Social needs for transport and gaps in transit service: Enniscorthy and other parts of County Wexford

Dr James Reynolds

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Introduction

The CONUNDRUM project relates to sustainable transport, community mobility and co-creation, and is using Enniscorthy in County Wexford, Ireland, as a test bed. However, assessments and mapping of social needs for transport, and public transport supply provided in Enniscorthy, and how these compare to other places in Ireland, do not appear to be publically available.
Currie et al[1] developed a methodology for assessing spatial gaps between social needs and transit supply An R package[2] has recently been developed that facilitates the calculation of the transit supply levels from General Transit Feed Specification (GTFS) datasets.

This note presents results obtained by applying the gtfssupply index R package to Ireland's GTFS dataset,
with an emphasis on Enniscorthy in county Wexford.

[1] "Quantitative Approaches to Needs Based Assessment of Public Transport Services: The Hobart Transport Needs Gap Study," Journal Article, 2003, https://www.semanticscholar.org/paper/2c049091cafb56c66efc532ad2bdd774d8efc0eb; "Gap Analysis of Public Transport Needs:measuring Spatial Distribution of Public Transport Needs and Identifying Gaps in the Quality of Public Transport Provision," *Transportation Research Record* 1895 (2004): 137–46, doi:10.3141/1895-18; "Identifying Spatial Gaps in Public Transport Provision for Socially Disadvantaged Australians: The Melbourne 'Needs Gap' Study," 2007; Graham Currie, "Quantifying Spatial Gaps in Public Transport Supply Based on Social Needs," *Journal of Transport Geography* 18, no. 1 (2010): 31–41.

[2] See https://github.com/James-Reynolds/gtfssupplyindex

Background

Transit supply

The social needs-gap analysis methodology involves calculating a Supply Index (SI) based on the number of transit service arrivals at stops in and around each area of interest. Adjustments are made for the amount of each area that is within a typical walking distance of each stop, according to the following formula:

$$SI_{area,time} = \sum \frac{Area_{Bn}}{Area_{area}} SL_{n,time}$$

where:

- $SI_{area,time}$ is the Supply Index for the area of interest and a given period of time;
- $Area_{Bn}$ is the buffer area for each stop (n) within the area of interest[3];
- $Area_{area}$ is the area of the area of interest; and
- $SL_{n,time}$ is the number of transit arrivals for each stop within the given time period.

[3] In Currie, "Quantifying Spatial Gaps in Public Transport Supply Based on Social Needs" this was based on a radius of 400 metres for bus and tram stops, and 800 metres for railway stations. The same definition is used here.

As such, the SI combines coverage (accessibility to transit) and service frequency (accibility by transit). The SI is a relative index, allowing comparison between different areas of interest, based on transit supplied over a specific time period. In the results reported in Currie[4] transit supply was assessed based on an entire week, and compared across Census Collection Districts (CCDs) within Greater Melbourne. CCDs were clasify into seven groups based on SI scores[5].

[4] Ibid.

[5] being those with: zero supply; very low, low, or below average supply; and above average, high or very high supply.
CCDs with above and below average SIs were evenly split into each of the three sub-groups, respectively.

Transport needs

Transport needs were similarly assessed using a index score, based on various metrics available from the Australian Bureau of Statistics (ABS). These included the Index of Relative Socio-Economic Advantage/Disadvantage (IRSAD), which is reported directly by the ABS based on 31 weighted indicators and data collected during the census. A transport-specific need index, based on eight weighted indicators[6] was also included, with scores categorised based on three groups below and three groups above the average score across all of Melbourne.

Clearly, the approach used to assess social needs for transport might need to be adjusted to reflect different data availability in different locations or from different editions of a census.

[6] Adults without cars (0.19), distance to the Melbourne Central Business District (0.15), persons aged over 60 years (0.14), persons on a disability pension (0.12), low income households (0.10), adults not in the labour force (0.09), students (0.09) and persons 5-9 years (0.12).

Needs-gaps

The final step was to compare social needs for transport with the amount of transit supplied in each area of interest. A key finding was that "8.2% of Melbourne residents ha(d) 'very high' needs but 'zero', 'low' or 'very low' public transport supply", reflective of areas of greater need often being in places on urban fringes or otherwise often remote from transit infrastructure and services.
More broadly, it was suggested that the developed methodology might be "substantially more useful than the presentation of anecdotal evidence which is the most common means of identifying transport needs in local transport studies throughout the world"[7].

[7] Currie, "Quantifying Spatial Gaps in Public Transport Supply Based on Social Needs."

