NISRA
Northern Ireland Statistics and Research Agency
Gníomhaireacht Thuaisceart Éireann um Staitisticí agus Taighde

New statistical output geographies for Northern Ireland derived from Census 2021

21 February 2023

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1. Introduction

Census statistical outputs are produced for a variety of geographies within Northern Ireland (NI). These geographies range in size from local neighbourhoods to large administrative units such as Local Government Districts. Since Census 2001, the Northern Ireland Statistics and Research Agency (NISRA) has published census information at local level using geographic units that were created from building blocks of postcode polygons. These were initially named Output Areas and Super Output Areas and are referred to within the statistical organisation as ‘statistical output geographies’.

For Census 2011, these Output Areas were updated slightly and renamed as ‘Small Areas’, while the Super Output Areas largely remained the same; these were the main small-area geographies used for the release of Census 2011 statistics. A public consultation on Census 2021 outputs in 2018/19 indicated a user need to update these geographies. Given this user input, NISRA has developed two new statistical output geographies to support the dissemination of Census 2021 statistics.

The factors supporting the development of the new statistical output geographies are outlined in this information paper (PDF, 733 KB), published alongside the aforementioned consultation. It also provides a brief description of the new geographies and the method being used to create them. The purpose of this paper is to provide users with more detailed information on the new geographies and to supplement the release of the digital boundaries on 21 February 2023.

2. Creating the new Census 2021 output geographies

The two new statistical output geographies for Census 2021 are named Data Zones and Super Data Zones. They were created using an automated zone design program called AZ Tool, developed by University of Southampton. It aggregates small geographic areas (termed building blocks) into larger zones, optimised to meet specified design criteria.

The building blocks were created in Geographic Information System (GIS), primarily using the intersecting main road network as a framework. Where applicable, the boundaries of the building blocks align with the administrative geographies of District Electoral Area and Local Government District, while they also broadly align with the larger 2015 Settlement Development Limits (PDF, 1.2 MB). The following design criteria informed the aggregation of the building blocks to create the Data Zone and Super Data Zone areas, facilitated where relevant by Census 2021 data:

- broadly similar population size;
- socially similar in terms of housing characteristics of tenure and accommodation type;
- compact and regular shape.

3. Census 2021 output geography hierarchy

There are 3,780 Data Zones across NI, which nest within the 850 Super Data Zones. These in turn nest within the 80 District Electoral Areas and 11 Local Government Districts. This creates a four-level output geography hierarchy for Census 2021 (Figure 1).

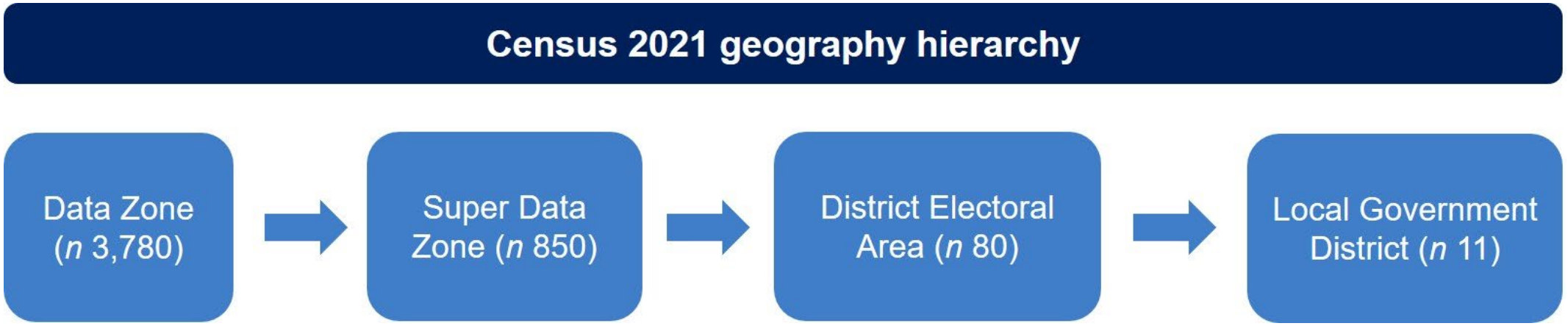


Figure 1. Output geography hierarchy for Census 2021

4. Overview of the new Census 2021 output geographies

4.1 Spatial distribution

Table 1 shows how the Data Zone and Super Data Zone areas relate to their higher-level geographic ‘parents’. The average number of Data Zones per Local Government District, District Electoral Area and Super Data Zone is 344, 47 and four, respectively. Regarding Super Data Zone, there is an average of 77 per Local Government District and 11 per District Electoral Area.

Table 1. Average number and range of Data Zone and Super Data Zone areas in the relevant upper levels of the Census 2021 output geography hierarchy

Geography	Per Local Government District		Per District Electoral Area		Per Super Data Zone	
	Average	Range	Average	Range	Average	Range
Super Data Zone	77	49-175	11	6-22	-	-
Data Zone	344	223-735	47	24-100	4	2-8

The maps in Figures 2 and 3 show the spatial distribution of the Super Data Zone and Data Zone areas across NI, with the inset maps showing the main urban centres in Belfast and Derry City and Strabane Local Government Districts at a lower scale.

