ClimateReadyClyde

Developing U.N. Race to Resilience Targets for Glasgow City Region

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Deep Demonstration
Resilient Regions
GLASGOW CITY REGION
Clyde Rebuilt

4EI

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> As one of the flagship regions in EIT Climate-KIC's Forging Resilient Regions Deep Demonstration, the work of Glasgow City Region will be showcased through the wider Race to Resilience (R2R) campaign. Climate Ready Clyde has worked on a methodology to quantify local R2R targets and how to identify the 140,000 most vulnerable people in the Region. The Forging Resilient Regions Deep Demonstration joins a cohort of approximately 22 other initiatives to be featured through the R2R Campaign.
> Further information is available here:
> First round of initiatives join the Race to Resilience - Race to Zero (unfccc.int)

1. Introduction

The UNFCCC's Race to Resilience is a global campaign – the sibling to Race to Zero – catalysing a step-change in global ambition for climate resilience, putting people and nature first in pursuit of a resilient world where we don't just survive climate shocks and stresses but thrive in spite of them.

The overall aim of the campaign is to build the resilience of four billion of the world's most vulnerable citizens to the impacts of climate change by 2030. As such, those involved in the campaign must commit to translate new and existing targets on adaptation resilience, directly or indirectly, into the numbers of people from vulnerable groups and communities who will be made more resilient to climate risks. To support this process for Glasgow City Region, 4 Earth Intelligence (4EI) and Clydeplan have provided support to Climate Ready Clyde to set an initial round of targets.

As part of the application process Climate Ready Clyde is using spatial data as evidence to indicate the number of people and percentage of population that may be vulnerable to climate change, within Glasgow City Region.

This document:
- Provides an overview to other Race to Resilience participants, and those considering applying, on the processes used to translate the commitments into a concrete target for the numbers of socially vulnerable people made more resilient to climate change in Glasgow City Region.
- Records the methods used to modify and analyse data provided by Climate Ready Clyde.
- To record a range of statistics and 'headline figures' for provision to Climate Ready Clyde.

2. Headline results

The data analysis methods are described within this document, and four key figures have been outputs as follows:

1. A total of 359,091 people live in postcodes that may experience either heat hazard or flood risk (20.6%). Of these, 140,445 people are in the top 20% of the SIMD (39%).
2. A total of 244,162 people live in postcodes that may experience heat hazard (14%). Of these, 104,929 people are in the top 20% of the SIMD (42%)
3. A total of 137,607 live in postcodes that may experience flood risk (7.8%). Of these, 45,072 are in the top 20% of the SIMD (32%)
4. A total of 22,678 live in postcodes that may experience heat hazard and flood risk (1.3%). Of these, 9,556 are in the top 20% of the SIMD (42%)

3. How the targets were calculated

To generate the targets, three primary geospatial data sets have been used in the analysis;

1. The Scottish Index of Multiple Deprivation[1],
2. 4EI Postcode Heat Hazard Index[2],
3. SEPA Flood Risk Maps (1 in 200 year plus climate change, all sources).

Analysis approach

To generate the headline targets, 4EI and Clydeplan used the postcode dataset of flooding and heat hazards (PCU2019_1JnHHJnFlood_v2.shp) alongside the settlement information (ClydeplanSettlements2019_2.shp) to create a layer containing 'urban postcodes'. To achieve this, ArcGIS Pro's 'Select Layer by Location' function was used with the following parameters:

Input Features	PCU2019_1JnHHJnFlood_v2
Relationship	WITHIN
Selecting Features	ClydeplanSettlements2019_2
Search Distance	-
Selection type	NEW_SELECTION

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[1] https://www.gov.scot/collections/scottish-index-of-multiple-deprivation-2020/
[2] https://www.4earthintelligence.com/products/heat/

Layer With Selection	PCU2019_1JnHHJnFlood_v2
Invert spatial relationship	NOT_INVERT
Output Layer Names	PCU2019_1JnHHJnFlood_Settlement_v2
Count	39200

This function selected those postcodes contained within the settlement shapefile, hereby referred to as 'urban postcodes'.