Methodology

Supply Index

This analysis used the all-Ireland GTFS dataset, downloaded on April 23, 2025 and reporting scores for transit services provided on that same date (the first Wednesday after Easter). The "Small Area" National Statistical Boundaries from 2022 were adopted as the areas

of interest, with the indexing of supply based on the average score across the County of Wexford.

Needs

The Irish Census (2022) reports various indicators for "Small Area", but these do not match those used in the Currie (2007) or other previous needs-gap analyses. However, there are some that are similar[8], but there does not appear to be a IRSAD or similar socio-economic indicator available.

As such, this analysis adapts the Currie (2007) approach and uses the same weighting for the following indicators: households without cars (0.19); distance to Wexford (0.15); persons aged 60 years and over (0.14), persons unable to work due to permant sickness or disability (0.12), those aged 15 years or older who are not at work; students (0.09) and people aged 5-9 years (0.12). Each of these indicators were normalised across all of the Small Areas in County Wexford, weighted as indicated to develop an combined value that was then weighted by the total population in each Small Area to produce the combined indicator of social need for transport used in this analysis.

[8] Item T15_1_NC is the number of households without a motor car. Items T1_1_AGE60-64T, T1_1_AGE65-69T, ... T1_1_AGE80-84T and T1_1_AGE85T report persons aged 60 years and older; T8_1_UTWSDT reports the total number of people unable to work due to permanent sickness or disability; T8_1_TT reports the total population aged 15 years and over, while T8_1_WT reports the total at work, thereby allowing calculation of the number of adults (15+) not in the labour force; T8_1_ST reports the number of people aged 15 years and over who are students; and T1_1AGE5T, T1_1AGE6T ... T1_1AGE9T report the number of people aged 5 through 9. There does not appear to be any data available about low income households at the "Small Area" geographic area.

Results

County Wexford

TRANSIT SUPPLY: Figure 1 maps Small Areas across County Wexford by transit supply category. Table 1 shows summary statistics for SI score and population, overall and split by transit supply category.

Table 1: Summary statistics, SI & pop.

Characteristic	Overall N = 620	Transit supply category						
		Zero Supply N = 191	Very Low N = 102	Low N = 101	Below average N = 101	Above average N = 42	High N = 41	Very High N = 42
SI								
Min	0.0	0.0	0.0	0.8	10.0	31.5	54.9	91.7
Q1	0.0	0.0	0.1	1.4	13.3	35.5	61.9	115.4
Mean	21.3	0.0	0.3	3.9	19.1	40.5	68.5	151.3
Q3	23.1	0.0	0.4	6.4	23.8	45.1	75.1	181.7
100% Centile	280.9	0.0	0.8	10.0	30.5	53.6	88.4	280.9
Sum	13,219.3	0.0	29.8	395.7	1,929.9	1,699.6	2,810.1	6,354.1
population								
Min	73	73	121	135	105	97	127	93
Q1	203	217	221	216	187	220	177	150
Mean	264	277	282	270	253	270	225	209
Q3	311	321	338	318	299	294	276	240
100% Centile	623	623	545	552	548	525	369	510
Sum	163,919	52,946	28,775	27,261	25,560	11,359	9,240	8,778

The total poplulation of County Wexford is 163,919, of whom 82% (134,542) live in Small Areas where the SI score is below the County