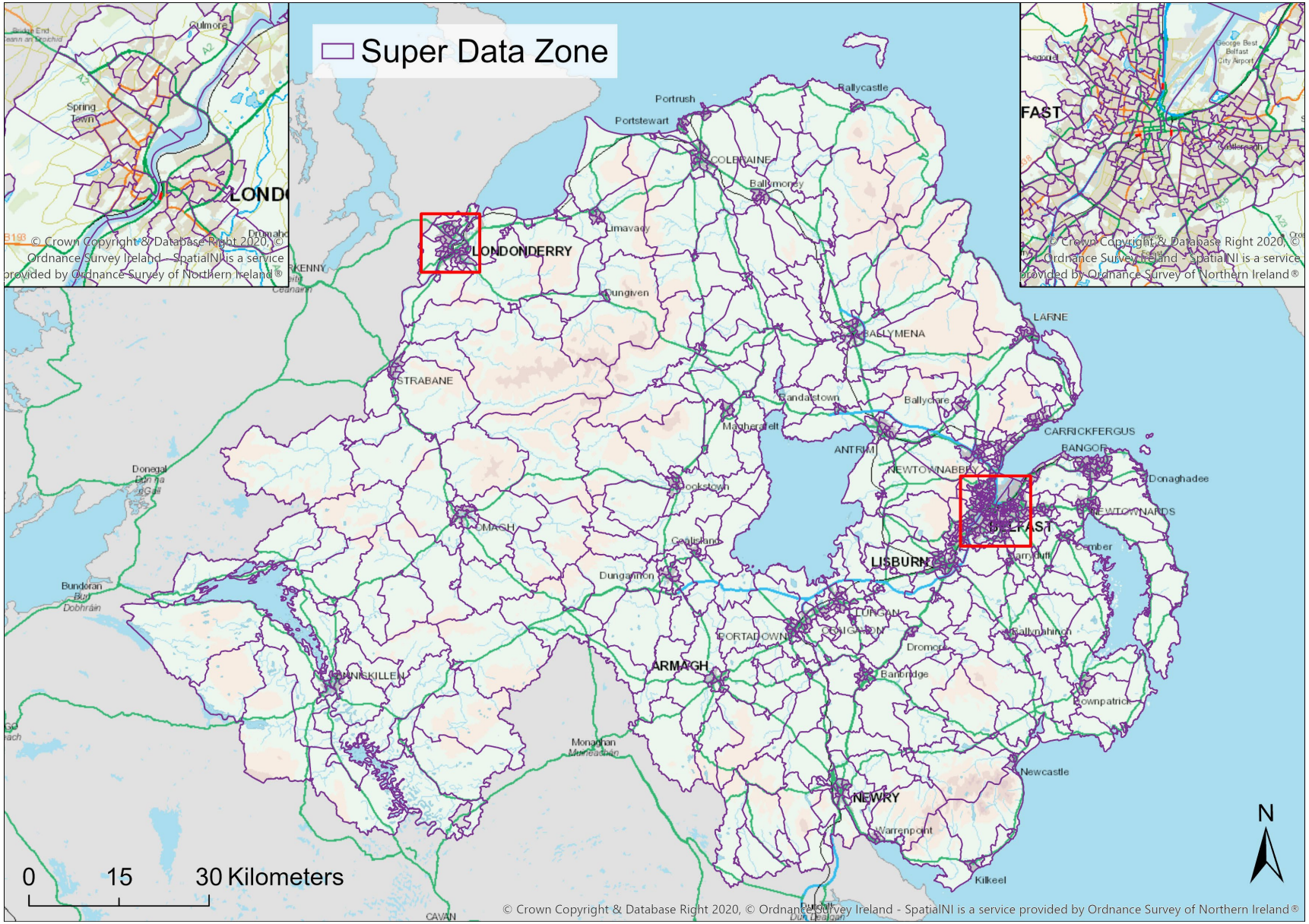


Figure 2. Census 2021 Super Data Zone boundaries

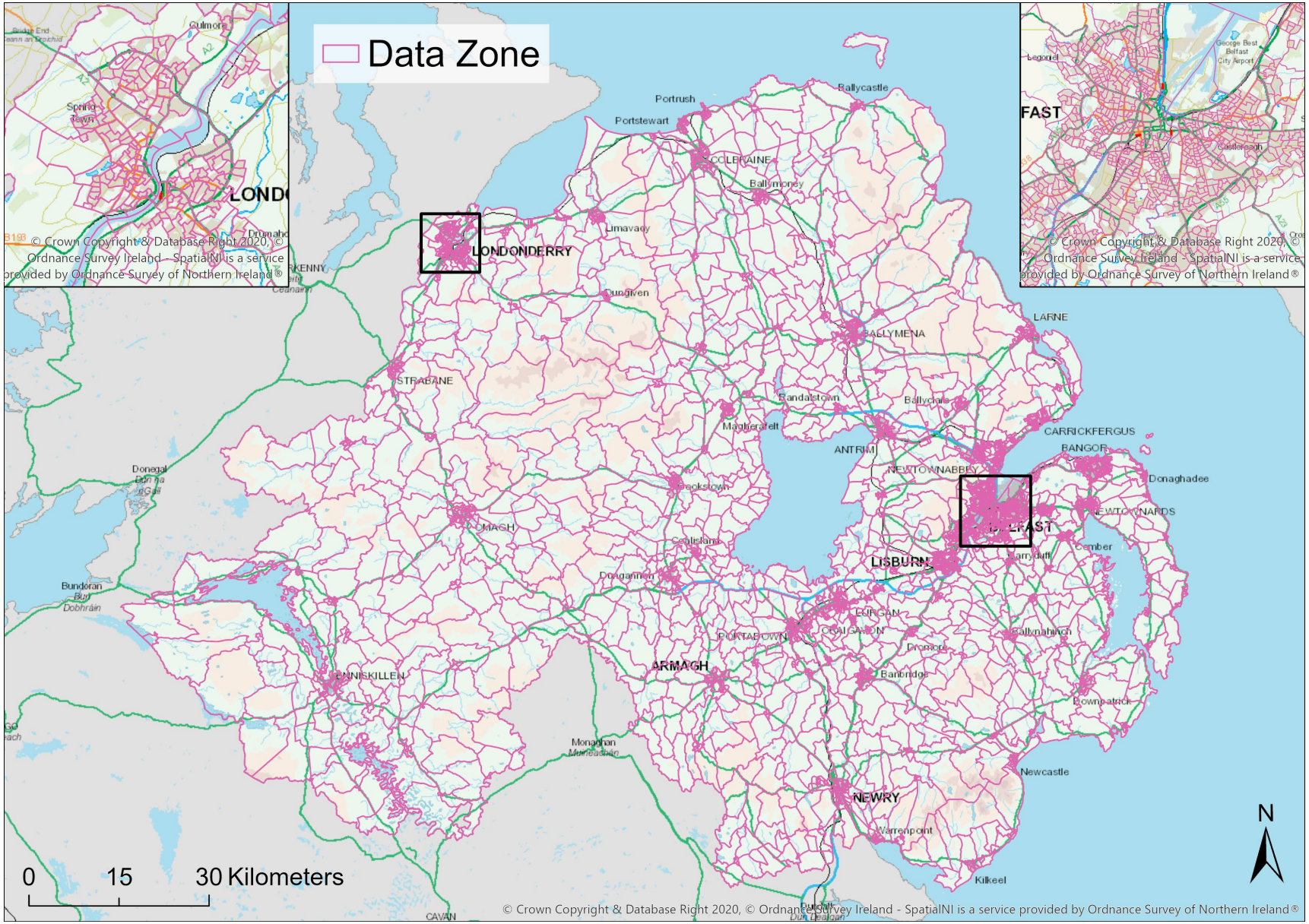


Figure 3. Census 2021 Data Zone boundaries

4.2 Population distribution

The distributions of Census 2021 usual resident persons (1,903,175) and households (768,810) by Data Zone and Super Data Zone are illustrated in Figures 4 and 5. The distributions of the same data by the Small Area and Super Output Area geographies are also included for comparison.

The shape of the distributions is reasonably symmetrical by Data Zone and Super Data Zone; this contrasts with Small Area and Super Output Area, whose distributions are more positively skewed (longer tail to the right). The high person count for a small proportion of Data Zones (Figure 4a) is mainly attributable to large communal establishment populations in these areas, as the Census 2021 data used in the AZ Tool processing to create the geographies related to households only.

Although the upper interval value for the person and household counts is capped on the horizontal axes (for example, 3,000+ in Figure 4a), the narrower spread of data by Data Zone and Super Data Zone is evident. This is reflected in the range and interquartile range (IQR) of the counts across the geographies shown in Table 2 (figures rounded to the nearest 10). The IQR and range are generally lower for Data Zone compared to Small Area and for Super Data Zone compared to Super Output Area. Table 2 also provides the rounded mean person and household counts for the four geographies.