The selected polygons were then exported to a new layer (PCU2019_1JnHHJnFlood_Settlement_v2.shp) to be used at a later point in the analysis.

4. Queries used to analyse the data

To generate the overall targets, and provide a greater level of analysis, 4EI and Clydeplan generated multiple queries to be used on three combinations of data layers – heat hazard only, flood risk only, and combined heat hazard and flood risk:

Using the ArcPro 'Select layer by attribute' function with the query expressions as detailed in the following tables:

Expression	RISK > 3	RISK > 3 And SIMD20Pct <> 'Outwith top20%'	RISK > 3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And RISK > 3 And DnstyVig < 5
Explanation	To identify the postcodes that have previously experienced a higher heat hazard.	To identify the postcodes that have experienced a higher heat hazard and are within the top 20% of the SIMD.	To identify the postcodes that have previously experienced a higher heat hazard and are in the top vigintile for population density.	To identify the postcodes that have previously experienced a higher heat hazard and are within the top 20% of the SIMD and are in the top vigintile for population density.

Expression	GenFlood = 'Yes'	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes'	GenFlood = 'Yes' And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And DnstyVig < 5
Explanation	To identify the postcodes that are at risk of flooding.	To identify the postcodes that are at risk of flooding and are within the top 20% of the SIMD.	To identify the postcodes that are at risk of flooding and are in the top vigintile for population density.	To identify the postcodes that are at risk of flooding and are within the top 20% of the SIMD and are in the top vigintile for population density.

Expression	GenFlood = 'Yes' And RISK >3	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And RISK >3	GenFlood = 'Yes' And RISK >3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And DnstyVig < 5 And GenFlood = 'Yes' And RISK >3
Explanation	To identify the postcodes that have previously experienced a higher heat hazard and are at risk of flooding.	To identify the postcodes that have previously experienced a higher heat hazard and are at risk of flooding and are within the top 20% of the SIMD.	To identify the postcodes that have previously experienced a higher heat hazard and are at risk of flooding and are in the top vigintile for population density.	To identify the postcodes that have previously experienced a higher heat hazard and are at risk of flooding and are within the top 20% of the SIMD and are in the top vigintile for population density.

Data layer 1: Using the whole postcode dataset (PCU2019_1JnHHJnFlood_v2.shp) for heat hazard only.

Input Rows	PCU2019_1JnHHJnFlood_v2			
Selection type	NEW_SELECTION			
Expression	RISK > 3	RISK > 3 And SIMD20Pct <> 'Outwith top20%'	RISK > 3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And RISK > 3 And DnstyVig < 5
Resulting features selected (/total features)	7038/44624	968/44624	2190/44624	1019/44624
PopCnt in selection (/PopCnt)	244162/1742748	104929/1742748	110422/1742748	51178/1742748
% of total population	14	6	6.3	2.9

From the above, it is possible to derive statistics such as:

- Of the 244,162 living in areas subject to a higher heat hazard, 104,929 are in the Top 20% of the SIMD (43%).
- For the most densely populated areas subject to a higher heat hazard, 51,178 people are in the Top 20% of the SIMD (46%).

Data layer 2: Using the whole postcode dataset (PCU2019_1JnHHJnFlood_v2.shp) for flood risk only.

When considering flood risk, the 'ClipPopn' attribute was used to calculate the number of people that may be affected. This attribute distinguishes people within postcodes affected by flood, as the whole postcode may not be affected.