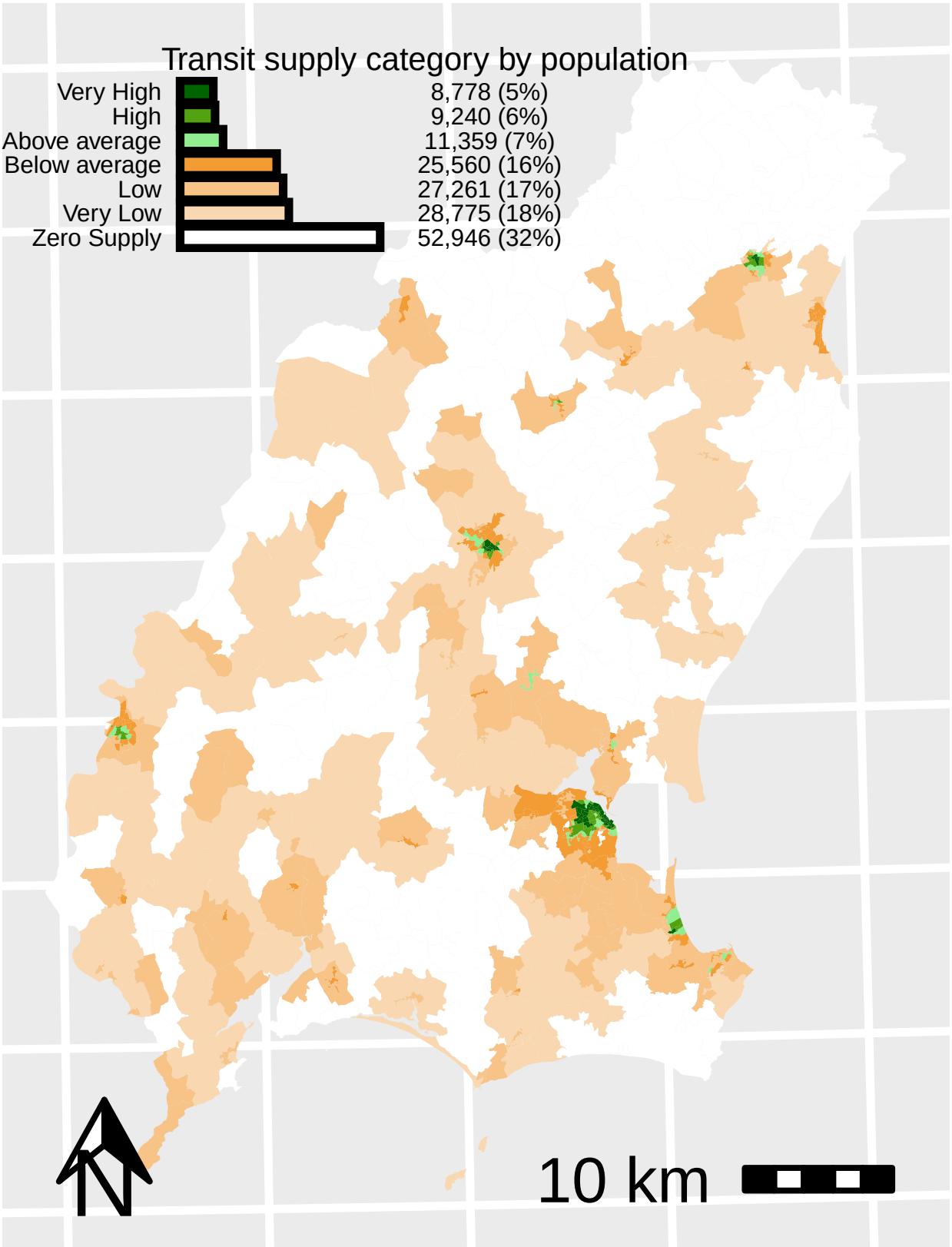

Figure 1: County Wexford: Small Areas by transit supply category

Wexford average (21.3). This includes the 52,946 people (32%) who live in Small Areas with no transit at all.

A Lorenz Curve of distribution of County Wexford's transit supply to the population is shown in Figure 2. The Gini co-efficient is 0.799, indicating a relatively unequal distribution. In total, the SI score across all of County Wexford is approximately 164,000, but 40% of this goes to Small Areas that are home to just 5% of the total population. 85% of the population live in Small Areas that, in combination, receive just 25% of the total supply. This is perhaps not surprising, given that providing transit services in rural and low density areas is challenging.

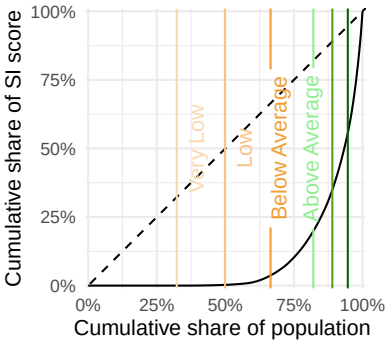

Figure 2: County Wexford: Lorenz curve

Approximately 50% of the county's population (80,000 people) live in Small Areas that are within one of the 45 named 'urban areas' within the county. Figure 3 shows the total population and aggregate SI scores across each named urban area. Boxplots of the SI scores for Small Areas within each of the various urban areas are shown in Figure 5.

