

Incorporating the Community Resilience Index into the digital connector.

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Introduction

As part of the Tomolo project we have developed relationships with the City of Leeds who are keen on better understanding Community resilience. Specifically, Malachi Rancecroft from the City has been developing a Community Resilience Index (CRI) based on scientific literature and discussions with universities.

This document summarises the methodology of the current iteration of Malachi's CRI. The goal of this document is to facilitate the inclusion of the CRI as a field in the Digital Connector. Including the CRI in the Digital Connector will likely involve:

- Creating importers for data required (~10 needed)
- Generating new fields for each new data point (*timed value*)
- Enabling the ability to transform fields (e.g. estimate quantiles / normalise)
- Generating a CRI field using a combination of transformed fields.

Data

To develop the CRI Malachi combined a range of indicators using data for Leeds. These indicators, e.g. amount of green space / density of schools are available at the LSOA level. Table 1 summarises the indicators used in the CRI. Note that the last row "Assets Combined" includes a combination of the indicators exhibiting low numbers and these rows are identified in the table with italicised font.

- Rows in GREEN = Open Data
- Rows in AMBER = Unclear if open / partially open
- Rows in RED = Not Open

Table 1: Indicators used on the general CRI methodology

Type of Resilience	Source	Description (from Malachi)
Household Income	Experian Mosaic Public Sector	Extract the 'most dominant HH income' for the LSOA defined by the number of postcodes with the HH income range
Property	Land Registry	House price data compared to household income and the difference between the two SOURCES: <i>Price Paid Data: https://www.gov.uk/government/statistical-data-sets/price-paid-data-downloads</i> <i>Household Income: See row above. FCC could use MSOA or LA level data from the census.</i>
Disability	SHBE	Postcode level data aggregated to LSOA using field 12 filtered for "Employment and Support Allowance (IR)" SOURCES: ?
Overcrowding	Census 2011	Based on the Occupancy rating (rooms) of -1 or less (indicating that there is 1 or more too few rooms for the household)

		SOURCES: https://www.nomisweb.co.uk/query/construct/summary.asp?mode=construct&version=0&dataset=769
Claimant	NOMIS Website	Custom query based on "Claimant count by sex and age" for Leeds LSOA 2011 (Apr '11 data) SOURCES: https://www.nomisweb.co.uk/query/construct/components/stdListComponent.asp?menuopt=12&subcomp=100
Medical	Census 2011	Based on "Day-to-day activities limited a lot" and "Very bad health" combined (already in connector) SOURCES: https://www.nomisweb.co.uk/census/2011/qs303ew
Deprivation	Indices of Multiple Deprivation 2015	Simple copy of the 10 IMD deciles for LSOAs converted to quartiles SOURCES: http://opendatacommunities.org/data/societal-wellbeing/imd/indices
Education	Children's Services	Combination of KS4, Outcomes: aged 19 Achieve Level 3, Secondary Home Persistent Absence (15%), Not in Education, Employment or Training (MAYBE: SOURCES: ?
<i>Children Centre</i>	<i>Leeds City Council (Leeds Data Mill)</i>	<i>(Low numbers - not used singularly*)</i> SOURCES: ?
Schools	Children's Services	Took the number of schools and Early Years Centre for each LSOA. Higher number = better quartile SOURCES: ?
<i>Leisure Centre</i>	<i>Leeds City Council</i>	<i>(Low numbers - not used singularly*)</i> SOURCES: ?
<i>Post Office</i>	<i>Royal Mail</i>	<i>(Low numbers - not used singularly*)</i> SOURCES: ?
<i>Library</i>	<i>Leeds City Council</i>	<i>(Low numbers - not used singularly*)</i> SOURCES: ?
Health (PCT) facility	PH Intel Team	Basic list of GP Surgeries across Leeds (October 2015) SOURCES: In connector but need to be able to query by spatial unit.
<i>Community Centre</i>	<i>Leeds City Council (Leeds Data Mill)</i>	<i>(Low numbers - not used singularly*)</i> SOURCES: ?
Local Green Space	Leeds City Council	Green Space as provided by City Development SOURCES: ?
Assets Combined*	Various	Mixture of Post Offices, Libraries, Community Centres, Leisure Centres, Children's Centres SOURCES: ?

Methodology

When combined, the table of data sources above generates 11 indicators used in the CRI calculation. Italicised rows are combined to create the "Assets Combined" score whereby the frequency of each of the assets in each LSOA is summed. For example, two post offices and a community centre would create an "Assets Combined Score of 3".

Depending on the nature of the data (if it is ordinal) the information is first ranked according to the number of different categories to enable a rough numerical representation of the measure. We note that nominal data is not used in the estimation of this measure - only numeric and ordinal.

Once a numerical representation of each indicator exists, the values for each indicator are split into quartiles (aka quartiles). This quartile is then translated into a score whereby 1 is best and 4 is worst from a CRI perspective.

For example:

Table 2: Explanation of generating a score for an indicator

(A) Medical Indicator	(B) Medical Indicator Quartile	(C) Medical Score
144	2	3
175	2	3
74	4	1
189	1	4
182	1	4
173	2	3
74	4	1
102	4	1
60	4	1
147	2	3

In Table 2, column A contains the raw numeric data from the census which documents the summed frequency^[a] of "Day-to-day activities limited a lot" and "Very bad health" for each LSOA. In Column B, the raw data is converted to quartiles where the 4th quartile is BEST health and the 1st quartile is WORST health. These quartiles are then inverted (e.g. 1 -> 4) because the CRI convention assumes that lower values are the best.

Once completed for all indicators, the scores from within each LSOA are summed to generate a final score. In Table 3, Columns C and D represent two of the 11 indicators that will be summed. Column E represents the results of an example summation of the 11 indicators for each LSOA.

Table 3: Explanation of generating an overall CRI score for an LSOA

(C) Medical Score	(D) Deprivation Score	(E) Total Score	(F) Quantile of Total Score
3	2	12	1
3	4	21	2
1	4	25	3
4	4	18	2
4	2	12	1
3	1	34	4
1	2	21	2
1	4	32	1
1	2	11	3
3	1	29	2

To further simplify, the range of CRI values for the LSOAs are split into quartiles in column F. This means that any given LSOA could have a final CRI value of between 1 (best) and 4 (worst). The data in column F should be considered as the final 'Community Resilience Value'.

Things to consider:

- Estimating quartiles is done based on the range of values from all of the LSOAs available (in this case for Leeds). Do we want to provide functionality that enables quartiles to be estimated over different spatial extents (e.g. UK vs Leeds). This would enable the execution of this method both on specific cities, and country-wide.
- Do we want to be able to aggregate these scores - e.g. average CRI for all MSOAs in the UK based on the LSOA level aggregations?

^[a]This needs to be confirmed as it has not yet been made clear.