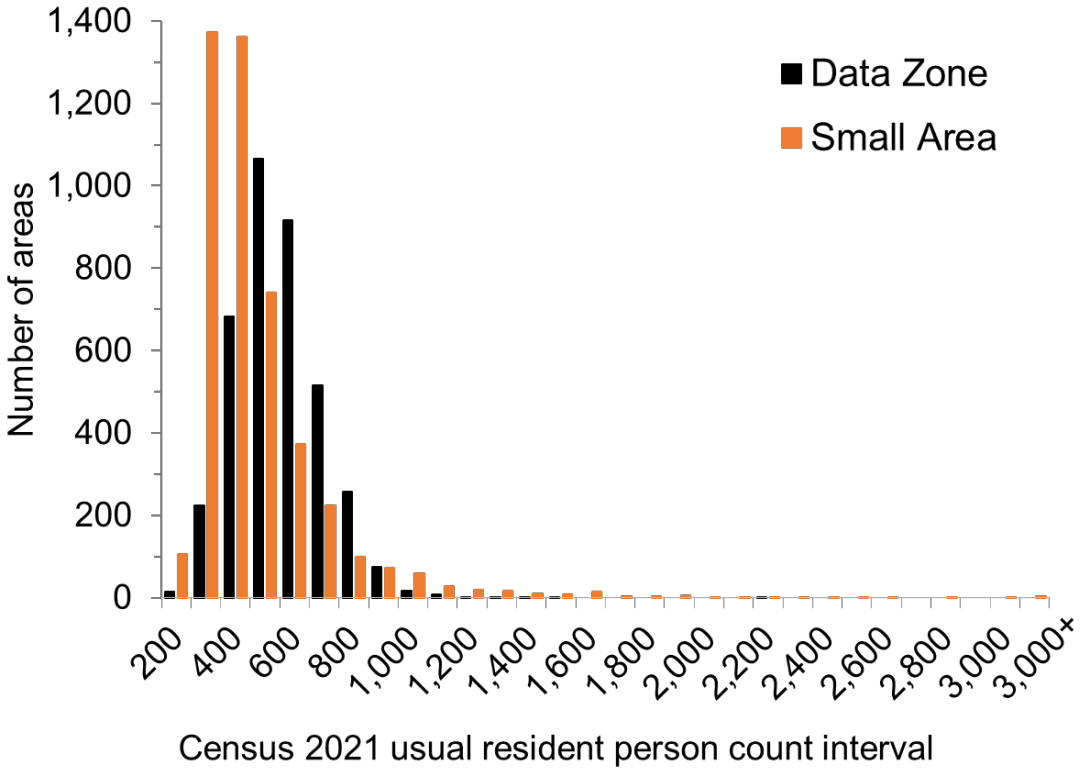


Figure 4a. Distribution of Census 2021 usual resident persons by Data Zone and Small Area

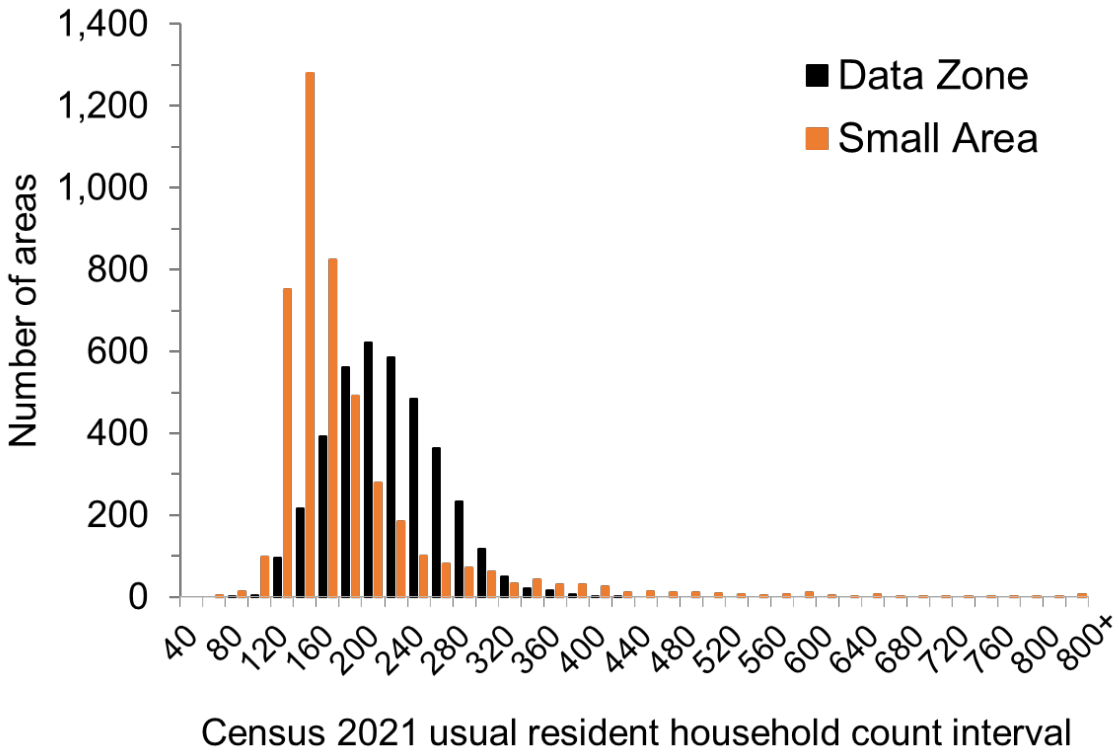


Figure 4b. Distribution of Census 2021 usual resident households by Data Zone and Small Area