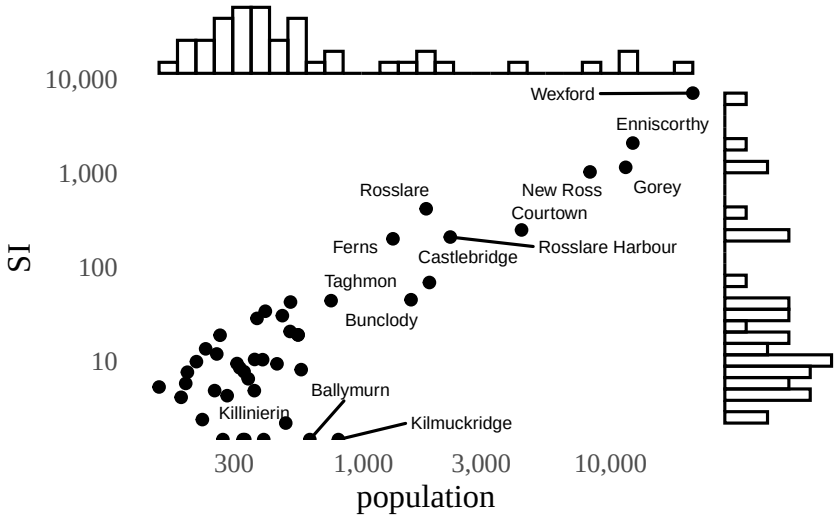

Figure 3: Country Wexford pop. vs SI, aggregated by urban areas

In general terms, places with larger populations tend to have higher SI scores, but this does not appear to consistent. Instead, some places have much higher or lower SI scores than others with similar population sizes[9]. Towards the lower end of the scale, some urban areas have no transit at all, despite having higher populations than others that do have transit services[10]. Further details are provided in Table XX, in the Appendix.

[9] For example, Rosslare (population 1,795) has an aggregate SI score of 419, which is 3.2% of the total for County Wexford. Castlebridge (population 1,850), however, has an SI of only 69 (0.5%) of the total for County Wexford.

[10] For example, Kilmuckridge (792) and Ballymurn (607) do not have any transit service at all, despite being of similar size to Taghmon (opulation 740), which has an SI score of 44 (0.3%) of the county total.

