Investing In Our Transport Future: A Strategic Framework for Investment in Land Transport

Background Paper Four

Assessment of Existing and Future Levels of Transport Demand

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Background Paper:

Assessment of Existing and Future Levels of Transport Demand

1. Background

Future year travel demand is driven by forecasted growth in key demographic and land use variables. In particular, the assumed growth in population is fundamental in determining the level of future travel demand. Population growth will in turn be the main driver of changes in the other key drivers of travel demand- namely growth in employment and education.

It was agreed by the SFILT Steering Group that 5.269m in 2041 represented a conservative future population scenario and should be used as the main scenario around which further analysis should be framed. It was also agreed by the Steering Group that an additional high population growth scenario of 6.1m should also be assessed. While the agreed demographic scenarios relate to demographic projections produced by the CSO and published in "Population and Labour Force Projections 2016-2046" (April 2013), no assumptions regarding patterns of fertility and migrations were made. This allowed the NTA to subsequently develop population distribution scenarios in line with SFILT requirements. The SFILT Group had agreed to test:

1. Current Patterns Scenario- with population and employment distribution in line with current patterns
2. Urban Consolidation Scenario- with population and employment strongly focused in urban areas and near public transport nodes.

2. Settlement Hierarchy

A settlement hierarchy was devised by the NTA in order to allocate population growth spatially around the country. 85 settlements (See Appendix 1) were identified through a process of identifying areas of high activity relating to population and employment. The 85 settlements were then organised in a hierarchy based on population and employment levels, as well as journey times and trip patterns as follows:

1. Dublin City
2. Regional Cities (not including Waterford)
3. Large Regional Towns
4. Dublin Commuters-Hinterland
5. Medium Regional Towns
6. Dublin Commuters- Metropolitan
7. Commuter Towns with good level of employment
8. Regional Towns
9. Small Regional Towns
10. Commuter Towns for Regional Cities
11. Unknown (settlements not in any of the above categories but which have similar characteristics in terms of trip patterns and journey times)

3. Population Distribution Scenarios

The NTA has developed a methodology to allocate national population projections into a defined settlement and county structure. The methodology involved distributing population growth within each region, based on growth projections set out in the respective Regional Planning Guidelines and Development Plan Core Strategies. RPG distributions are only forecast to 2022; however the methodology holds the distribution constant to the forecast year of 2041.

A second population distribution scenario was devised to demonstrate the effects of targeting future growth much more heavily in settlements with a particular focus on cities. The distribution of growth was assigned using the ratio of 50:30:20, where 50% of the growth was allocated into the cities, 30% into the remaining NTA settlements and 20% into the "rural remainder".

The allocation of population growth into settlement and non-settlement areas has been reviewed by Department of Environment, Community and Local Government and may be subject to further discussions with that Department.

4. National Forecasts for Employment and Education

A set of national forecasts has also been devised with respect to the location of employment and education. Forecasting employment growth is not as straightforward as population, primarily due to a lack of available data. The overall approach used by the NTA in the forecasting and distribution of employment for the future year of 2041 was to examine the relationship between population, employment and unemployment in 2011, and to bring this forward, with appropriate assumptions to the forecast year of 2041. Forecast employment rates were devised, holding the ratio of jobs to labour force observed in 2011 constant. A rate of unemployment of 7% has been assumed by the NTA. The distribution of employment growth at settlement level was held constant with the distribution observed in 2011. It should be noted that no sectoral growth forecasts were used to allocate employment growth.

The growth in education is closely linked to the growth in population. For macro-economic forecasts, it was assumed that the proportion of the population of school going age would remain roughly the same, and that this proportion of the population would always require school places. Therefore education projections are solely based on population growth, and the 2011 ratio has been held constant. This methodology ensures that the number of educational places will increase proportionally with population growth. However, the methodology does not account for what may happen as a result of changing demographic conditions or migration patterns. It follows the existing location pattern of education places, which may change over time as a result of Government policy.

Appendix 1 summarises the distribution of population growth into cities, other NTA settlements and the rural remainder. The “urban consolidation” distribution scenario allocates considerably more into large urban areas in terms of population growth, employment and education.

5. Forecasting Travel Demand

Using the derived growth projections, the population forecasts have been converted into trip productions for each of the settlements using trip rates derived from the Irish National Household Survey (IHNS). Forecast year trip productions can now be compared to base year travel demand to show projected increases in travel demand for each settlement. The impacts of the growth in travel demand on the transport networks that serve these settlements can then be assessed. The NTA has produced trip matrices disaggregated by work, education and "other" purposes for the base year of 2011 and for the future year of 2041. Trip demand matrices have been produced based on the conservative population scenario of 5.269m and a high population scenario of 6.1m. Trip matrices based on the two population distribution scenarios have also been produced.

Trip rates derived from the IHNS assume an unemployment rate of 19%. If these trip rates were applied to future year scenarios, the total number of trips would be significantly underestimated. Therefore revised trip rates were calculated based on an unemployment rate of 7%. The original trip rates based on the IHNS along with the adjusted trip rates applied to the population forecasts are the following:

Trip Rate Type	Household Survey Trip Rates	Unemployment Rate Adjusted Trips Rates
Work Trip Rate	0.2892	0.3394
Education Trip Rate	0.1780	0.1664
Shopping Trip Rate	0.2035	0.1902
Other Trip Rate	0.3885	0.3632
Total	**1.0592**	**1.0592**

Table 1: Trip Rates

In summary the following trip demand matrices have been created:

- Base Year Total (2011) – (Work, Education, "Other" matrices combined)
- Future Year Total (2041)- (Conservative population & urban consolidation distribution scenario- Work, Education, "Other" matrices combined)
- Future Year Total (2041)- (Conservative population & RPG/development plan distribution scenario- Work, Education, "Other" matrices combined)
- Future Year Total (2041)- (High population & urban consolidation distribution scenario- Work, Education, "Other" matrices combined)

- Future Year Total (2041) High population & RPG/development plan distribution scenario- Work, Education, "Other" matrices

6. Overview of National Work Travel Patterns Based on Settlement Structure- Base Year of 2011 and Future Year Scenarios

The overall distribution of work and education related trips across the country as applied to the NTA settlement structure is set out in Table 1 below. Trips for work and education purposes are the most influential on peak time travel trends and demand levels. The table sets out the following information for the base year of 2011. 42% of all work trips in the country are internal to NTA settlements and 19% relate to trips between rural areas. In addition, there are 8% of trips moving between settlements to go to work, and 23% of trips which involve travel into settlements to work from rural areas. In total 50% of all trips to work currently involve a rural component (either origin or destination), with 42% originating in rural areas. 45% of trips relating to education are internal to NTA settlements and 31% of trips relate to education trips between rural areas. 18% of education trips relate to travel from rural areas to NTA settlements. 4% of education trips occur between different settlements with just 3% relating to trips from settlements to rural areas.

Table 1 also shows work and education trip patterns as applied to the NTA settlement structure for a future year of 2041 with conservative population growth with RPG distribution and conservative population growth with urban consolidation distribution. The table also shows work and education trip patterns for 2041 with high population growth with RPG distribution and high population growth with urban consolidation distribution. For the conservative growth RPG scenario, 39% of all work trips in the country are internal to NTA settlements and 21% relate to trips between rural areas. In addition, there are 7% of trips moving between settlements to go to work, and 24% of trips which involve travel into settlements to work from rural areas. In total 54% of all trips to work for this scenario involve a rural component (either origin or destination), with 45% originating in rural areas. 45% of trips relating to education are internal to NTA settlements, however for this scenario 26% of trips relate to education trips between rural areas. 19% of education trips relate to

travel from rural areas to NTA settlements. 5% of education trips occur between different settlements with just 5% relating to trips from settlements to rural areas.

For the conservative growth urban consolidation scenario, 39% of all work trips in the country are internal to NTA settlements and 21% relate to trips between rural areas. In addition, there are 8% of trips moving between settlements to go to work, and 23% of trips which involve travel into settlements to work from rural areas. In total 53% of all trips to work for this scenario involve a rural component (either origin or destination), with 44% originating in rural areas. 46% of trips relating to education are internal to NTA settlements. In this scenario 25% of trips relate to education trips between rural areas. 19% of education trips relate to travel from rural areas to NTA settlements. 5% of education trips occur between different settlements with just 5% relating to trips from settlements to rural areas.

For the high growth RPG scenario, 40% of all work trips in the country are internal to NTA settlements and 20% relate to trips between rural areas. In addition, there are 7% of trips moving between settlements to go to work, and 23% of trips which involve travel into settlements to work from rural areas. In total 52% of all trips to work for this scenario involve a rural component (either origin or destination), with 43% originating in rural areas. 47% of trips relating to education are internal to NTA settlements. In this scenario 21% of trips relate to education trips between rural areas. 19% of education trips relate to travel from rural areas to NTA settlements. 5% of education trips occur between different settlements with a further 5% relating to trips from settlements to rural areas.

Finally, for the high growth urban consolidation scenario, 43% of all work trips in the country are internal to NTA settlements and 19% relate to trips between rural areas. In addition, there are 8% of trips moving between settlements to go to work, and 21% of trips which involve travel into settlements to work from rural areas. In total 50% of all trips to work for this scenario involve a rural component (either origin or destination), with 40% originating in rural areas. 49% of trips relating to education are internal to NTA settlements. In this scenario 22% of trips relate to education trips between rural areas. 19% of education trips relate to travel from rural areas to NTA settlements. 5% of education trips occur between different settlements with 6% relating to trips from settlements to rural areas.