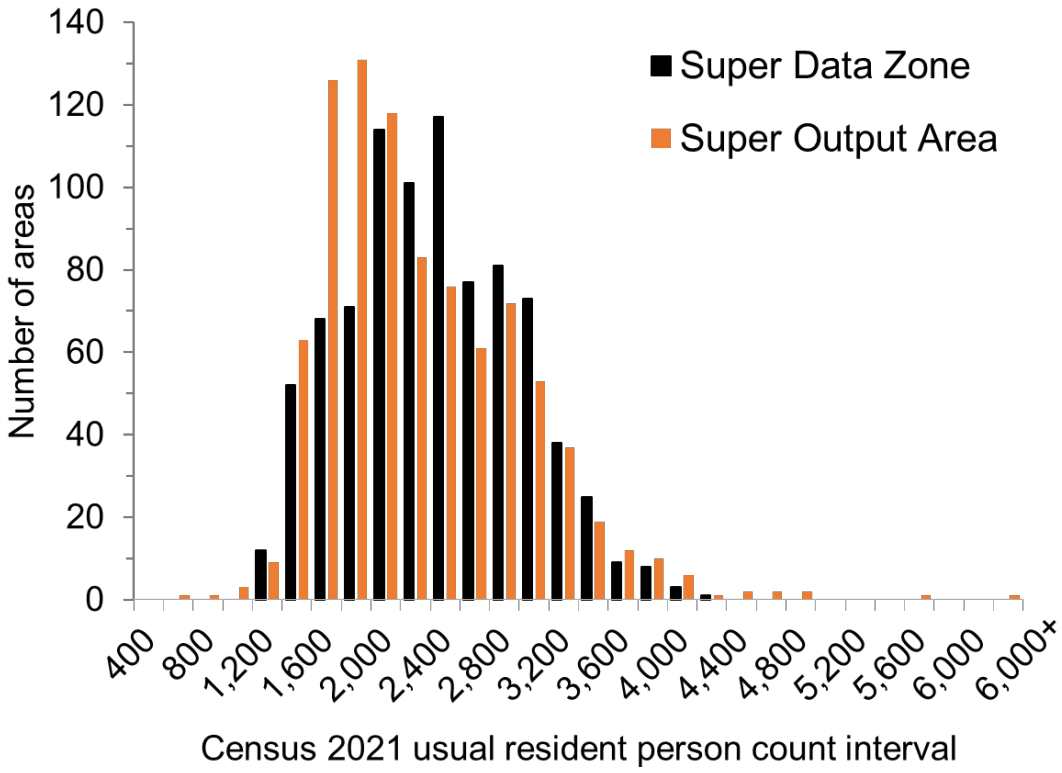


Figure 5a. Distribution of Census 2021 usual resident persons by Super Data Zone and Super Output Area

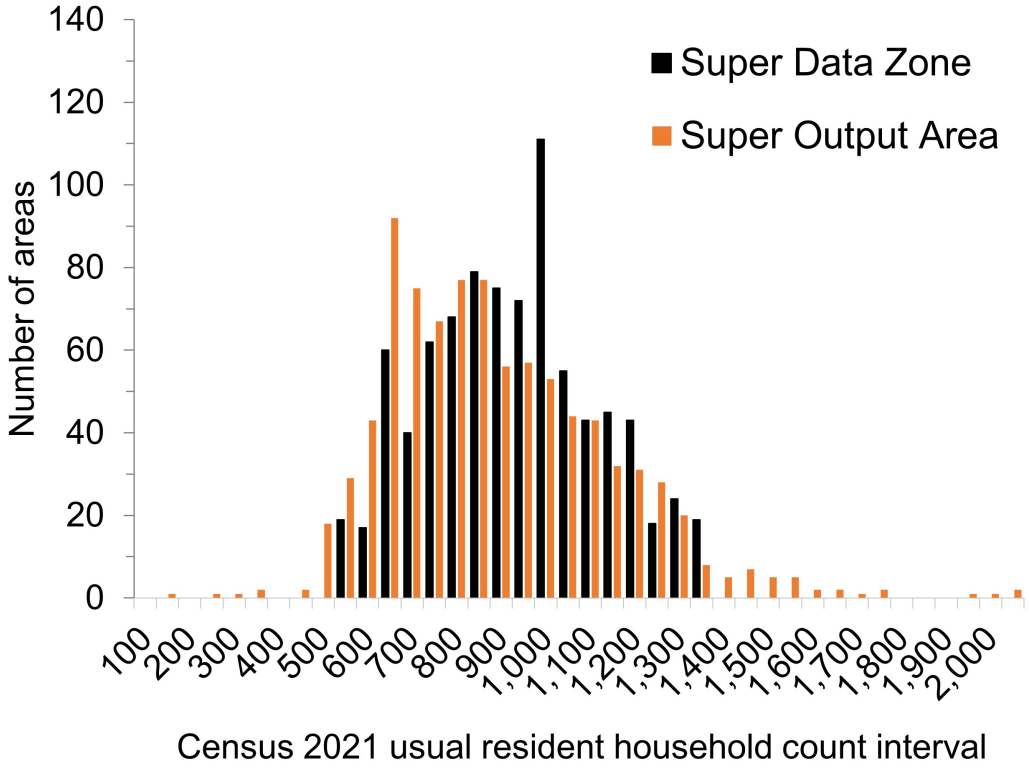


Figure 5b. Distribution of Census 2021 usual resident households by Super Data Zone and Super Output Area

Table 2. Summary statistics based on Census 2021 usual resident person and household counts by Super Data Zone and Data Zone, and by Super Output Area and Small Area

Measure	Super Data Zone		Data Zone		Super Output Area		Small Area	
	Persons	Households	Persons	Households	Persons	Households	Persons	Households
Range	2,980	830	2,010	330	5,780	2,100	4,040	1,390
Interquartile range	840	270	190	70	940	350	190	50
Mean	2,240	900	500	200	2,140	860	420	170

5. Codes and names

The entity codes for the Data Zone and Super Data Zone areas are based on the Coding and Naming Policy for UK Statistical Geographies. The codes are in nine-character alpha-numeric format, with the first character signifying the country, the next two characters identifying the specific geography, and the following six numeric characters identifying the specific area within that geography. The numbering begins at '000001' and ends at '003780' for Data Zones and '000850' for Super Data Zones (based on the number of areas in each geography). Figure 6 illustrates the format using sample codes for the two new geographies, with a sample code for a Local Government District area included for comparison. Note that this geographic coding structure is mandated and provides no intelligence that relates the geographic unit in focus with its higher-level 'parents'.

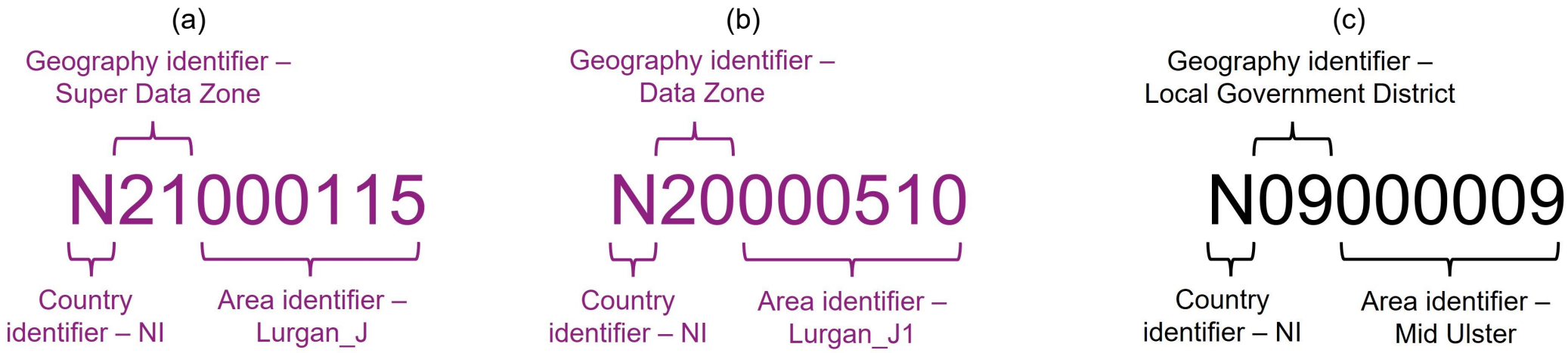


Figure 6. Entity code format for sample (a) Super Data Zone, (b) Data Zone, and (c) Local Government District

The Data Zone and Super Data Zone names are based on the District Electoral Area they are located in. For Super Data Zones, the District Electoral Area name has a suffix of _A, _B, _C and so on according to the approximate north to south location within the DEA. Following the approach of Royal Mail with postcode format, the letters I, M, O and V are not used in the suffix. The Data Zone names have an additional ascending number 1 to *n* on the suffix where *n* is the number of Data Zones within that Super Data Zone (for example, _A1, _A2). Where a District Electoral Area name includes spaces, the names of the constituent Data Zones and Super Data Zones have an underscore instead of the space. Figure 7 illustrates the name format for the two geographies.