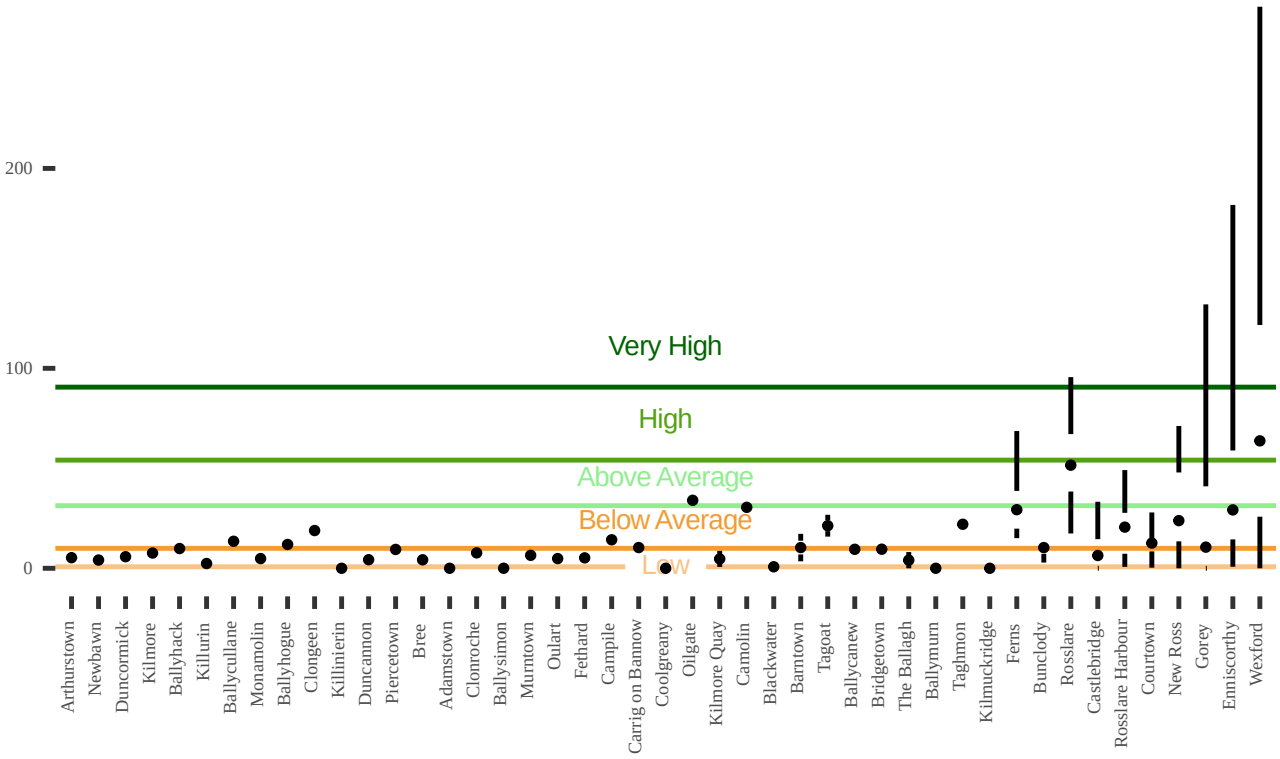

Figure 4: County Wexford urban areas: boxplot of Small Area SI scores, ordered

SOCIAL NEEDS FOR TRANSPORT: The average social needs index score across County Wexford is 35.1. Figure 5 maps the social needs categories across County Wexford, while Figure 6 shows the grouping by population.

There are 91,894 people living in Small Areas that have social need for transport scores that are above the County Wexford average, representing some 56% of the total popluation (163,919). This includes the 37,452 people (23%) living in Small Areas with Very High social needs for transport.

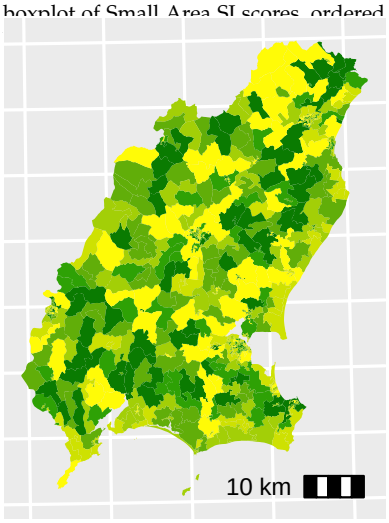

Figure 5: County Wexford: Small Area, by social need for transport category

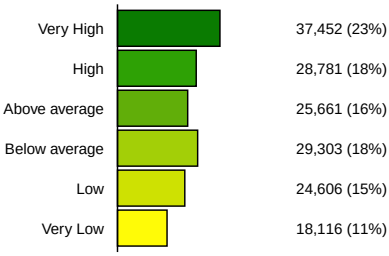

Figure 6: County Wexford: population living in Small Areas, by social need for transport category

NEEDS-GAP: Table 2 shows summary statistics for SI score and transit supply category, overall and split by social needs category, for Small Areas across County Wexford. Figure 7 shows boxplots of SI scores for Small Areas across County Wexford, by social need for transport category.

Table 2: Small Areas: SI score and transit supply category, by needs category.

Characteristic	Overall N = 620	Social needs category						p-value
		Very High N = 89	High N = 89	Above average N = 90	Below average N = 117	Low N = 117	Very Low N = 118	
SI								<0.001
Min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Q1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	
Mean	21.3	13.0	10.1	21.5	16.7	22.6	39.2	
Q3	23.1	13.3	3.5	27.9	19.6	25.8	64.9	
100% Centile	280.9	212.8	263.2	280.9	193.7	238.1	237.3	
Sum	13,219.3	1,156.7	902.6	1,932.9	1,952.8	2,648.9	4,625.4	
transit_supply								<0.001
Zero Supply	191 (31%)	32 (36%)	36 (40%)	26 (29%)	40 (34%)	31 (26%)	26 (22%)	
Very Low	102 (16%)	20 (22%)	20 (22%)	11 (12%)	18 (15%)	17 (15%)	16 (14%)	
Low	101 (16%)	13 (15%)	18 (20%)	17 (19%)	19 (16%)	22 (19%)	12 (10%)	
Below average	101 (16%)	14 (16%)	7 (7.9%)	16 (18%)	18 (15%)	21 (18%)	25 (21%)	
Above average	42 (6.8%)	6 (6.7%)	3 (3.4%)	8 (8.9%)	10 (8.5%)	11 (9.4%)	4 (3.4%)	
High	41 (6.6%)	1 (1.1%)	3 (3.4%)	8 (8.9%)	8 (6.8%)	7 (6.0%)	14 (12%)	
Very High	42 (6.8%)	3 (3.4%)	2 (2.2%)	4 (4.4%)	4 (3.4%)	8 (6.8%)	21 (18%)	

[1] n (%)