In summary, the following key issues relating to current and future work and education travel trends are clear from the analysis:

1. Currently, a large proportion of work and education related trips occur within settlement areas (42% and 45% respectively). This highlights the importance of adequate public transport provision within urban areas
2. A similarly large proportion of work and education trips currently involve travel to or from rural areas (42%). This type of travel pattern is more difficult to serve with public transport from transport planning and cost perspectives.
3. There is an increase in travel demand arising from work trips of 35% and 57% respectively for the conservation population and high population scenarios respectively. Given a figure in the region of 1.9 million[1] in employment currently, this would imply an additional 665,000 trips to work to be accommodated daily under a conservative population scenario, the majority of which occur during peak AM and PM travel times. This increases to an additional 1.08 million trips under a high population growth scenario.
4. The substantial increase in demand is not only the result of population increase but also as a result of a projected decrease in the unemployment rate in the medium to long term. In fact, even without any population growth, a reduction in the unemployment rate will result in a notable increase in the number of trips in the AM and PM peak travel periods.
5. If trends of increased car dependency continue (Census 2011 showed 69% of commuters used a car to travel to work) and growth in travel demand is not managed, the ability of the existing road network to accommodate such a significant increase in car commuting trips during peak periods will be severely tested.

[1] Quarterly National Household Survey Quarter 4 2013

Year	*2011*		*2041*							
Trip Purpose	*Work*	*Education*	*Low RPG Work*	*Low RPG Education*	*Low Consolid. Work*	*Low Consolid. Education*	*High RPG Work*	*High RPG Education*	*High Consolid. Work*	*High Consolid. Education*
All Work Trips	1,323,090	814,350	1,788,076	876,664	1,788,076	876,664	2,077,676	1,018,650	2,077,676	1,018,650
Internal Settlement	558,323	362,451	693,267	392,974	705,419	402,871	838,469	473,896	883,859	496,775
Settlement to Settlement - No Internal	103,476	29,774	128,403	41,974	134,412	44,439	150,689	49,516	158,690	53,968
Settlement to Rural	103,317	23,292	157,087	44,938	166,265	45,954	186,477	53,006	200,934	58,902
Rural to Rural	250,551	255,871	375,618	226,861	366,608	214,812	420,843	249,374	395,860	219,344
Rural To Settlement	307,422	142,961	433,701	169,917	415,172	168,589	481,198	192,858	438,332	189,662
Percentages										
All Work Trips	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Internal Settlement	42%	45%	39%	45%	39%	46%	40%	47%	43%	49%
Settlement to Settlement - No Internal	8%	4%	7%	5%	8%	5%	7%	5%	8%	5%
Settlement to Rural	8%	3%	9%	5%	9%	5%	9%	5%	10%	6%
Rural to Rural	19%	31%	21%	26%	21%	25%	20%	24%	19%	22%
Rural To Settlement	23%	18%	24%	19%	23%	19%	23%	19%	21%	19%

Table 2: Overview of National Work and Education Travel Movement for the base year and future forecast year of 2041

7. Analysis of Trip Origins Using Settlement Hierarchy

The eleven settlement tiers defined by the NTA were used to assess the frequency of trip origins for all trips, both for the base year of 2011 and for the future forecast year scenarios (Conservative RPG Scenario, Conservative Urban Consolidation Scenario, High RPG Scenario and High Urban Consolidation Scenario). Table 2 below sets out proportion of trip origins and destinations by settlement category. In the base year of 2011, 24% of all trips nationally had an origin in Dublin City and 8% had a destination in the regional cities (Cork, Limerick, Galway). 47% of trips had an origin outside of the settlements. Large regional towns accounted for 5% of trip origins and Dublin Commuter Hinterland Towns accounted for 4% of all trips.

With regard to destinations patterns in the base year, 20% of trips had a destination in Dublin, 7% in the regional cities of Cork, Limerick, Galway, 5% in large regional towns and 4%in Dublin commuter hinterland towns. 50% of all trips had a destination outside of the 85 settlement, in what could be considered rural areas.

The conservative population growth scenario brings about an increase of 15% in total trips (an additional 721,000 trips). The proportion of all trips with an origin in Dublin City is observed to stay the same as the base at 24% for a scenario in line with current RPG distribution trends, and to increase to 26% for an urban consolidation scenario. There is an increase of 15% (175,000 trips) in the number of all trips generated by Dublin City under an RPG distribution scenario. There is an increase of 22% (264,000 trips) in the number of trips originating from Dublin City under an urban consolidation scenario. Both distribution scenarios show the same proportion of trips from Regional Cities (8%). The actual number of trips with an origin in this settlement type increases by 17% of the total for the conservative RPG scenario (approximately 64,000 trips) and by 22% for the conservative urban consolidation scenario (approximately 84,000 trips).

Also of particular note is the decrease in the proportion of all trips with an origin outside the 85 settlements from 47% in the base to 45% for the RPG distribution scenario and to 44% for the urban consolidation scenario. The proportion of trips from Large Regional Towns increases from 5% to 6% of the total, with no significant change to the proportion of other lower order settlement tiers.

With regard to destination patterns under conservative population growth current trends distribution scenario, 23% of trips have a destination in Dublin (an increase of 3% on the base year proportion), 13% in the regional cities of Cork, Limerick and Galway, 8% in large regional towns (an increase of 3% on the base year proportion) and 4% in Dublin commuter hinterland towns. Most significantly 34% of trips have a destination outside of the 85 settlements, a significant reduction on the base proportion of 50%. Destination patterns under the conservative population growth urban consolidation are identical to the current trends scenario apart from fewer trips with a destination outside of the settlement structures- 33%.

The high population growth scenario brings about an increase of 33% in total trips (an additional 1,620,000 trips). The proportion of all trips with an origin in Dublin City is observed at 26% for a scenario for the high RPG Distribution Scenario, and to increase to 27% for the urban consolidation scenario. In absolute terms, there is an increase of 395,000 in the number of all trips generated by Dublin City under an RPG distribution scenario, with a higher increase in trips of 594,000 under an urban consolidation scenario. The proportion of trips generated by Regional Cities of Cork, Limerick and Galway stays the same as the base at 8% of the total for the RPG scenario and increases to 9% under the urban consolidation scenario. The actual number of trips with an origin in Regional Cities increases by 38% on the base for the high RPG scenario (approximately 144,000 trips) and by 50% for the conservative urban consolidation scenario (approximately 190,000 trips).

A decrease in the proportion of all trips with an origin outside the 85 settlements from 47% to 43% is observed for the RPG distribution scenario and to 40% for the urban consolidation scenario. The proportion of trips from Large Regional Towns increases slightly from 5% to 6% of the total for both distribution scenarios, with no significant change to the proportion of other lower order settlement tiers.

With regard to destination patterns under high population growth urban current trends distribution scenario, 24% of trips have a destination in Dublin City. This increases to 25% under the high population growth urban consolidation scenario. 13% of trips have a destination in the regional cities of Cork, Limerick and Galway (14% in the urban consolidation scenario). Finally 33% of trips have a destination outside of the settlement

structures for the current trends distribution scenario. This reduces further to 31% under an urban consolidation distribution scenario.

In summary, key issues regarding *existing* trips on the network which will influence land transport investment decisions are:

1. The importance of Dublin City as the most significant trip generating and trip attracting settlement
2. The regional cities of Cork, Galway and Limerick as a collective are important trip generators and attractors
3. Settlement towns lower down in the hierarchy do not generate or attract a significant number of trips
4. A very high proportion of all trips (47%) originate outside of the settlement towns, i.e. in rural areas and an even higher proportion of all trips (50%) have a destination in outside of the settlement towns

With regard to *future* demand on the network arising from population growth, key issues which will influence land transport investment decisions are:

1. Dublin City continues to generate a similar proportion of trips to the base scenario under a conservative population growth scenario. However this proportion increases under high population growth scenario. In future year population growth scenarios, there is a noted increase in the proportion of all trips with a destination in Dublin City
2. The proportion of trips generated by the regional cities remains relatively constant across scenarios. The proportion of trips with a destination in the regional cities increases in future year scenarios
3. The proportion of trips originating in rural areas is reduced significantly under future year population growth scenarios, particularly the high population growth scenarios. Similarly, the proportion of trips with a destination in rural areas is reduced significantly under future year population growth scenarios.

Settlement Tier	Base Model		Conservative RPG		Conservative Urban Consolidation		High RPG		High Urban Consolidation	
	All Trips: % of trip origins by settlement	All Trips: % of trip destinations by settlement	All Trips: % of trip origins by settlement	All Trips: % of trip destinations by settlement	All Trips: % of trip origins by settlement	All Trips: % of trip destinations by settlement	All Trips: % of trip origins by settlement	All Trips: % of trip destinations by settlement	All Trips: % of trip origins by settlement	All Trips: % of trip destinations by settlement
1. Dublin City	24%	20%	24%	23%	24%	23%	26%	24%	27%	25%
2. Regional Cities	8%	7%	8%	13%	8%	13%	8%	13%	9%	14%
3.Large Regional Towns	5%	5%	6%	8%	6%	8%	6%	8%	6%	8%
4.Dublin Commuters – Hinterland	4%	4%	4%	4%	4%	4%	4%	4%	4%	5%
5.Medium Regional Towns	3%	3%	3%	4%	3%	4%	3%	4%	3%	4%
6.Dublin Commuters-Metropolitan	2%	2%	2%	2%	2%	2%	2%	2%	2%	2%
7.Commuter Towns with good level of local employment	2%	2%	2%	3%	2%	3%	2%	2%	2%	3%
8.Regional Towns	2%	3%	3%	4%	3%	4%	3%	4%	3%	4%
9.Small Regional Towns	1%	2%	1%	3%	1%	3%	1%	2%	1%	3%
10.Commuter Towns for Regional Cities	1%	2%	2%	2%	2%	2%	1%	2%	2%	2%
11.Unclassified	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Rest of Country	47%	50%	45%	34%	44%	33%	43%	33%	40%	31%

Table 3: Assessment of Trip Origins and Destinations by Settlement Type- Base and Future Year Scenarios

8. Use of NTA GDA Model to Assess the Existing Transport System

While the settlement structure is a useful framework to analyse trip demand based on existing and future population levels, it is important to incorporate the concept of capacity in the assessment of the status of the existing transport system and the identification of future needs. One way to do this is to graphically display volume/capacity (V/C) ratios across a transport network. V/C ratios compare demand with carrying capacity (supply) and are an indicator of capacity sufficiency of various parts of a transport network. Appendix 2 below shows 2 maps of the GDA and associated V/C ratios using a **2006 network**. The maps show that V/C ratios of links on the approaches to and within Dublin City are already operating at levels in excess of 90%, suggesting that many of these links are at capacity in the AM peak period.