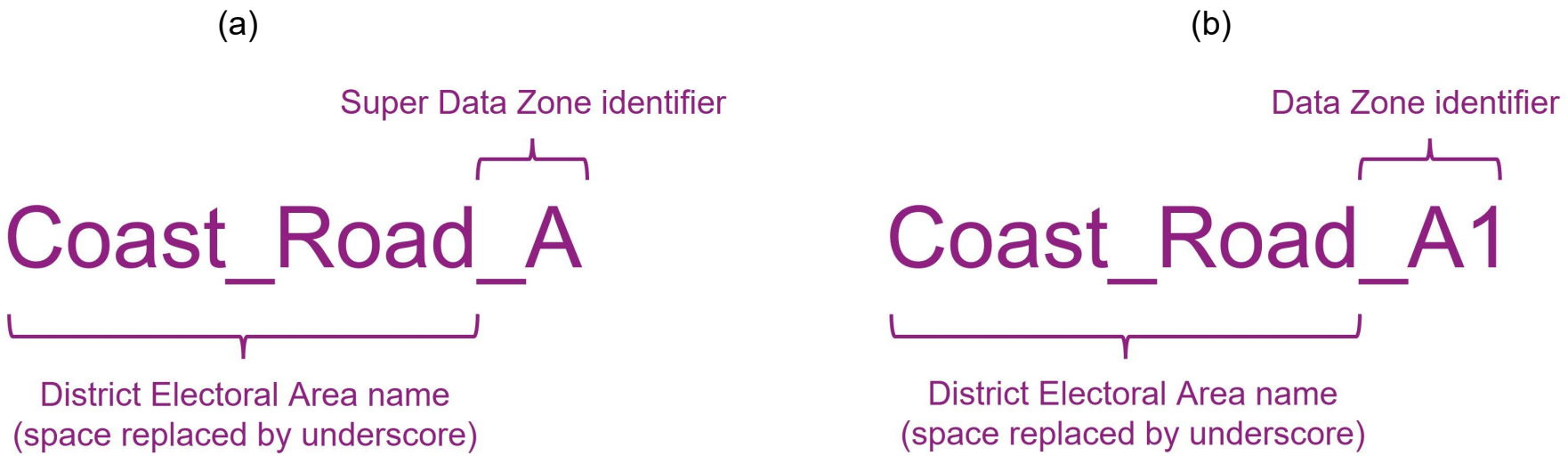
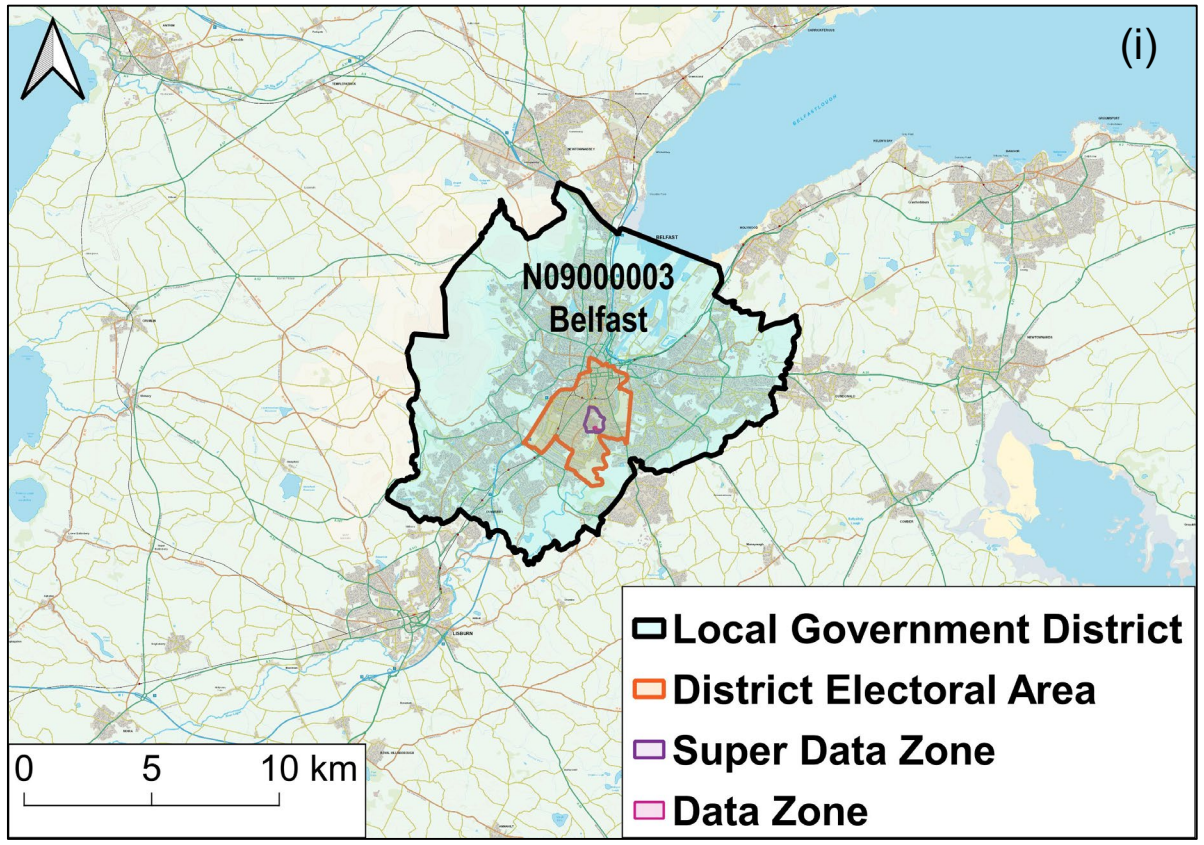


Figure 7. Name format for sample (a) Super Data Zone and (b) Data Zone

The series of maps in Figure 8 illustrate the Data Zone and Super Data Zone code format in the context of the Census 2021 output geography hierarchy. Using the location of Colby House in south Belfast (NISRA headquarters), Figure 8a(i) and 8a(ii) show the associated Local Government District and District Electoral Area, respectively, with their code and name. Figure 8b(i) displays the Super Data Zone containing Colby House, with the relevant Data Zone highlighted in the lowest scale map in Figure 8b(ii). Note that the maps only show the boundaries of the relevant area within the hierarchy; for example, there are five Data Zones in Botanic_Q Super Data Zone but only the one with Colby House is displayed in Figure 8b(i).