[2] Kruskal-Wallis rank sum test; Pearson's Chi-squared test

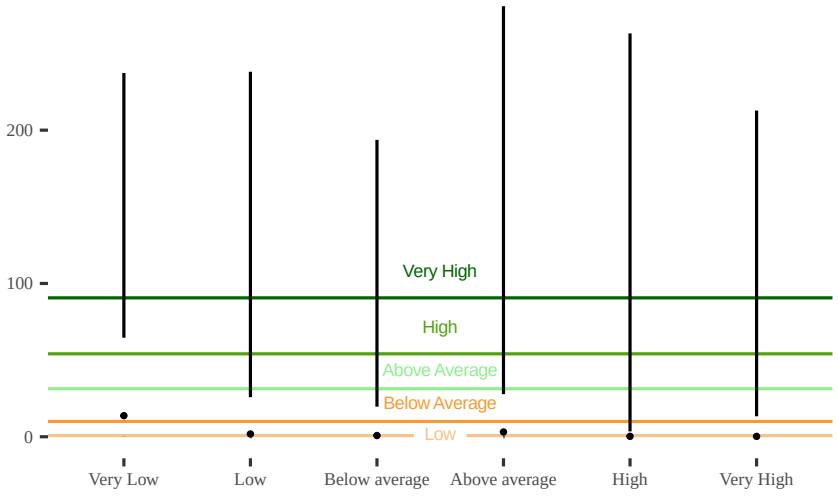

Figure 7: County Wexford, SI score by needs category

Differences in the SI score between Small Areas in different social needs categories are statistically significant[11]. The average SI score for Small Areas with Very Low social needs for transport is 39.2, compared to only 13.0 for those with Very High social needs for transport, which is the opposite to what might be desired to improve social equity.

[11] Kruskal-Wallis rank sum test(df=5)=32.9, p=0.0000

Differences in the share of Small Areas in each transit supply category across the different social need for transport groups were statistically significant[12]. However, exploring this as it relates to the population living in Small Areas with each combination of each combination of the transit supply and social need for transport categories, as shown in Table 1, may be of more interest.

[12] $\chi^2(30) = 69.11$, $p < .001$

Table 1: County Wexford, population in each Transit Supply and Combined Needs grouping

	Combined Needs Index Category						
Transit Supply Category	Very High	High	Above average	Below average	Low	Very Low	Total
Zero Supply	36.5% (13,678)	39.9% (11,480)	28.8% (7,394)	34.4% (10,092)	26.5% (6,509)	20.9% (3,793)	32.3% (52,946)
Very Low	22.3% (8,367)	22.7% (6,530)	12.0% (3,091)	15.6% (4,565)	14.8% (3,651)	14.2% (2,571)	17.6% (28,775)
Low	14.3% (5,362)	20.5% (5,898)	18.7% (4,810)	16.2% (4,734)	18.7% (4,590)	10.3% (1,867)	16.6% (27,261)
Below average	15.5% (5,799)	7.8% (2,250)	18.0% (4,613)	15.4% (4,517)	17.9% (4,405)	21.9% (3,976)	15.6% (25,560)
Above average	6.9% (2,594)	3.6% (1,024)	8.8% (2,265)	8.6% (2,516)	9.6% (2,360)	3.3% (600)	6.9% (11,359)
High	1.0% (369)	3.3% (945)	9.1% (2,326)	6.6% (1,920)	6.0% (1,465)	12.2% (2,215)	5.6% (9,240)
Very High	3.4% (1,283)	2.3% (654)	4.5% (1,162)	3.3% (959)	6.6% (1,626)	17.1% (3,094)	5.4% (8,778)
Total	100.0% (37,452)	100.0% (28,781)	100.0% (25,661)	100.0% (29,303)	100.0% (24,606)	100.0% (18,116)	100.0% (163,919)

Some 13,678 people in County Wexford (8% of the total population) live in Small Areas with Very High Needs, but no transit supply. A further 8,367 (5%) live in Small Areas with Very High Needs, but Very Low Supply, while another 11,480 (7%) are in Small Areas with High Needs, but Zero Supply. These people are those with the largest needs-gaps in County Wexford, but outnumber those at the other end of the spectrum[13]. This relates to the general pattern that those with higher social needs for transport appear to be more likely to live in Small Areas with less transit supply. For example, 48% of those living in Small Areas with Very High social needs for transport had below average transit supplies, compared to just 70% of those living in Small Areas with Very Low social needs for transport. Out of the total 163,919 population of County Wexford, some 9,092 (6%) live in Small Areas with social needs for transport that are above the County average, but where there is no transit supply at all.

[13] Some 6,935 people live in Small Areas with Very Low needs and Very High or High suppy, or Low needs and Very High supply, representing just 4% of the total population.