9. Use of NRA National Transport Model to Assess the Existing Transport System and Assist in the Identification of Future Needs

The NRA's National Transport Model (NTM) has also been used to assess the existing transport system and identify whereabouts on the network future needs are likely to arise. The current version of the NTM has a base year of 2013. The base year model includes extensive additional data for calibration, 2011 POWSCAR, HGV O-D information from CSO, additional speed flow curves and improved journey time information. The NRA has supplied the following information in graphical form for SFILT (Appendix 3):

- 2013 Level of Service: National
- 2013 Level of Service: GDA/Cork/Limerick/Galway
- 2013 Level of Service: M50, N40 Cork,N11/M11
- 2013 V/C Ratio: National
- 2013 V/C: GDA/Cork/Limerick/Galway

In order to provide an indication of the impact of conservative population growth on the performance of the transport network, the NRA has also supplied the following information (see Appendix 3) relating to a their 2040 Medium Population Growth forecast of 5.1 million by 2040, which is broadly in line with the SFILT conservative population scenario:

- 2040 Level of Service: National

- 2040 Level of Service: GDA/Cork/Limerick/Galway
- 2040 Level of Service: M50, N40 Cork, N11/M11
- 2040 V/C Ratio: National
- 2040 V/C: GDA/Cork/Limerick/Galway

10. Output from NRA National Transport Model

Output from the NRA National Transport Model indicates that for the base year, (2010 pending the updated 2013 model) while the network in general broadly operates at a high level of service, there are a number of pinch points around Dublin and the Regional Cities of Cork and Galway where the level of service is already at forced or breakdown flow. These pinch points become even more prevalent in a future year of 2040 with a population of 5.1 million and the associated increase in trip demand. The corridors into Dublin, Cork and Galway show a demonstrable decrease in flow conditions in the future year. In the GDA, an increase in Volume/Capacity ratios to >90% is observed on parts of the N11, N81, N4, N3 (approaching the M50) and the M1. In Cork, an increase in Volume/Capacity ratios to >90% is observed on parts of N28, N25 and N71 (approaching the city centre). In Limerick Volume/Capacity ratios show an increase from the base year to future year, however very few parts of the network around Limerick are shown to experience V/C ratios in excess of 90%. Galway also shows a deterioration in V/C ratios on the approaches to the city centre, however the network in Galway for the future year show V/Cs of less than 60% in general.

Looking at specific parts of the road network, the following is observed:

- Significant decrease in the proportion of the M50 with free flow and reasonably free flow traffic conditions
- Significant decrease in the proportion of the N40 with free flow and reasonably free flow traffic conditions and increase in the sections of the N40 with unstable or approaching un stable flows
- For both the N11/M11 and N20/M20, a significant decrease in the proportion of the N11/M11 with free flow traffic conditions is observed, alongside an increase in the proportion of the roads with reasonably free flow or stable flow traffic conditions

Appendix 1: Population in Base Year and Future Year Scenarios

Settlement Number	Settlement Name	Base Population	Settlement POP FUTURE YEAR LOW RPG	Settlement POP FUTURE YEAR HIGH RPG	Settlement POP Future Year LOW UC	Settlement POP FUTURE YEAR HIGH UC
1	Cavan Legal Town and its Environs	10205	13,148	16,841	12,496	15,371
2	Ballybofey-Stranorlar	4852	6,003	7,447	5,941	7,308
3	Buncrana Legal Town and its Environs	6839	8,475	10,527	8,375	10,301
4	Donegal	2607	3,269	4,099	3,192	3,927
5	Letterkenny Legal Town and its Environs	19588	24,413	30,466	23,986	29,503
6	Carrick-On-Shannon	3980	4,934	6,132	4,874	5,995
7	Ardee Legal Town and its Environs	4554	4,859	5,241	5,577	6,859
8	Drogheda Legal Town and its Environs	30393	36,008	43,051	37,217	45,777
9	Dundalk Legal Town and its Environs	37816	45,020	54,057	46,307	56,958
10	Carrickmacross Legal Town and its Environs	4874	5,779	6,914	5,968	7,341
11	Castleblayney Legal Town and its Environs	3386	3,914	4,575	4,146	5,100
12	Monaghan Legal Town and its Environs	7850	9,067	10,593	9,613	11,824
13	Sligo Legal Town and its Environs	19452	22,008	25,214	23,820	29,298
14	Dublin city and suburbs	1118142	1,283,658	1,491,281	1,367,010	1,679,190

15	Balbriggan Legal Town and its Environs	19960	23,106	27,052	24,442	30,063
16	Malahide	15846	16,856	18,122	19,404	23,867
17	Swords	36924	43,275	51,241	45,215	55,614
18	Athy Legal Town and its Environs	9926	11,622	13,748	12,155	14,950
19	Kildare	8142	9,777	11,827	9,970	12,263
20	Leixlip Legal Town	15452	19,573	24,742	18,921	23,273
21	Maynooth	12510	15,722	19,750	15,319	18,842
22	Naas Legal Town	20713	25,602	31,735	25,364	31,198
23	Newbridge Legal Town and its Environs	21561	25,405	30,227	26,402	32,475
24	Ashbourne	11355	13,300	15,740	13,905	17,103
25	Ceanannas Mór (Kells) Legal Town and its Environs	5888	6,734	7,796	7,210	8,868
26	Navan (An Uaimh) Legal Town and its Environs	28559	33,214	39,054	34,971	43,015
27	Trim Legal Town and its Environs	8268	9,664	11,414	10,124	12,453
28	Arklow Legal Town and its Environs	13009	16,894	21,767	15,930	19,594
29	Bray Legal Town and its Environs	31872	37,466	44,483	39,028	48,005
30	Wicklow Legal Town and its Environs	10356	14,531	19,769	12,681	15,598
31	Ennis Legal Town and its Environs	25360	30,399	36,721	31,054	38,197
32	Shannon Legal Town	9673	11,990	14,897	11,845	14,569

33	Limerick city and suburbs	84336	102,823	126,014	103,107	126,654
34	Newcastle West	6327	8,714	11,709	7,748	9,530
35	Nenagh Legal Town and its Environs	8439	9,504	10,841	10,334	12,711
36	Roscrea	5403	6,239	7,289	6,616	8,138
37	Thurles Legal Town and its Environs	7933	8,912	10,140	9,714	11,949
38	Portlaoise Legal Town and its Environs	20145	23,211	27,058	24,668	30,342
39	Longford Legal Town and its Environs	8002	11,068	14,915	9,799	12,052
40	Birr Legal Town and its Environs	4428	4,829	5,333	5,422	6,669
41	Edenderry Legal Town and its Environs	6977	7,583	8,344	8,544	10,509
42	Tullamore Legal Town and its Environs	14361	21,504	30,465	17,585	21,630
43	Athlone Legal Town and its Environs	16327	23,164	31,740	19,993	24,591
44	Mullingar Legal Town and its Environs	20103	28,876	39,882	24,617	30,279
45	Carlow Legal Town and its Environs	19064	24,449	31,204	23,344	28,714
46	Tullow	3972	4,275	4,655	4,864	5,983
47	Kilkenny Legal Town and its Environs	24423	27,848	32,143	29,907	36,785
48	Carrick-On-Suir Legal Town and its Environs	5886	7,047	8,504	7,208	8,865
49	Cashel Legal Town and its Environs	4051	4,155	4,286	4,961	6,102
50	Clonmel Legal Town and its Environs	17048	23,577	31,766	20,876	25,677

51	Tipperary Legal Town and its Environs	4322	6,755	9,807	5,292	6,510
52	Waterford city and suburbs	52496	59,259	67,742	64,180	78,836
53	Dungarvan Legal Town and its Environs	9427	12,818	17,071	11,544	14,199
54	Enniscorthy Legal Town and its Environs	10838	13,649	17,175	13,271	16,324
55	Gorey Legal Town and its Environs	9114	11,925	15,451	11,160	13,727
56	New Ross Legal Town and its Environs	7887	10,698	14,224	9,658	11,879
57	Wexford Legal Town and its Environs	20072	26,801	35,241	24,579	30,232
58	Cork city and suburbs	197640	220,945	250,179	241,629	296,809
59	Bandon Legal Town and its Environs	6640	7,624	8,858	8,131	10,001
60	Bantry Legal Town	3348	4,722	6,446	4,100	5,043
61	Carrigaline	14775	15,553	16,529	18,092	22,254
62	Clonakilty Legal Town and its Environs	4721	6,657	9,086	5,781	7,111
63	Fermoy Legal Town and its Environs	6489	7,480	8,724	7,946	9,774
64	Kinsale Legal Town and its Environs	4893	5,158	5,491	5,992	7,370
65	Macroom Legal Town and its Environs	3879	4,383	5,016	4,750	5,842
66	Mallow Legal Town and its Environs	11605	17,772	25,507	14,211	17,479
67	Midleton Legal Town and its Environs	12001	20,650	31,499	14,696	18,076
68	Mitchelstown	3677	4,929	6,499	4,503	5,538