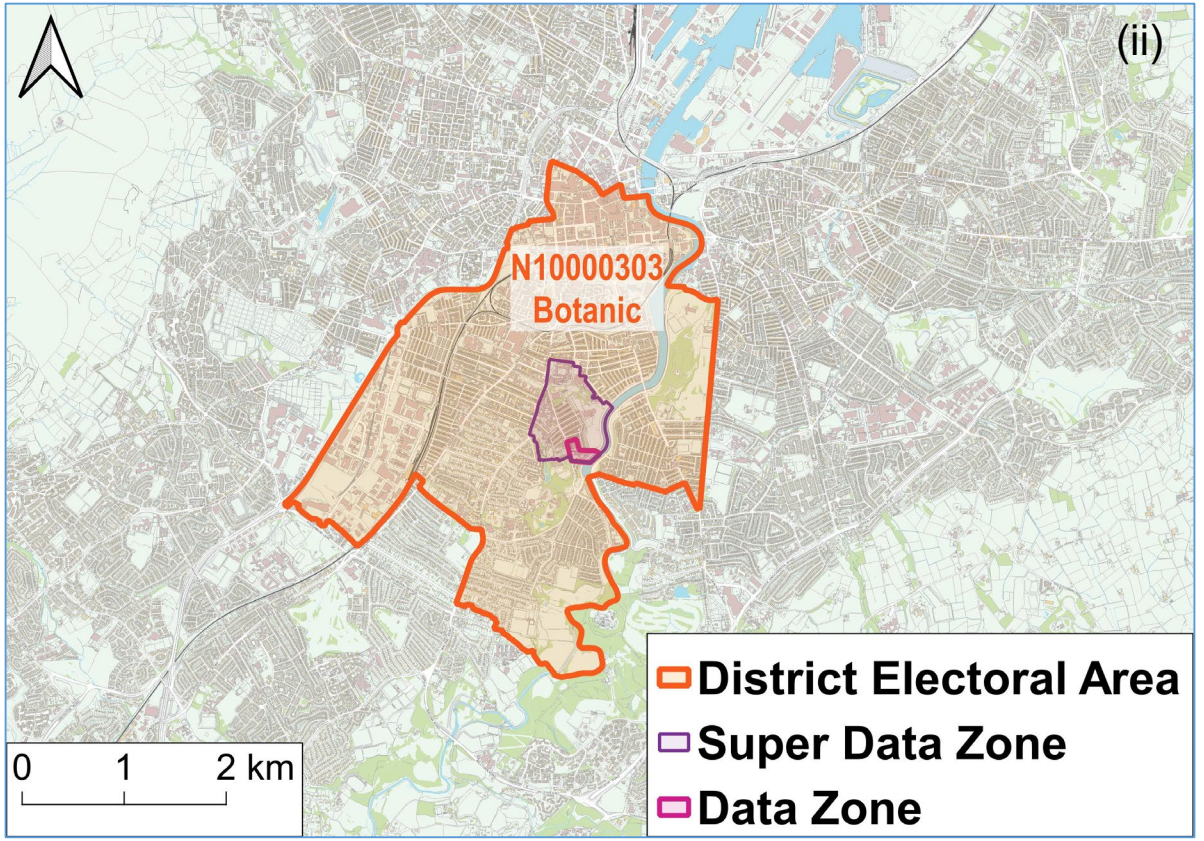


Figure 8a. Levels of the Census 2021 geography hierarchy using Colby House (NISRA headquarters) in Belfast as a sample location; (i) from Local Government District down, and (ii) from District Electoral area down

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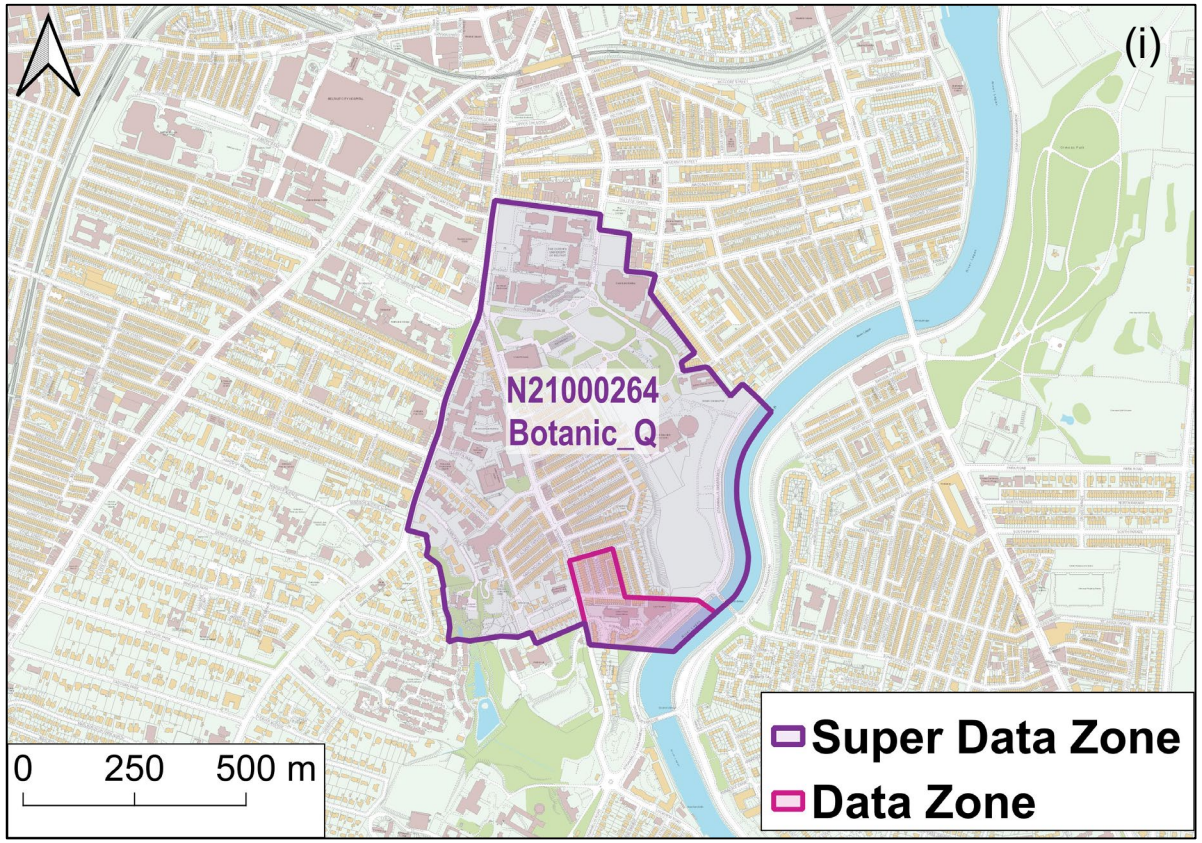

