003295	136	-0.35030866	22	0.114226944	-0.118040855	-0.1636306
104	E01003296	130	-0.46303889	15	-0.757582573	-0.610310733	-0.84602497
105	E01003297	27	-2.39824129	11	-1.255759441	-1.827000367	-2.532624527
106	E01003298	81	-1.38366916	14	-0.88212679	-1.132897975	-1.57044588
107	E01003299	95	-1.12063194	19	-0.259405706	-0.690018824	-0.956517923
108	E01003300	105	-0.93274821	10	-1.380303658	-1.156525935	-1.603199431
109	E01003301	72	-1.55276452	17	-0.50849414	-1.030629328	-1.428679031
110	E01003302	119	-0.66971099	18	-0.383949923	-0.526830458	-0.73030294
111	E01003303	108	-0.87638309	12	-1.131215224	-1.003799159	-1.391486513
112	E01003304	99	-1.04547845	13	-1.006671007	-1.026074728	-1.422365354
113	E01003305	167	0.2321309	23	0.238771161	0.235451032	0.326386939
114	E01003307	171	0.30728439	18	-0.383949923	-0.038332765	-0.053137647
115	E01003308	149	-0.10605981	25	0.487859595	0.190899893	0.264629258
116	E01003309	205	0.94608907	29	0.986036462	0.966062766	1.339175568
117	E01003310	97	-1.0830552	31	1.235124896	0.07603485	0.105401033
118	E01003311	231	1.43458676	14	-0.88212679	0.276229986	0.382915543
119	E01003312	165	0.19455416	35	1.733301763	0.96392796	1.336216258
120	E01003313	106	-0.91395984	29	0.986036462	0.036038311	0.049957029
121	E01003314	113	-0.78244123	16	-0.633038357	-0.707739793	-0.981083087
122	E01003315	109	-0.85759472	8	-1.629392091	-1.243493406	-1.723755483
123	E01003316	146	-0.16242493	18	-0.383949923	-0.273187425	-0.378697884
124	E01003317	184	0.55153324	31	1.235124896	0.893329068	1.238350659
125	E01003318	132	-0.42546215	24	0.363315378	-0.031073384	-0.043074548
126	E01003319	198	0.81457046	21	-0.010317272	0.402126594	0.557435944
127	E01003320	117	-0.70728774	11	-1.255759441	-0.98152359	-1.360607673
128	E01003321	166	0.21334253	25	0.487859595	0.350601062	0.486010219
129	E01003322	131	-0.44425052	30	1.110580679	0.33316508	0.461840111
130	E01003323	133	-0.40667377	26	0.612403812	0.102865019	0.142593551
131	E01003324	133	-0.40667377	37	1.982390197	0.787858211	1.092144844
132	E01003325	143	-0.21879005	31	1.235124896	0.508167425	0.70443187
133	E01003326	254	1.86671934	33	1.48421333	1.675466334	2.322565013
134	E01003327	175	0.38243788	27	0.736948029	0.559692957	0.775857594
135	E01003328	206	0.96487744	35	1.733301763	1.349089603	1.870135047
136	E01003329	132	-0.42546215	22	0.114226944	-0.155617601	-0.215720238
137	E01003330	200	0.85214721	22	0.114226944	0.483187075	0.669803608
138	E01003331	245	1.69762398	35	1.733301763	1.715462873	2.378009017
139	E01003332	162	0.13818904	21	-0.010317272	0.063935883	0.088629202
140	E01003333	136	-0.35030866	41	2.480567064	1.065129204	1.476503451
141	E01003334	203	0.90851232	28	0.861492245	0.885002285	1.226807905
142	E01003335	141	-0.25636679	18	-0.383949923	-0.320158357	-0.443809931
143	E01003336	124	-0.57576913	17	-0.50849414	-0.542131634	-0.751513738

144	E01003337	80	-1.40245753	22	0.114226944	-0.644115295	-0.892885531
145	E01003338	176	0.40122626	27	0.736948029	0.569087143	0.788880004
146	E01003339	152	-0.04969469	20	-0.134861489	-0.09227809	-0.127917738
147	E01003340	115	-0.74486448	15	-0.757582573	-0.751223529	-1.041361113
148	E01003341	102	-0.98911333	38	2.106934414	0.558910541	0.774772994
149	E01003342	79	-1.42124591	14	-0.88212679	-1.151686348	-1.596490699
150	E01003343	109	-0.85759472	33	1.48421333	0.313309304	0.434315637
151	E01003344	115	-0.74486448	23	0.238771161	-0.253046662	-0.350778354
152	E01003345	94	-1.13942031	22	0.114226944	-0.512596685	-0.710571798
153	E01003346	170	0.28849602	29	0.986036462	0.637266241	0.883391236
154	E01003347	108	-0.87638309	19	-0.259405706	-0.5678944	-0.7872266
155	E01003348	212	1.07760768	18	-0.383949923	0.346828878	0.480781142
156	E01003349	127	-0.51940401	35	1.733301763	0.606948876	0.841364697
157	E01003350	152	-0.04969469	21	-0.010317272	-0.030005981	-0.041594893
158	E01003351	214	1.11518442	22	0.114226944	0.614705685	0.85211734
159	E01003352	268	2.12975656	19	-0.259405706	0.935175426	1.296358918
160	E01003353	217	1.17154954	19	-0.259405706	0.456071919	0.632216034
161	E01003354	147	-0.14363655	21	-0.010317272	-0.076976913	-0.10670694
162	E01032564	131	-0.44425052	32	1.359669113	0.457709297	0.634485801
163	E01032565	212	1.07760768	32	1.359669113	1.218638396	1.689300969
164	E01032579	64	-1.7030715	25	0.487859595	-0.607605952	-0.842275549
165	E01033320	132	-0.42546215	24	0.363315378	-0.031073384	-0.043074548
166	E01033322	41	-2.13520407	17	-0.50849414	-1.321849107	-1.832373725
167	E01033324	183	0.53274487	25	0.487859595	0.510302231	0.707391181
168	E01033325	7	-2.77400875	12	-1.131215224	-1.952611987	-2.706749872
169	E01033327	129	-0.48182727	17	-0.50849414	-0.495160702	-0.68640169
170	E01033341	72	-1.55276452	28	0.861492245	-0.345636135	-0.479127738
171	**Mean**	154.6449704	**Mean**	21.08284024	**Mean**	-1.24161E-16	
172	**St_dev**	53.2244069	**St_dev**	8.029276874	**St_dev**	0.721386194	