69	Rathluirc (Or Charleville)	3672	4,899	6,437	4,496	5,531
70	Skibbereen Legal Town and its Environs	2670	3,110	3,663	3,269	4,022
71	Youghal Legal Town and its Environs	7794	8,757	9,965	9,544	11,739
72	Castleisland	2513	3,249	4,173	3,077	3,785
73	Killarney Legal Town and its Environs	14219	16,991	20,467	17,412	21,416
74	Killorglin	2082	2,804	3,710	2,549	3,136
75	Listowel Legal Town and its Environs	4832	6,000	7,464	5,917	7,278
76	Tralee Legal Town and its Environs	23693	28,311	34,105	29,013	35,686
77	Galway city and suburbs	75529	94,109	117,416	92,340	113,427
78	Athenry	3950	6,012	8,598	4,837	5,949
79	Ballinasloe Legal Town and its Environs	6659	9,475	13,008	8,154	10,030
80	Loughrea Legal Town	5062	7,132	9,729	6,199	7,624
81	Tuam Legal Town and its Environs	8242	9,543	11,175	10,093	12,414
82	Ballina Legal Town and its Environs	11086	12,593	14,482	13,575	16,698
83	Castlebar Legal Town and its Environs	12318	15,174	18,756	15,084	18,553
84	Westport Legal Town and its Environs	6063	7,750	9,866	7,424	9,132
85	Roscommon	5693	6,797	8,181	6,971	8,575
Settlement		**2,437,037**				

Total			**2,883,948**	**3,444,550**	**2,981,235**	**3,663,875**
86	Cavan County Remaind	62978	71,510	82,212	66,961	71,957
87	Donegal County Remaind	127251	141,090	158,450	135,299	145,394
88	Leitrim County Remaind	27818	30,878	34,715	29,577	31,784
89	Louth County Remaind	50134	55,762	62,821	53,305	57,282
90	Monaghan County Remaind	44373	50,884	59,051	47,179	50,699
91	Sligo County Remaind	45941	53,171	62,240	48,846	52,491
92	Dublin City Remaind	0	-	-	-	-
93	Dun Laoghaire Remaind	0	-	-	-	-
94	Fingal County Remaind	82197	91,467	103,095	87,396	93,917
95	South Dublin Remaind	0	-	-	-	-
96	Kildare County Remaind	122008	135,275	151,917	129,724	139,403
97	Meath County Remaind	130065	144,587	162,803	138,291	148,609
98	Wicklow County Remaind	81403	92,678	106,821	86,551	93,009
99	Clare County Remaind	82163	92,561	105,604	87,359	93,877
100	Limerick City Remaind	0	-	-	-	-
101	Limerick County Remaind	101146	111,696	124,930	107,543	115,567
102	North Tipperary Remaind	48547	54,992	63,078	51,617	55,469
103	Laoighis County Remaind	60414	64,863	70,444	64,235	69,028
104	Longford County Remaind	30998	32,225	33,764	32,958	35,418

105	Offaly County Remaind	50921	52,523	54,532	54,141	58,181
106	Westmeath County Remaind	49734	52,692	56,402	52,879	56,825
107	Carlow County Remaind	31576	33,984	37,004	33,573	36,078
108	Kilkenny County Remaind	70996	82,517	96,970	75,486	81,118
109	South Tipperary Remaind	57125	59,951	63,496	60,738	65,270
110	Waterford City Remaind	0	-	-	-	-
111	Waterford County Remaind	51872.4	58,009	65,706	55,153	59,268
112	Wexford County Remaind	97409	103,326	110,747	103,569	111,297
113	Cork City Remaind	0	-	-	-	-
114	Cork County Remaind	235229	267,013	306,884	250,105	268,766
115	Kerry County Remaind	98163	108,135	120,644	104,371	112,159
116	Galway City Remaind	0	-	-	-	-
117	Galway County Remaind	151211	164,747	181,726	160,774	172,770
118	Mayo County Remaind	101171	111,729	124,973	107,569	115,595
119	Roscommon County Remaind	58372	66,281	76,203	62,064	66,694
County Remainder Total		**2,151,215**	**2,384,546**	**2,677,234**	**2,287,265**	**2,457,925**
Total		**4,588,252**	**5,268,493**	**6,121,785**	**5,268,500**	**6,121,800**