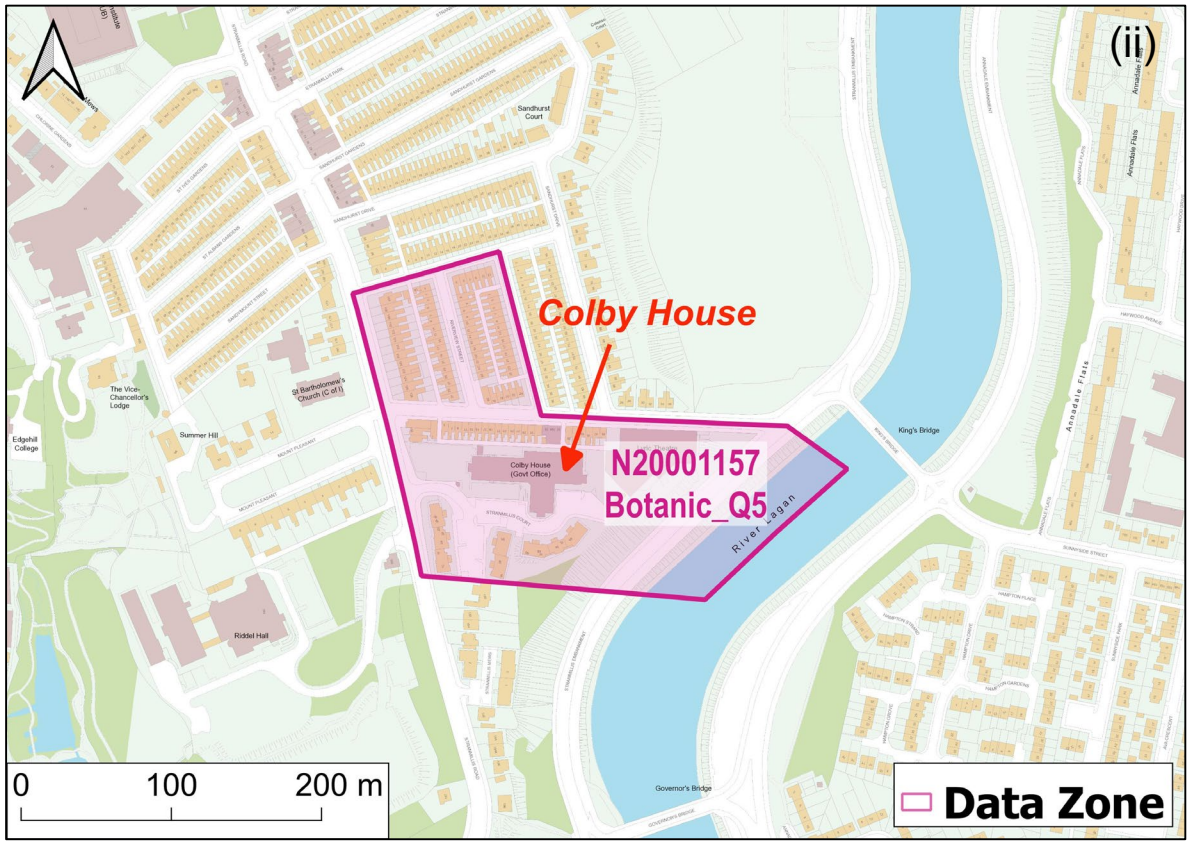

Figure 8b. Levels of the Census 2021 geography hierarchy using Colby House (NISRA headquarters) in Belfast as a sample location; (i) from Super Data Zone down, and (ii) the base Data Zone

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6. Benefits of the new Census 2021 output geographies

6.1 Nest within administrative geographies

The introduction of Data Zone and Super Data Zone restores the nesting of the census statistical output geographies with the local government boundaries, which was lost in 2015 when the former 26 Districts were reorganised to create the current 11 Local Government Districts. In this context, it is important to acknowledge the recently completed Review of Local Boundaries for Northern Ireland, which proposes changes to some Local Government District boundaries. However, these changes are small in spatial terms and they should not materially impact the aggregation of Data Zone/Super Data Zone data to produce statistics by Local Government District. Also, the passing of the recommendations from this review into law triggers an independent review of District Electoral Areas; this cannot be established until after the May 2023 local government elections, so these boundaries will not change in the short-term.

6.2 Socially-similar areas

The AZ Tool program drew upon Census 2021 data on housing tenure and accommodation type to merge building-blocks that are similar with respect to these attributes. As a result, the Data Zone and Super Data Zone areas are socially-similar in terms of these household-level characteristics. This should be beneficial in terms of using Census 2021 statistics and data in the context of local service planning and resource allocation.

6.3 Reflect housing and population change

Given the growth in population and housing in NI over the past decade, some of the Small Areas and Super Output Areas would have excessive person and household counts based on Census 2021 data. The Data Zones and Super Data Zones have a narrower range of population and household counts (see section 4.2) as AZ Tool used associated data from Census 2021 to create areas of target size with upper and lower thresholds. The average size of the Data Zone areas in population terms is approximately 500 persons and 200 households, while the corresponding figures for Super Data Zones are 2,240 persons and 900 households.

The two maps in Figure 9 show the same location on the north-western fringe of Derry City and Strabane Local Government District. Figure 9(a) displays the Small Area boundaries on an orthophotography background from 2013; the built-up and more rural areas are evident. Figure 9(b) shows the Data Zone boundaries on a recent orthophotography background from 2021 that is a more accurate representation of the current distribution of housing in the area. The yellow circle highlights where substantial housing development has occurred since 2013. Census 2021 population and/or household counts for the Small Area in the highlighted area would be overly large, potentially masking some of the detail in the data describing characteristics of the resident population. The Data Zone geography on the other hand better reflects the spatial distribution of housing and population in this high-growth location, comprising areas that have broadly similar population size.

(a)

(b)

Figure 9. Orthophotography map of area to north-west of Derry City and Strabane Local Government District from (a) 2013 with Small Area boundaries, and (b) 2021 with Data Zone boundaries (yellow circle highlights where substantial housing development has occurred over the time period)

6.4 Alignment with settlements

The Data Zone and Super Data Zone areas are closely aligned with the larger settlements as defined in the 2015 Review of the Statistical Classification and Delineation of Settlements (PDF, 1.2 MB). These are Belfast City (Band A) and Derry City (Band B) along with the 14 large towns (Band C), 10 medium towns (Band D), 14 of the 17 small towns in Band E and 20 of the 24 intermediate settlements in Band F. This feature will benefit users seeking to compile Census 2021 statistics for the settlements in question. Further detail is available in the paper 'Aggregating Data Zones to produce statistics for higher-level geographies' (PDF, 753 KB).