Input Rows	PCU2019_1JnHHJnFlood_v2			
Selection type	NEW_SELECTION			
Expression	GenFlood = 'Yes'	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes'	GenFlood = 'Yes' And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And DnstyVig < 5
Resulting features selected (/total features)	26547/44624	8001/44624	4308/44624	1880/44624
ClipPopn in selection (/PopCnt)	137607/1742748	45073/1742748	43334/1742748	17256/1742748
% population	7.9	2.6	2.5	1

From the above, it is possible to derive statistics such as:

- Of the 137,607 people subject to flood risk, 32.8% are in the Top 20% of the SIMD (45,073).

Data layer 3: Using the whole postcode dataset (PCU2019_1JnHHJnFlood_v2.shp) for heat hazard and flood risk together.

Input Rows	PCU2019_1JnHHJnFlood_v2			
Selection type	NEW_SELECTION			
Expression	GenFlood = 'Yes' And RISK >3	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And RISK >3	GenFlood = 'Yes' And RISK >3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And DnstyVig < 5 And GenFlood = 'Yes' And RISK >3
Resulting features selected (/total features)	4243/44624	586/44624	1189/44624	539/44624
ClipPopn in selection (/PopCnt)	22678/1742748	9556/1742748	11670/1742748	5060/1742748
% population	1.3	0.6	0.7	0.3

From the above, it is possible to derive statistics such as:

- Of the 22,678 people subject to both heat hazard and flood risk, 42% are in the top 20% of the SIMD (9,556).

Headline statistics from the whole dataset:

Within Glasgow City Region, a total of 359,091 people live in postcodes that may experience either heat hazard or flood risk (20.6%).

Of these, 140,445 people are in the top 20% of the SIMD (39%).

A total of 244,162 people live in postcodes that may experience heat hazard (14%).
Of these, 104,929 people are in the top 20% of the SIMD (42%)

A total of 137,607 live in postcodes that may experience flood risk (7.8%).
Of these, 45,072 are in the top 20% of the SIMD (32%)

A total of 22,678 live in postcodes that may experience heat hazard and flood risk (1.3%).
Of these, 9,556 are in the top 20% of the SIMD (42%).

5. Impact of constraining the data to an 'urban postcodes'

As part of exploring the development of appropriate targets, 4EI and Clydeplan also created an 'urban postcode' data layer (detailed on page 4), which is included to demonstrate the effect of constraining the data analysis to a more limited area.

Data layer 4: Using the newly created 'urban postcode' layer (PCU2019_1JnHHJnFlood_Settlement_v2.shp) for heat hazard.

Input Rows	PCU2019_1JnHHJnFlood_Settlement_v2			
Selection type	NEW_SELECTION			
Expression	RISK > 3	SIMD20Pct <> 'Outwith top20%' And RISK > 3	RISK > 3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And RISK > 3 And DnstyVig < 5
Resulting features selected (/total features)	6906/39200	956/39200	2178/39200	1013/39200
PopCnt in selection (/PopCnt)	240376/1562336	103474/1562336	109762/1562336	50839/1562336
% population	15.4	6.6	7	3.3

From the above, it is possible to derive statistics such as:

Of the 240,376 living in urban areas subject to higher heat hazard, 43% are in the Top 20% of the SIMD (103,474).

Data layer 5: Using the newly created 'urban postcode' layer (PCU2019_1JnHHJnFlood_Settlement_v2.shp) for flood risk.

When considering flood risk, the 'ClipPopn' attribute was used to calculate the number of people that may be affected. This attribute distinguishes people within postcodes affected by flood, as the whole postcode may not be affected.

Input Rows	PCU2019_1JnHHJnFlood_Settlement_v2			
Selection type	NEW_SELECTION			
Expression	GenFlood = 'Yes'	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes'	GenFlood = 'Yes' And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And DnstyVig < 5
Resulting features selected (/total features)	22350/39200	7456/39200	4187/39200	1837/39200
ClipPopn in selection (/PopCnt)	120172/1562336	41354/1562336	41212/1562336	16484/1562336
% population	7.7	2.6	2.6	1

From the above, it is possible to derive statistics such as:

- Of the 120,172 in urban areas subject to flood risk, 34% are in the top 20% of the SIMD (41,354).