Appendix 2: NTA V/C GDA Maps

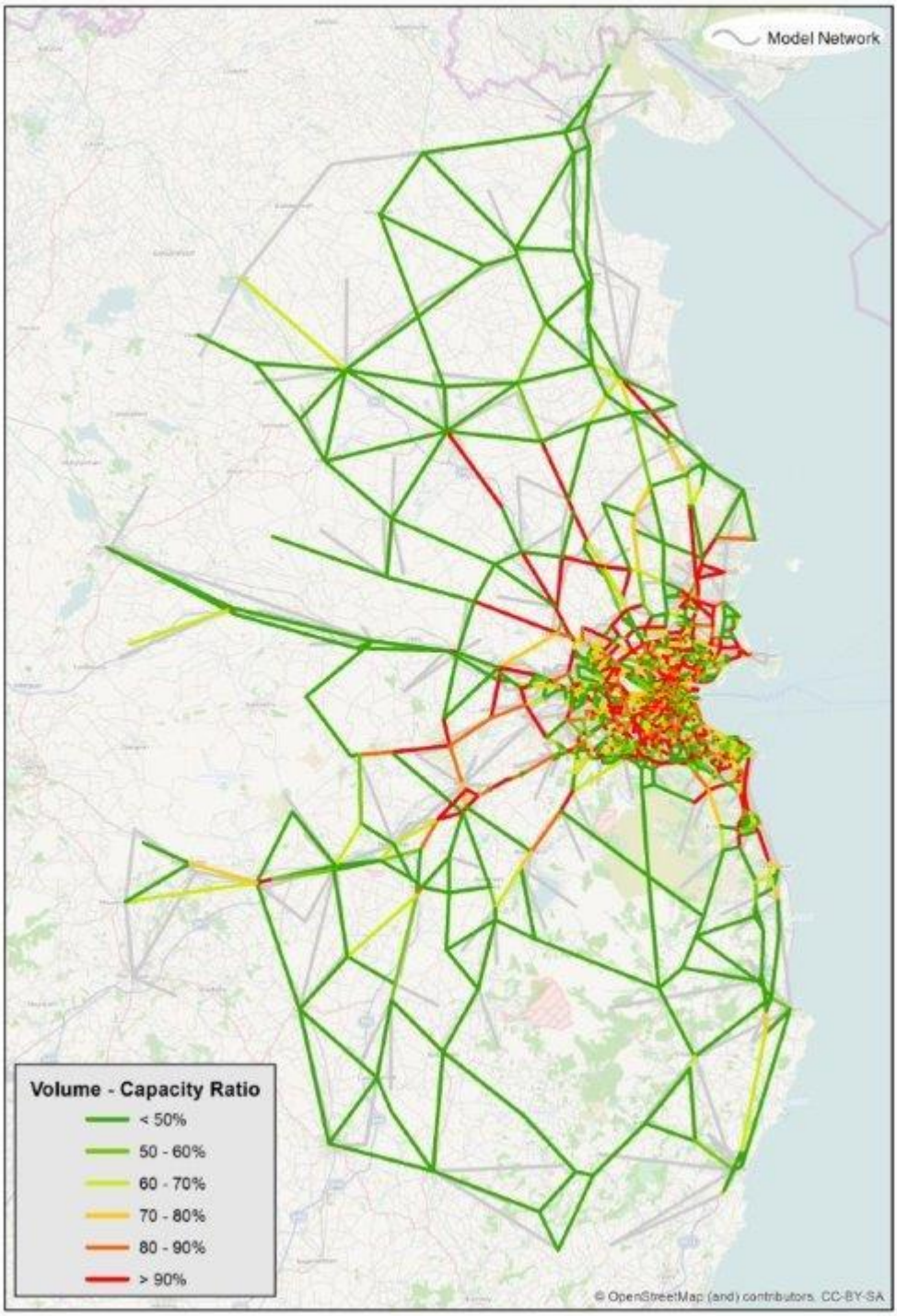

Figure 1: GDA V/C Map Zoomed Out

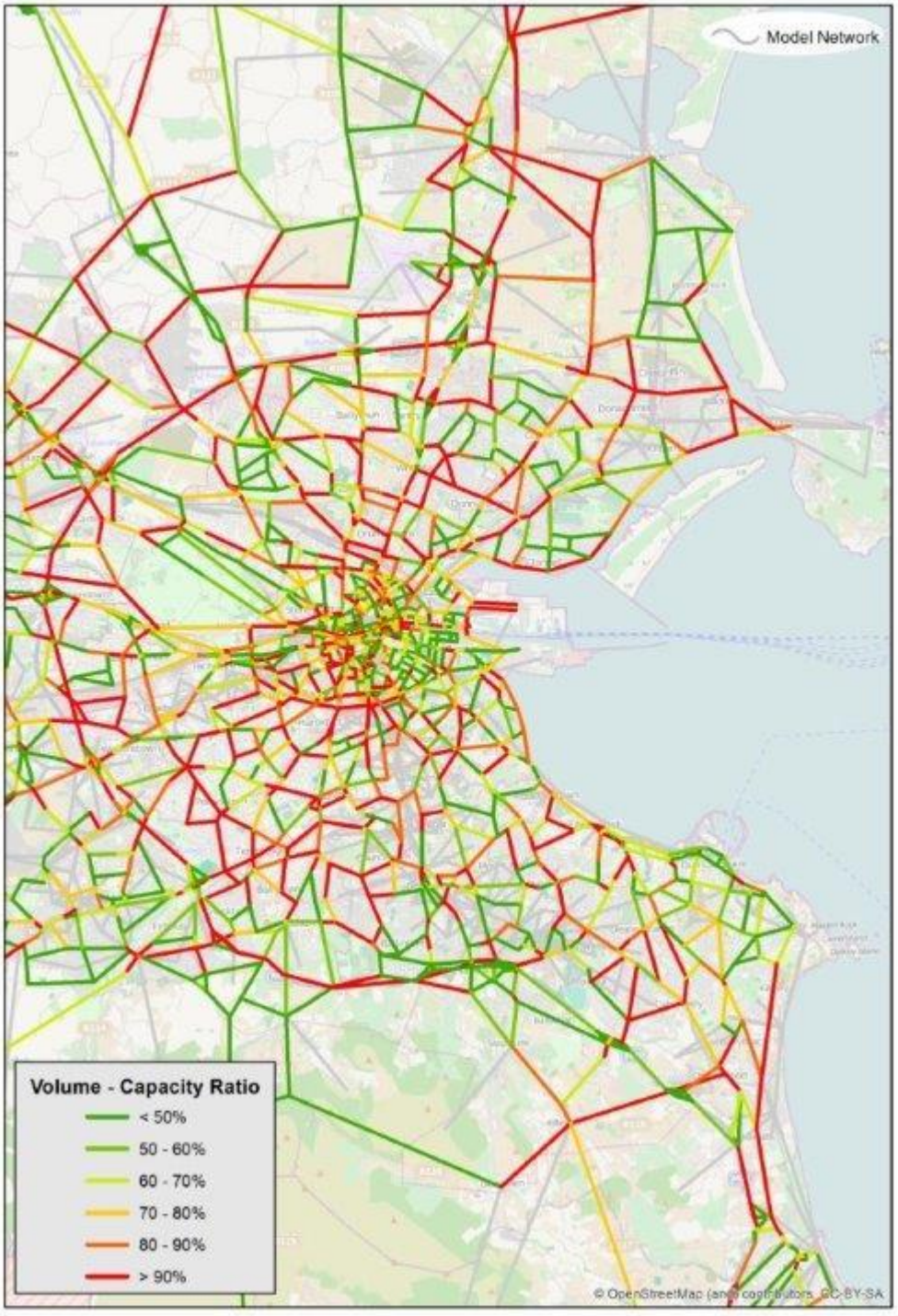

Figure 2: GDA V/C Map Zoomed In

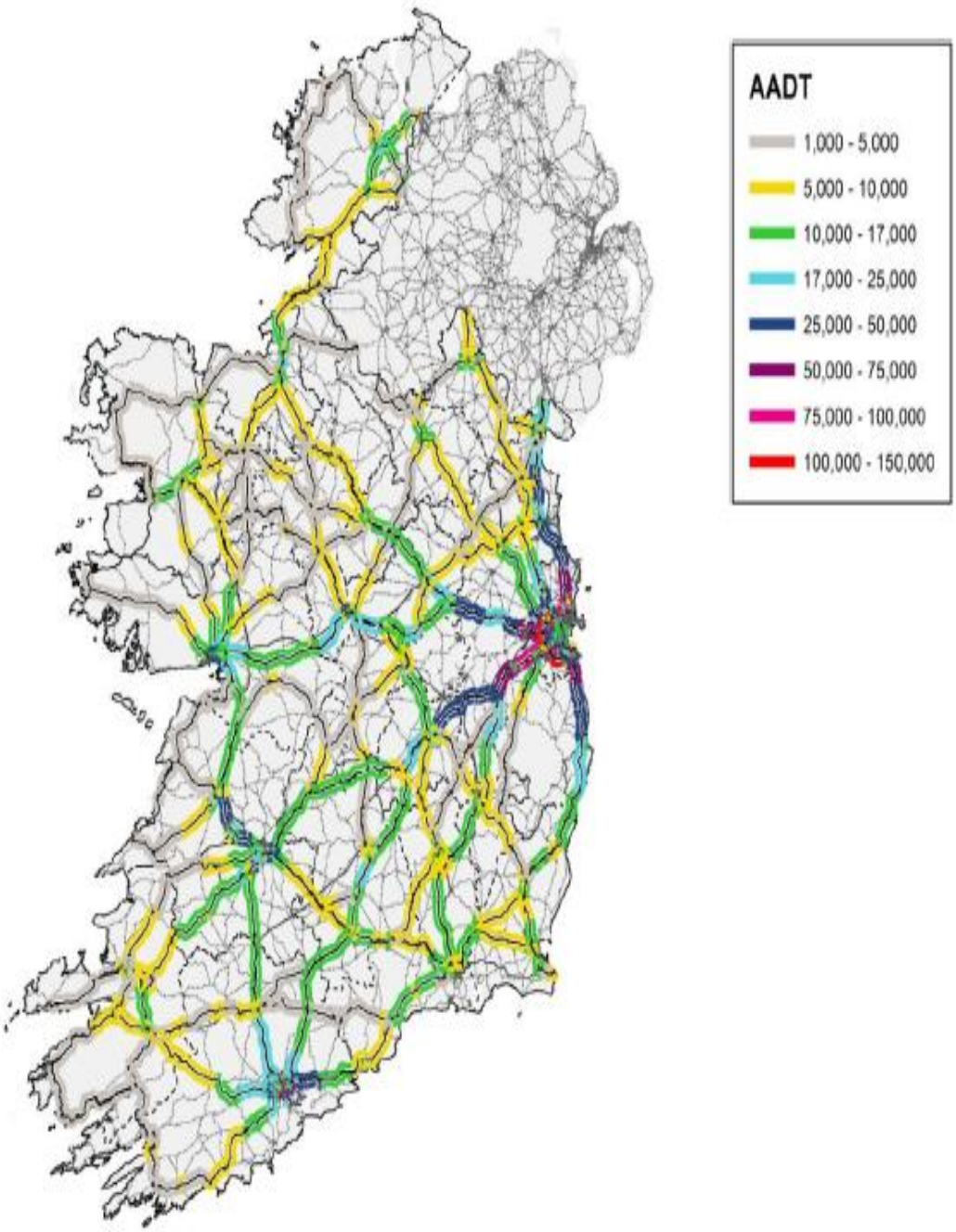

Figure 3: 2013 AADT National

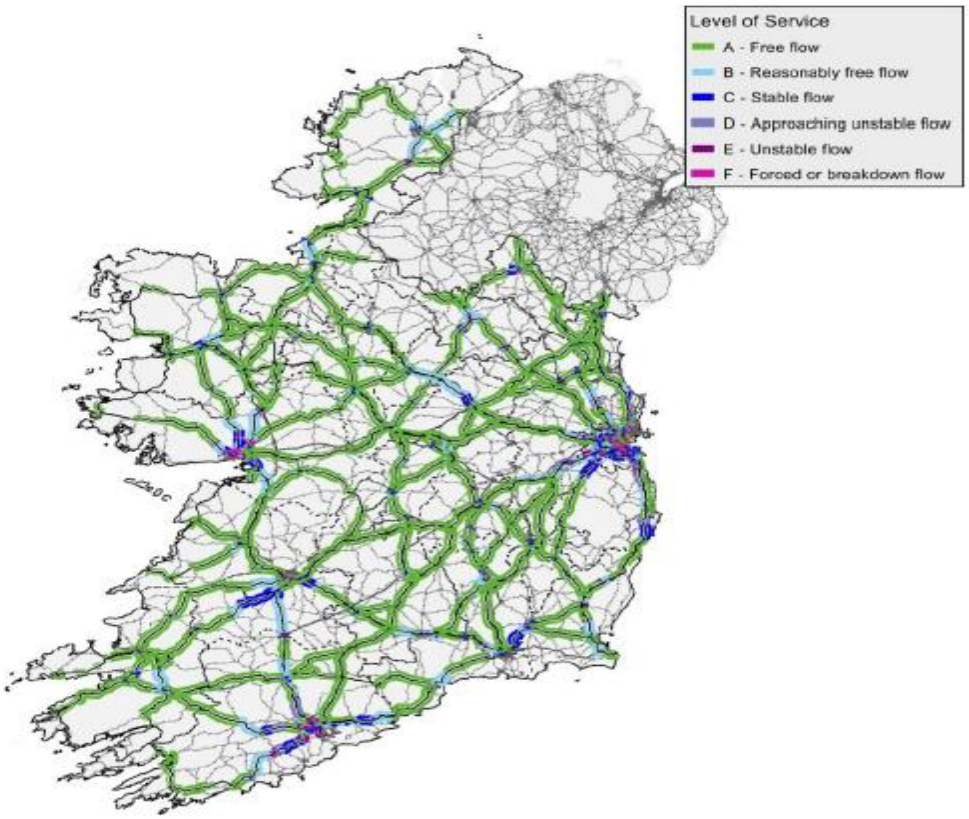