Figure 8 maps Small Areas across County Wexford by the magnitude of the needs-gap. In general it appears that Small Areas with larger needs gaps are in more rural areas, as might be expected given that these areas have little or no transit supply. However, at a county-

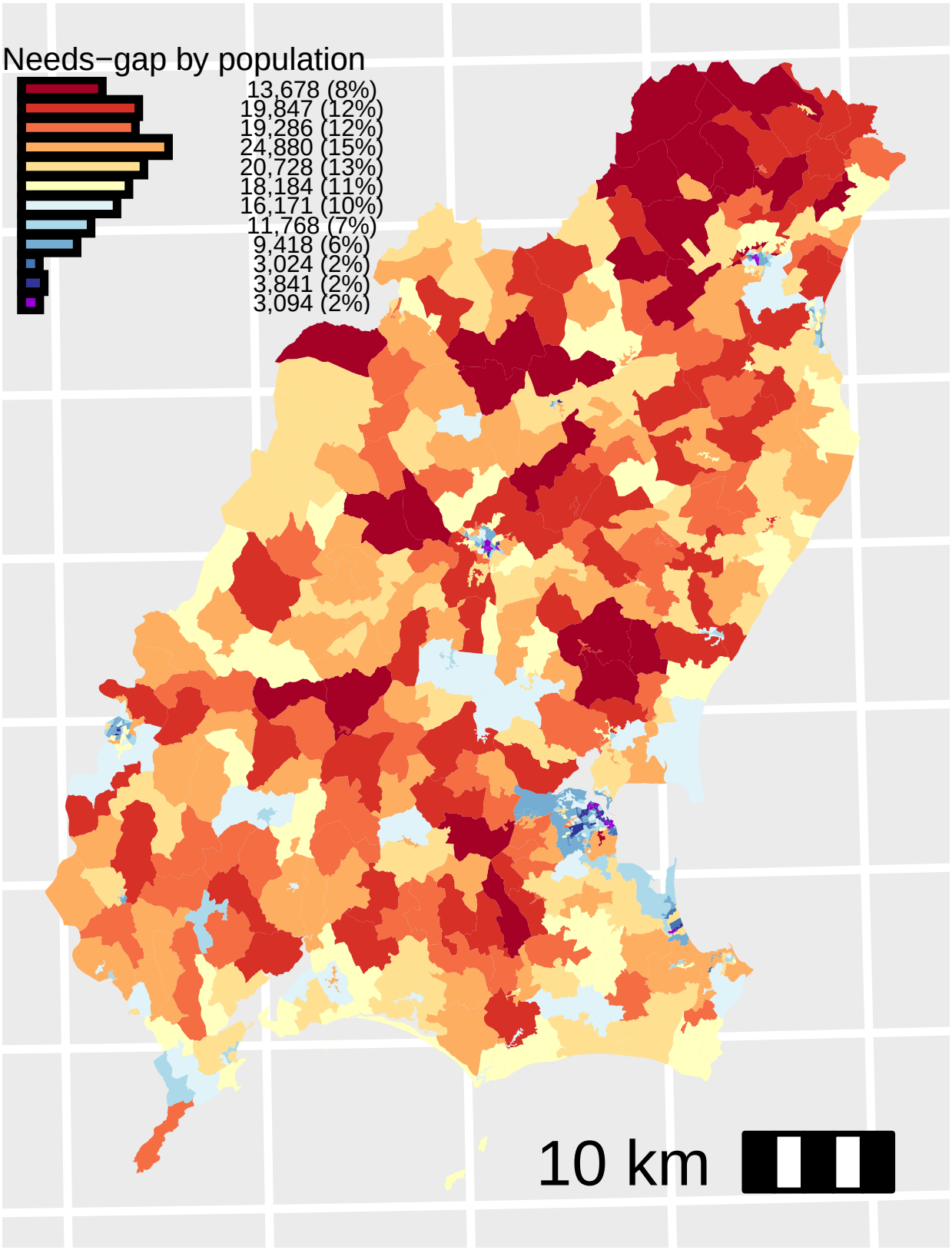

Figure 8: County Wexford, Needs-gap by Small Area (red = highest gap)

wide scale it is difficult to see the detail and make comparisons between the various urban areas. These are examined in the following.