Data layer 6: Using the newly created 'urban postcode' layer (PCU2019_1JnHHJnFlood_Settlement_v2.shp) for heat hazard and flood risk.

Input Rows	PCU2019_1JnHHJnFlood_Settlement_v2			
Selection type	NEW_SELECTION			
Expression	GenFlood = 'Yes' And RISK >3	SIMD20Pct <> 'Outwith top20%' And GenFlood = 'Yes' And RISK >3	GenFlood = 'Yes' And RISK >3 And DnstyVig < 5	SIMD20Pct <> 'Outwith top20%' And DnstyVig < 5 And GenFlood = 'Yes' And RISK >3
Resulting features selected (/total features)	4142/39200	578/39200	1182/39200	535/39200
ClipPopn in selection (/PopCnt)	22170/1562336	9357/1562336	11501/1562336	5000/1562336
% population	1.4	0.6	0.7	0.3

From the above, it is possible to derive statistics such as:
- Of the 22,170 people subject to both a high heat hazard and flood risk, 9357 are in the top 20% of the SIMD (42%).

Headline statistics from the urban 'postcode' only dataset:

A total of 338,378 people live in postcodes that may experience either heat hazard or flood risk (21.7%).
Of these, 135,471 people are in the top 20% of the SIMD (40%).

A total of 240,376 people live in postcodes that may experience heat hazard (15.4%).
Of these, 103,474 people are in the top 20% of the SIMD (43%)

A total of 120,172 live in postcodes that may experience flood risk (7.7%).
Of these, 41,354 are in the top 20% of the SIMD (34.4%)

A total of 22,170 live in postcodes that may experience heat hazard and flood risk (1.4%).
Of these, 9,357 are in the top 20% of the SIMD (42.2%).

Example calculations from the whole dataset:

(244,162 (heat) + 137,607 (flood) - 22,678 (heat and flood))/ 1,742,748 (total population) * 100

(104929 (heat, 20% SIMD) + 45072 (flood, 20% SIMD) - 9556 (both, 20% SIMD) / 359,091 (heat or flood risk) * 100

Example calculations from the urban postcode dataset:

(240376 (heat) + 120172 (flood) - 22170 (heat and flood)) / 1562336 (total settlement population) * 100

103474 (heat, 20% SIMD) + 41354 (flood, 20% SIMD) - 9357 (heat and flood, 20% SIMD) / 338,378 (heat or flood risk) * 100

About 4 Earth Intelligence (www.4earthintelligence.com)

4 Earth Intelligence (4EI) use space data for the betterment of humans and the planet, through Applied Earth Intelligence. They transform geospatial data into actionable insight about our Earth through the delivery of innovative data solutions. As experts in Earth Observation, GIS and remote sensing analytics, they apply their diverse knowledge to delivering objective, timely and reliable Earth Intelligence data that truly empowers decision makers to lead more sustainable and more informed business activities.

About Clydeplan (www.clydeplan-sdpa.gov.uk/)

Clydeplan is the operating name for the Glasgow and Clyde Valley Strategic Development Planning Authority Joint Committee and comprises the eight local authorities of East Dunbartonshire, East Renfrewshire, Glasgow City, Inverclyde, North Lanarkshire, Renfrewshire, South Lanarkshire and West Dunbartonshire Councils who work together on strategic development planning matters. The principal role of Clydeplan is to prepare and maintain an up to date Strategic Development Plan (SDP) for Glasgow City Region. This process involves engagement through joint working and consultation with a number of key stakeholder organisations and the wider community.

6. Contact details

For further information, please contact climatereadyclyde@sniffer.org.uk

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ClimateReadyClyde

Climate Ready Clyde, c/o City Chambers East,
Floor 2, Room 29, Glasgow, G1 1JL
T: 0141 229 7738
E: climatereadyclyde@sniffer.org.uk
W: www.climatereadyclyde.org.uk