Figure 4: 2013 Level of Service National

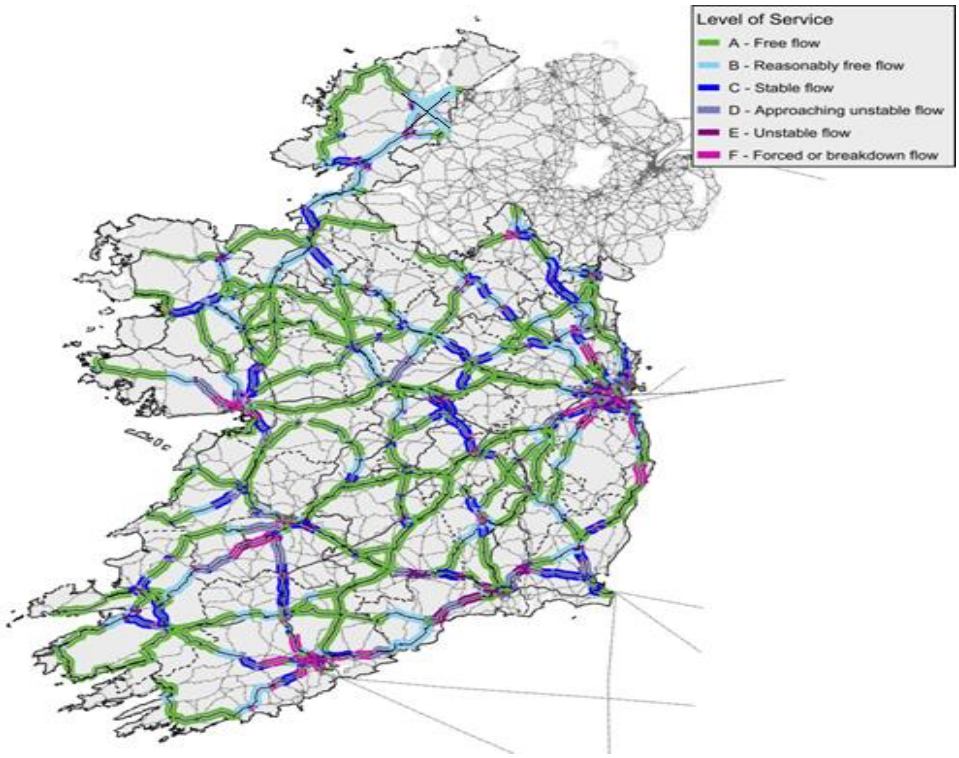

Figure 5: 2040 Level of Service- National

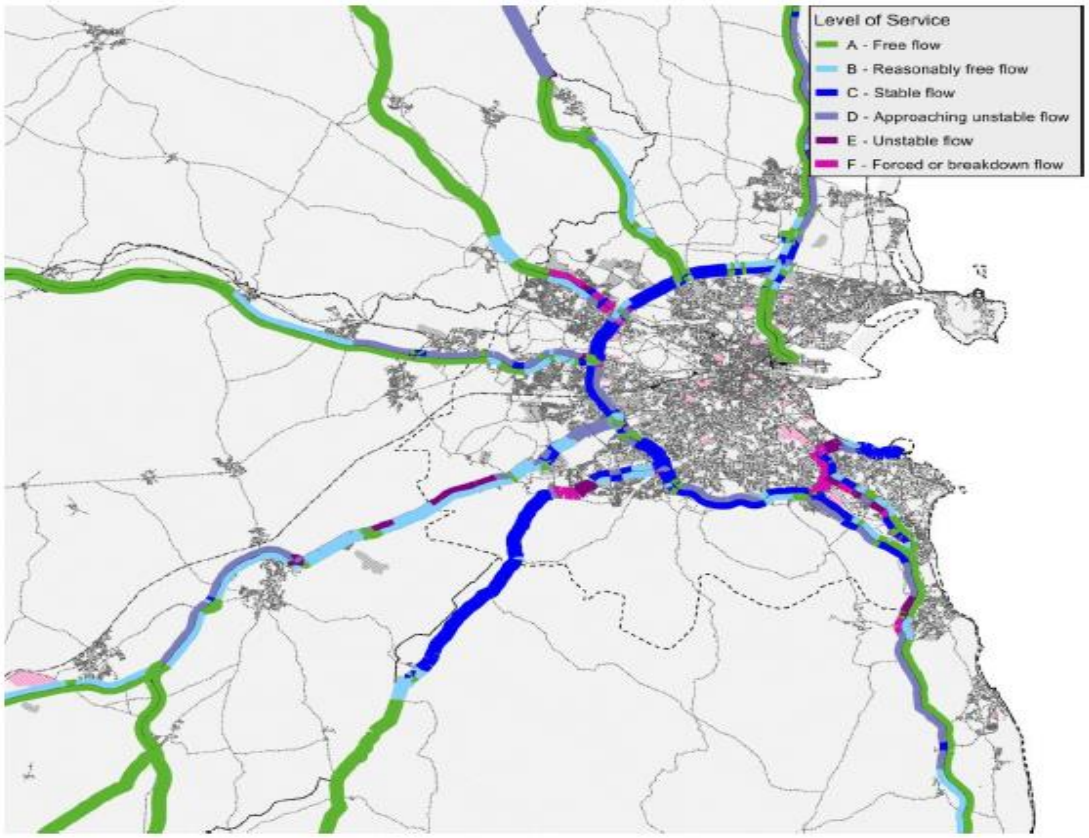

Figure 6: 2013 Level of Service GDA

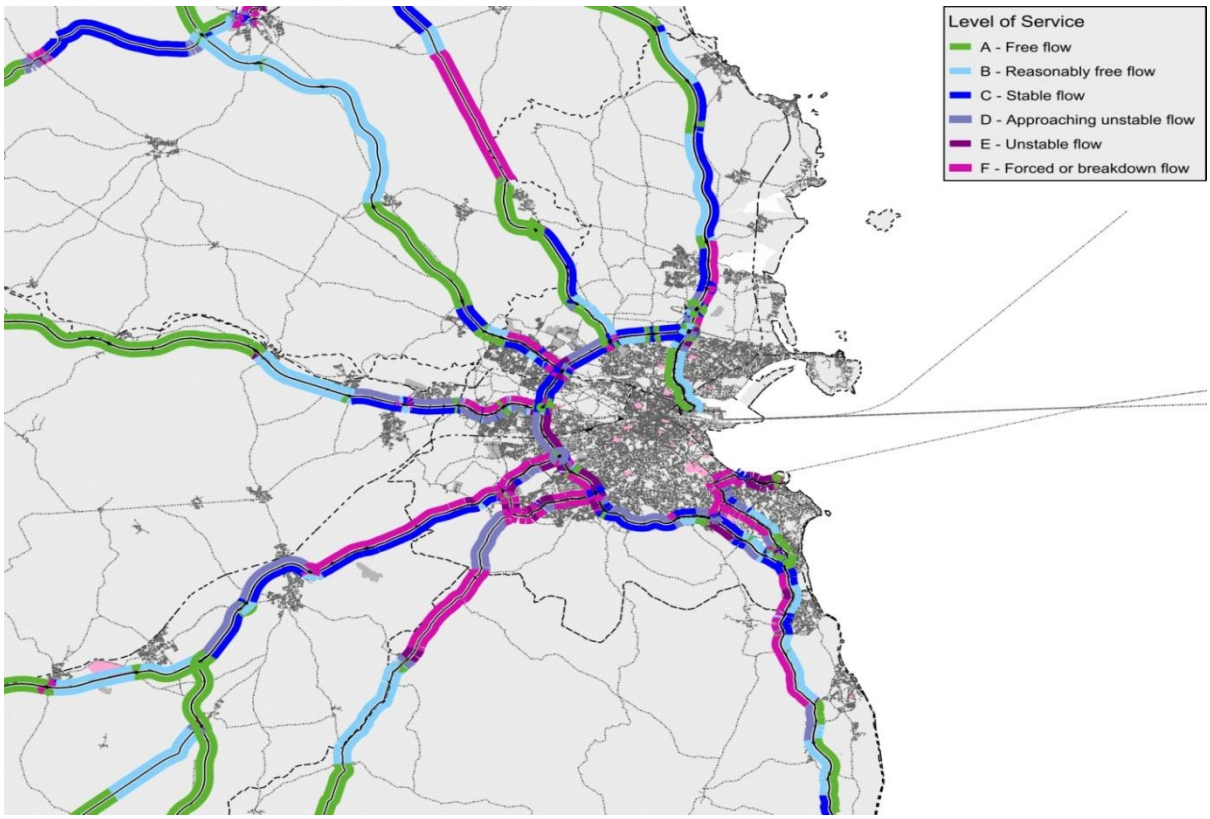

Figure 7: 2040 Level of Service GDA