6.5 Readily identifiable boundaries and more regular shape

The Data Zone and Super Data Zone boundaries are recognisable on the ground as they largely align with physical landscape features, notably the NI road network. This contrasts with the Small Area and Super Output Area geographies, whose boundaries are more abstract in design and are less aligned with landscape features. A further design element of the new geographies is minimal intersection of the boundaries with building footprints; this was unavoidable in some areas though where recent housing development overlaps the District Electoral Area and/or Local Government District boundaries.

In general, the Data Zone and Super Data Zone areas are compact and have a regular shape. These design criteria were applied by setting specific parameters in AZ Tool relating to (a) the perimeter to area ratio for the individual areas, and (b) a minimum boundary length threshold that influenced the merging of building blocks to create the areas. These shape characteristics lend themselves well to mapping of data for and visualisation of the new geographies in GIS.

The map of Ballymena in Figure 10 illustrates these features of the new geographies. The Data Zone and Super Data Zone boundaries are generally aligned with the road network, for example, with the M2 motorway to the right of the settlement. There is also alignment with parts of the Braid River to the south-west. The reasonably compact and regular shape of the areas is evident.

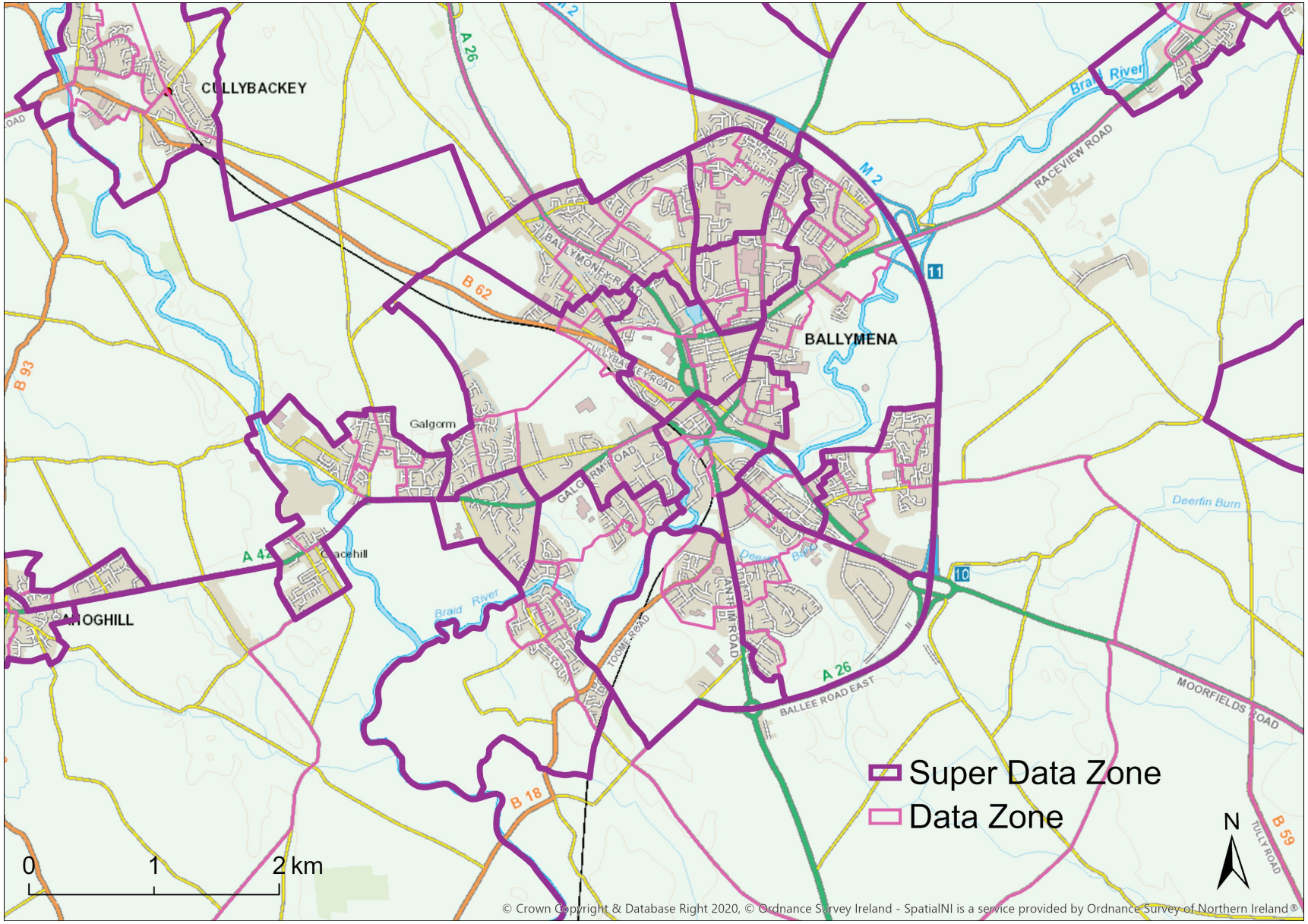

Figure 10. Data Zones and Super Data Zones in the settlement of Ballymena

7. Resources

7.1 Digital boundaries

The digital boundaries for Data Zone and Super Data Zone are available to download from the NISRA website. They are available in a range of formats, namely shapefile, GeoJSON and Geodatabase. These digital boundaries can be used in GIS programs for mapping and data visualisation. Users should note that the downloads only contain digital boundaries; there is no background mapping.

Northern Ireland Mapping Agreement (NIMA) participants (PDF, 213 KB) can access Spatial NI, which is the web mapping platform provided by Ordnance Survey of Northern Ireland (OSNI). This provides access to OSNI's mapping data as well as other geospatial information from multiple providers across the public and private sectors. Users outside of NIMA can access some features of Spatial NI. Contact details for queries related to Spatial NI or general mapping are available on the Spatial NI website.

Digital boundaries for administrative geographies in NI (e.g. Local Government District, District Electoral Area, Parliamentary Constituency) can be downloaded from Open Data NI.

7.2 Central Postcode Directory

The new Census 2021 output geographies will be included in the NISRA Central Postcode Directory (CPD) in due course. Once the required Census data have been published, the CPD will be accompanied by information on the accuracy of aggregating postcode-level data to generate statistics for Data Zone and Super Data Zone. This will assist users in deciding whether the levels of accuracy are acceptable for their purposes.

7.3 Approximating other geographies

The proposed method for approximating Census 2021 statistics for geographies outside the aforementioned four-level hierarchy is described in 'Aggregating Data Zones to produce statistics for higher-level geographies' (PDF, 753 KB). An associated lookup table (Excel, 458 KB) is available to download.

7.4 Lookup table

The lookup table (Excel, 458 KB) for the Census 2021 output geography hierarchy (Data Zone – Super Data Zone – District Electoral Area – Local Government District) is available to download.

8. Further information

8.1 Contact details

For further information on the new Census 2021 statistical output geographies, or any Census 2021 geography-related queries, please contact NISRA Geography (geography@nisra.gov.uk).

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