Enniscorthy

Wexford (town)

Appendix

Table 2: County Wexford: urban populations in each Transit Supply grouping

Urban area	Transit Supply category							Total
	Zero Supply	Very Low	Low	Below average	Above average	High	Very High	
Wexford	5.4% (1,171)	0.9% (203)	6.4% (1,384)	17.9% (3,854)	14.8% (3,192)	21.9% (4,712)	32.6% (7,008)	100.0% (21,524)
Enniscorthy	0.0% (0)	0.0% (0)	21.6% (2,658)	38.8% (4,781)	19.5% (2,406)	11.5% (1,420)	8.5% (1,045)	100.0% (12,310)
Gorey	39.6% (4,566)	6.5% (754)	10.0% (1,152)	11.8% (1,364)	18.2% (2,100)	8.8% (1,012)	4.9% (569)	100.0% (11,517)
New Ross	2.6% (213)	0.0% (0)	15.7% (1,299)	47.4% (3,918)	14.9% (1,234)	19.3% (1,598)	0.0% (0)	100.0% (8,262)
Courtown	0.0% (0)	4.2% (184)	24.6% (1,073)	71.2% (3,108)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (4,365)
Rosslare Harbour	0.0% (0)	8.3% (187)	30.6% (687)	36.2% (814)	24.9% (559)	0.0% (0)	0.0% (0)	100.0% (2,247)
Castlebridge	38.2% (706)	0.0% (0)	13.8% (255)	33.0% (611)	15.0% (278)	0.0% (0)	0.0% (0)	100.0% (1,850)
Rosslare	0.0% (0)	0.0% (0)	0.0% (0)	20.0% (359)	52.4% (940)	18.9% (340)	8.7% (156)	100.0% (1,795)
Bunclody	0.0% (0)	0.0% (0)	44.3% (690)	55.7% (869)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (1,559)
Ferns	0.0% (0)	0.0% (0)	0.0% (0)	69.1% (910)	18.9% (249)	12.0% (158)	0.0% (0)	100.0% (1,317)
Kilmuckridge	100.0% (792)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (792)
Taghmon	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (740)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (740)
Ballymurn	100.0% (607)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (607)
The Ballagh	49.1% (275)	0.0% (0)	50.9% (285)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (560)
Ballycanew	0.0% (0)	0.0% (0)	49.1% (267)	50.9% (277)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (544)
Bridgetown	0.0% (0)	0.0% (0)	50.6% (275)	49.4% (269)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (544)
Tagoat	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (507)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (507)
Barntown	0.0% (0)	0.0% (0)	66.3% (335)	33.7% (170)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (505)
Blackwater	0.0% (0)	67.6% (328)	32.4% (157)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (485)
Camolin	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (470)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (470)
Kilmore Quay	0.0% (0)	47.4% (212)	52.6% (235)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (447)
Oilgate	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (401)	0.0% (0)	0.0% (0)	100.0% (401)
Coolgreany	100.0% (395)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (395)
Carrig on Bannow	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (391)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (391)
Campile	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (371)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (371)
Fethard	0.0% (0)	0.0% (0)	100.0% (363)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (363)
Oulart	0.0% (0)	0.0% (0)	100.0% (362)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (362)
Murntown	0.0% (0)	0.0% (0)	100.0% (342)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (342)
Ballysimon	100.0% (331)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (331)
Clonroche	0.0% (0)	0.0% (0)	100.0% (329)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (329)
Adamstown	100.0% (326)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (326)
Bree	0.0% (0)	0.0% (0)	100.0% (316)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (316)
Piercetown	0.0% (0)	0.0% (0)	100.0% (308)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (308)
Duncannon	0.0% (0)	0.0% (0)	100.0% (281)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (281)
Killinierin	100.0% (270)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (270)
Clongeen	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (263)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (263)

Ballyhogue	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (255)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (255)
Monamolin	0.0% (0)	0.0% (0)	100.0% (250)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (250)
Ballycullane	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (230)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (230)
Killurin	0.0% (0)	0.0% (0)	100.0% (223)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (223)
Ballyhack	0.0% (0)	0.0% (0)	100.0% (211)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (211)
Kilmore	0.0% (0)	0.0% (0)	100.0% (194)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (194)
Duncormick	0.0% (0)	0.0% (0)	100.0% (191)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (191)
Newbawn	0.0% (0)	0.0% (0)	100.0% (183)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (183)
Arthurstown	0.0% (0)	0.0% (0)	100.0% (149)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	100.0% (149)
Total	12.1% (9,652)	2.3% (1,868)	18.1% (14,454)	30.7% (24,531)	14.2% (11,359)	11.6% (9,240)	11.0% (8,778)	100.0% (79,882)