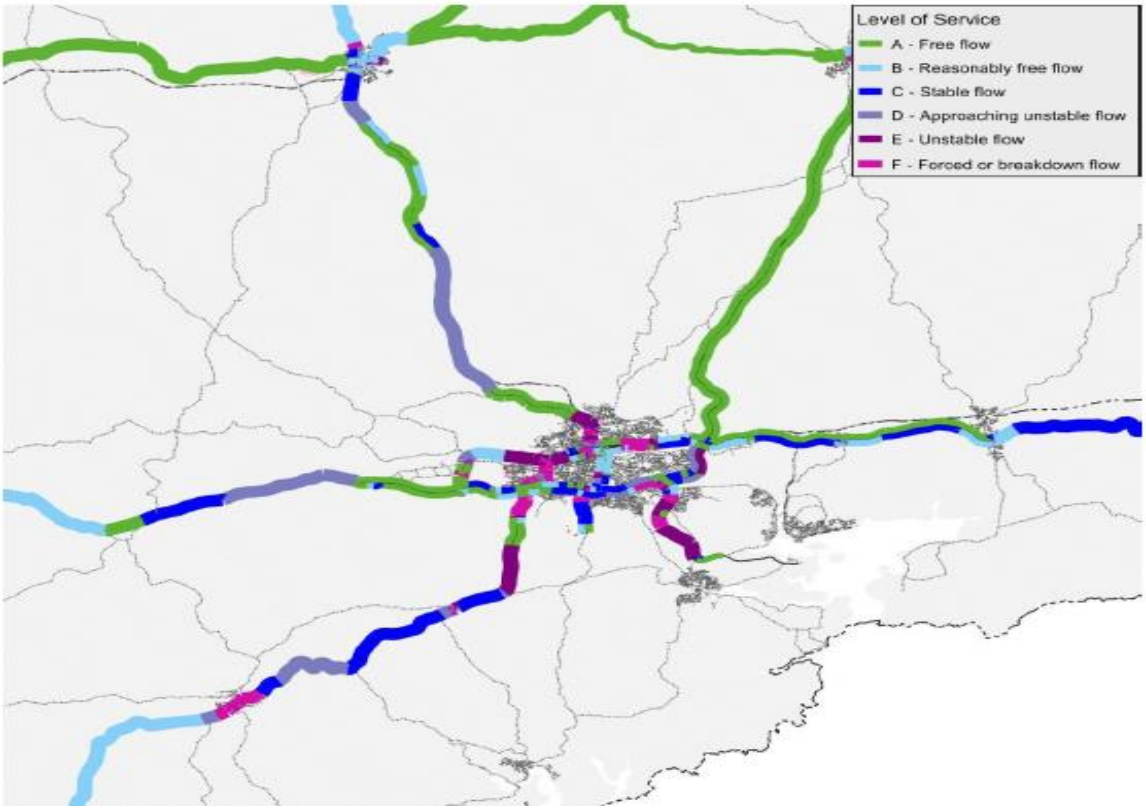

Figure 8: 2013 Level of Service Cork

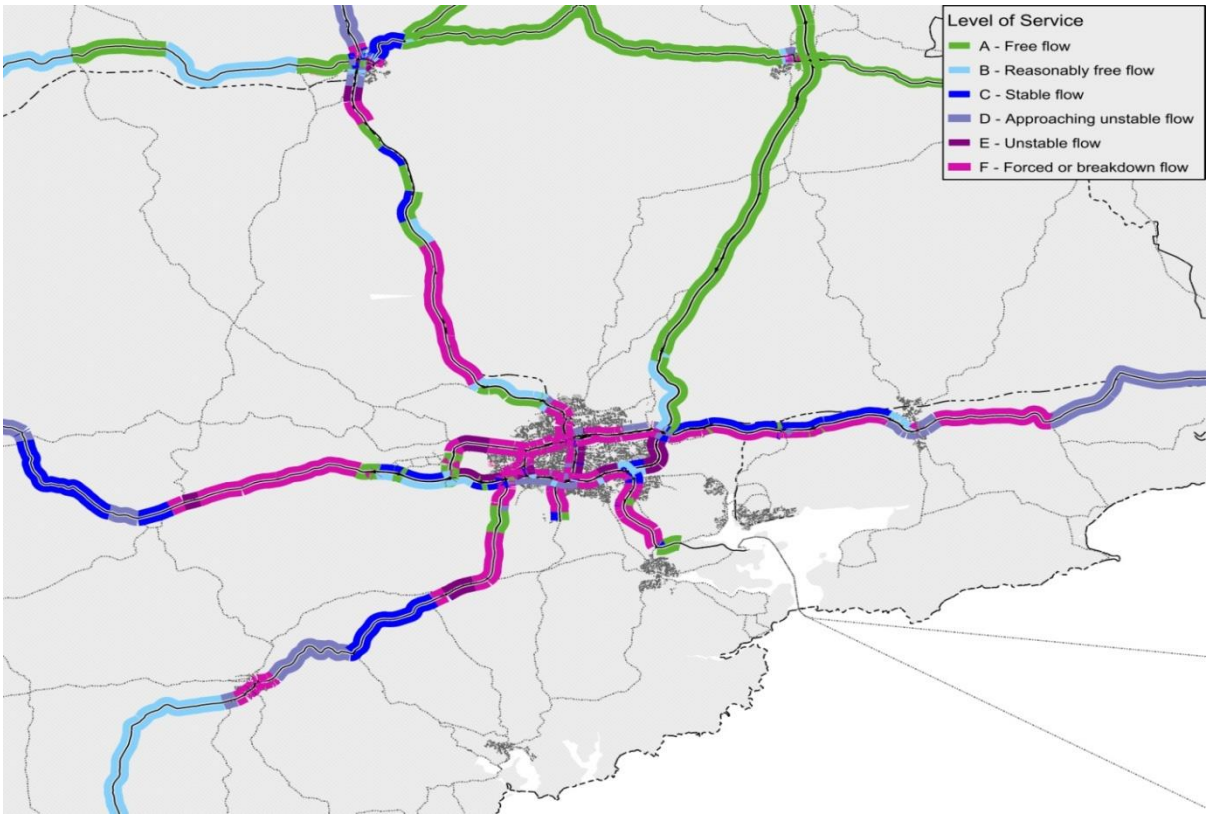

Figure 9: 2040 Level of Service Cork

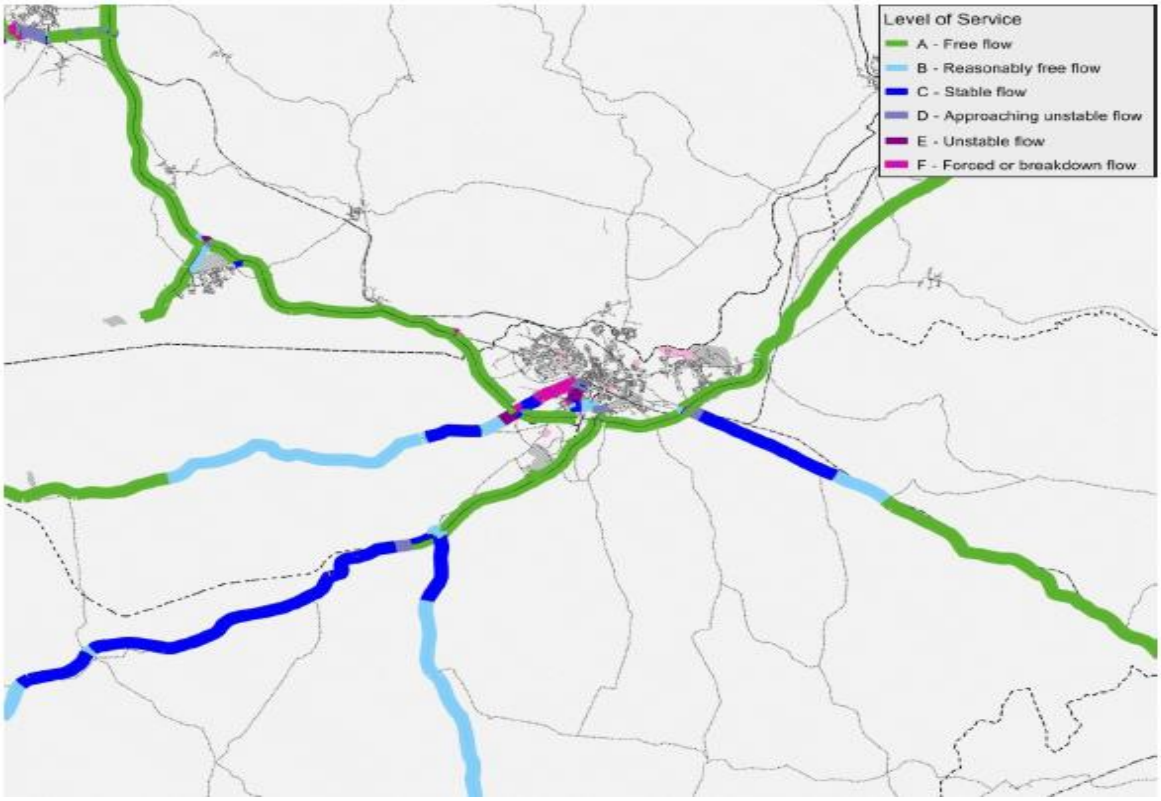

Figure 10: 2013 Level of Service Limerick

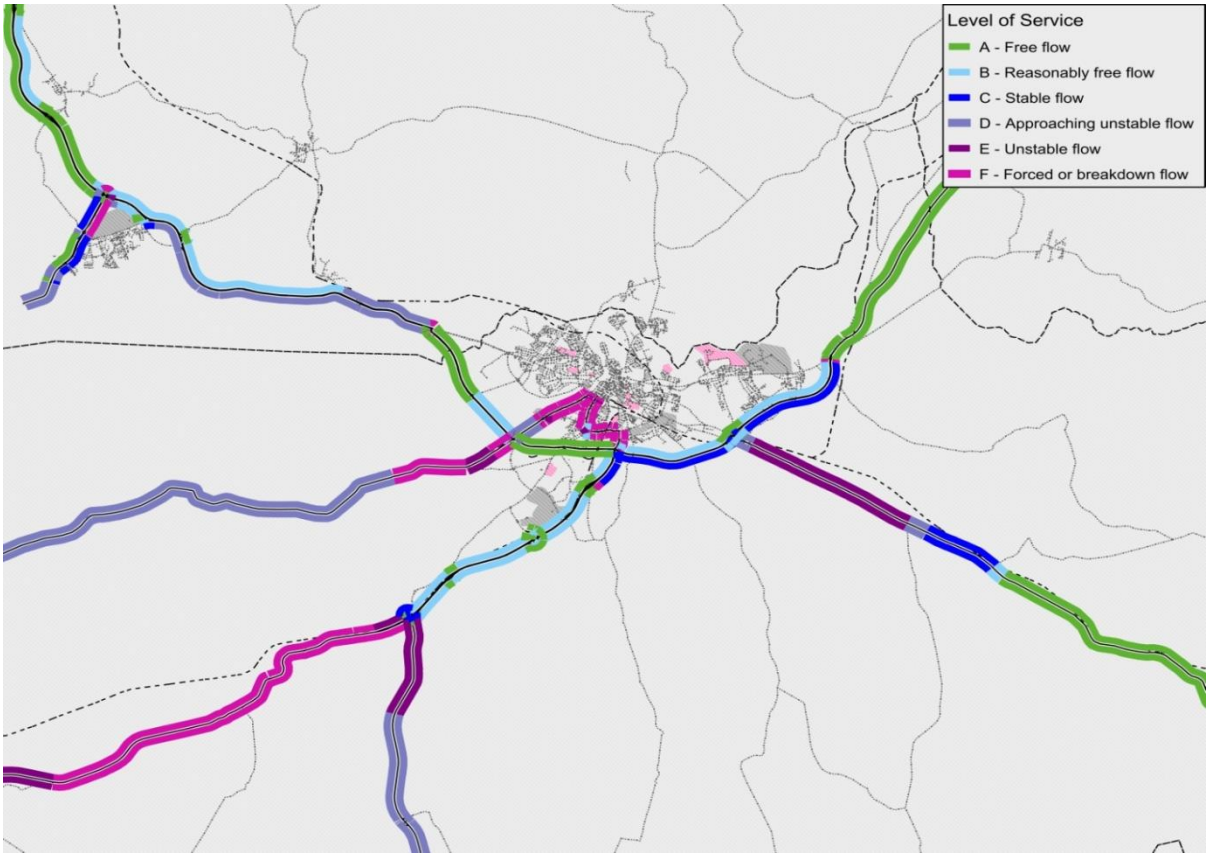

Figure 11: 2040 Level of Service Limerick

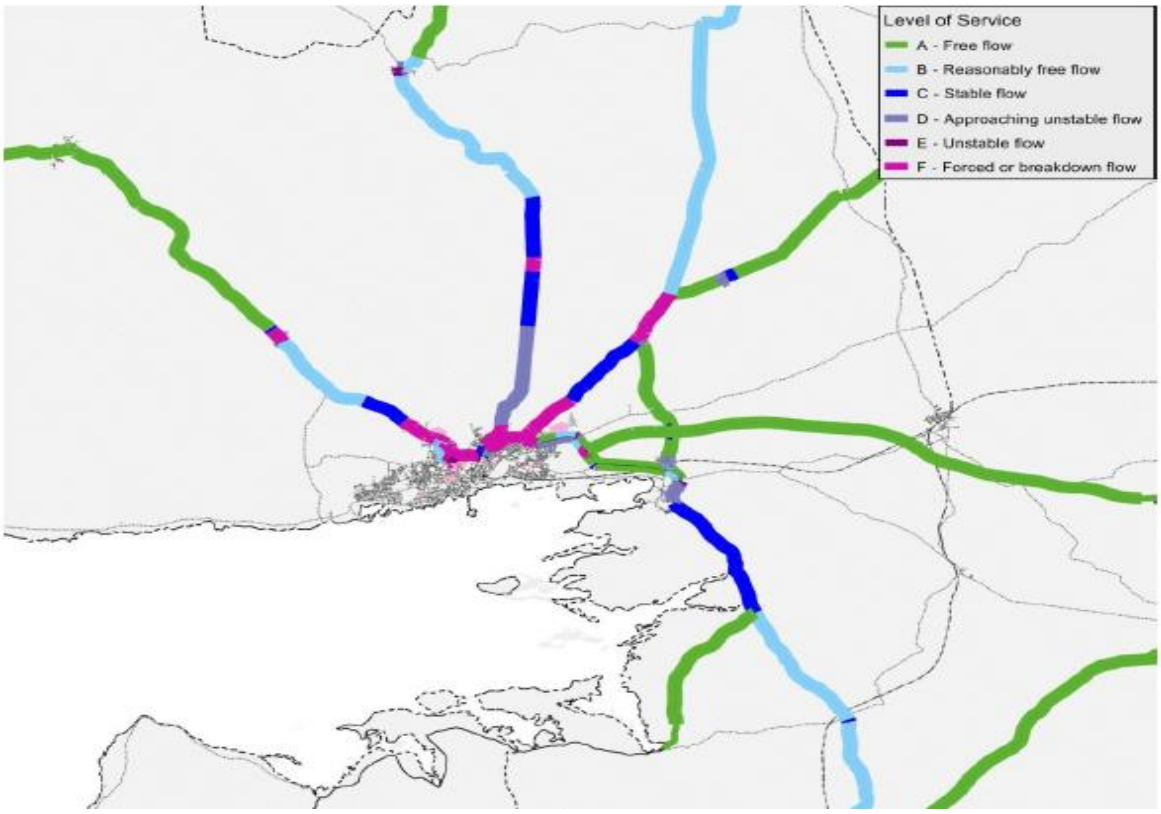

Figure 12: 2013 Level of Service Galway

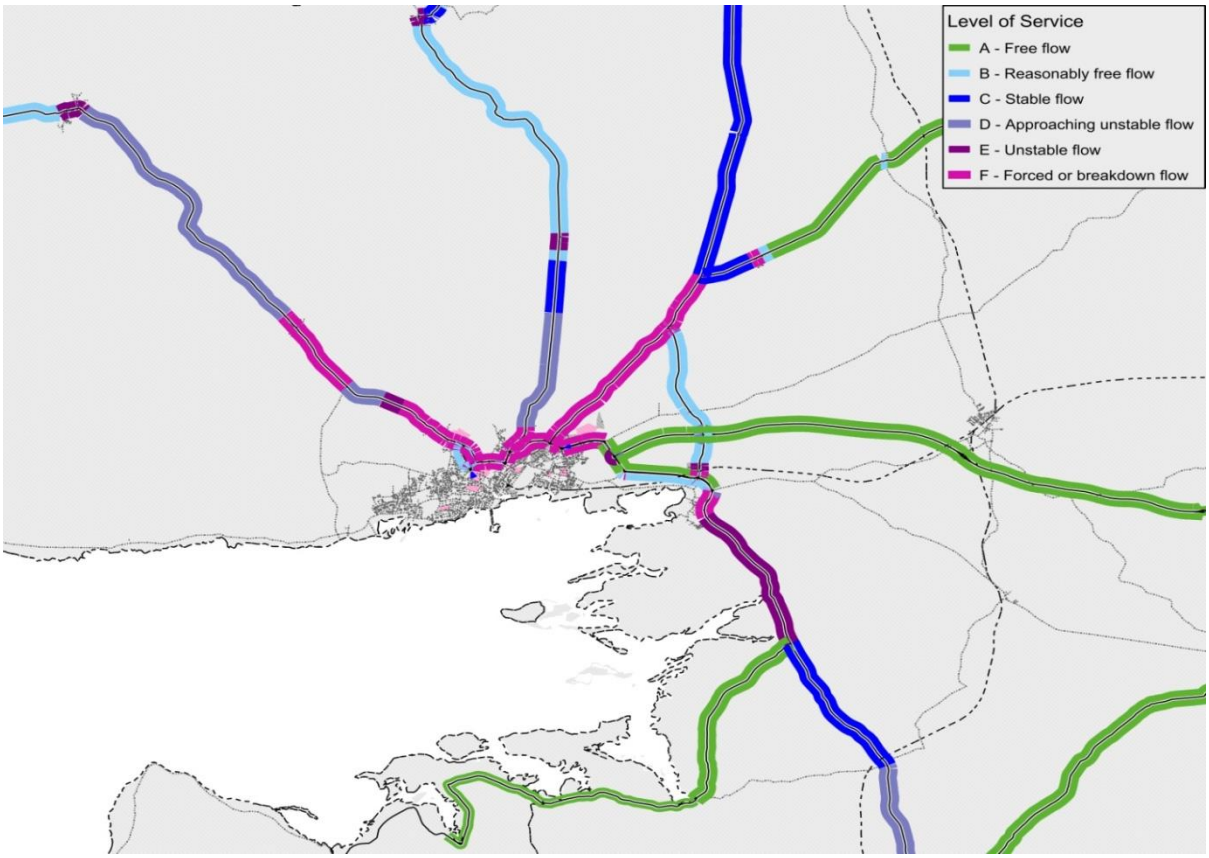

Figure 13: 2040 Level of Service Galway

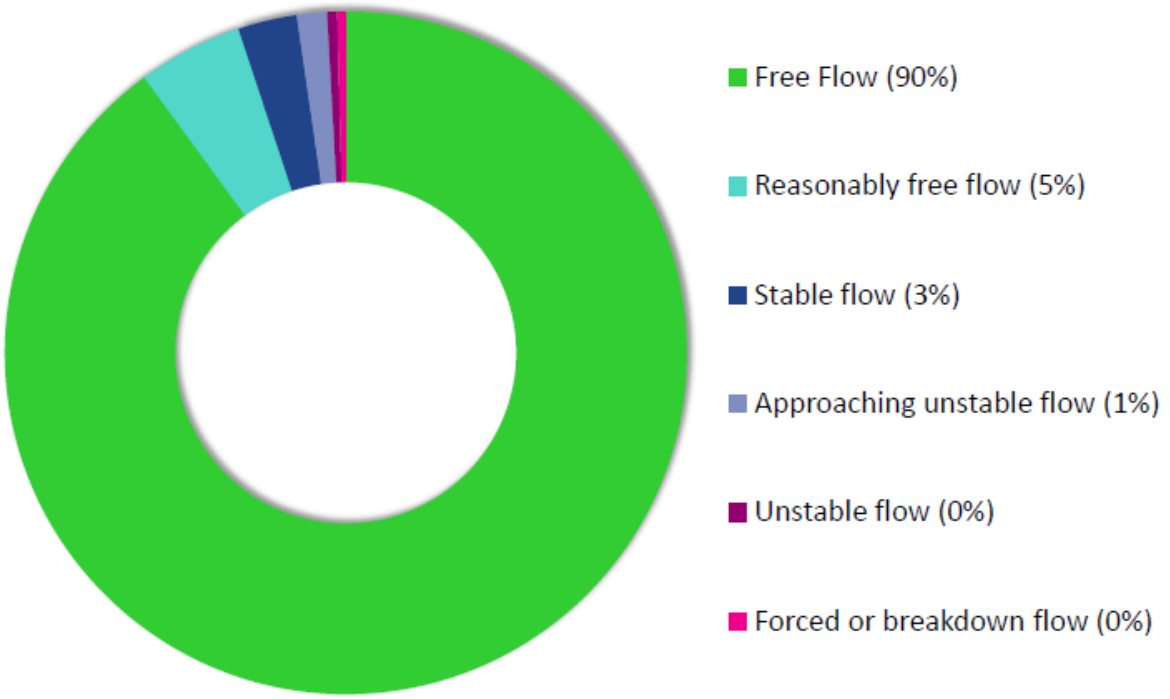

Figure 14: 2013 Level of Service All National

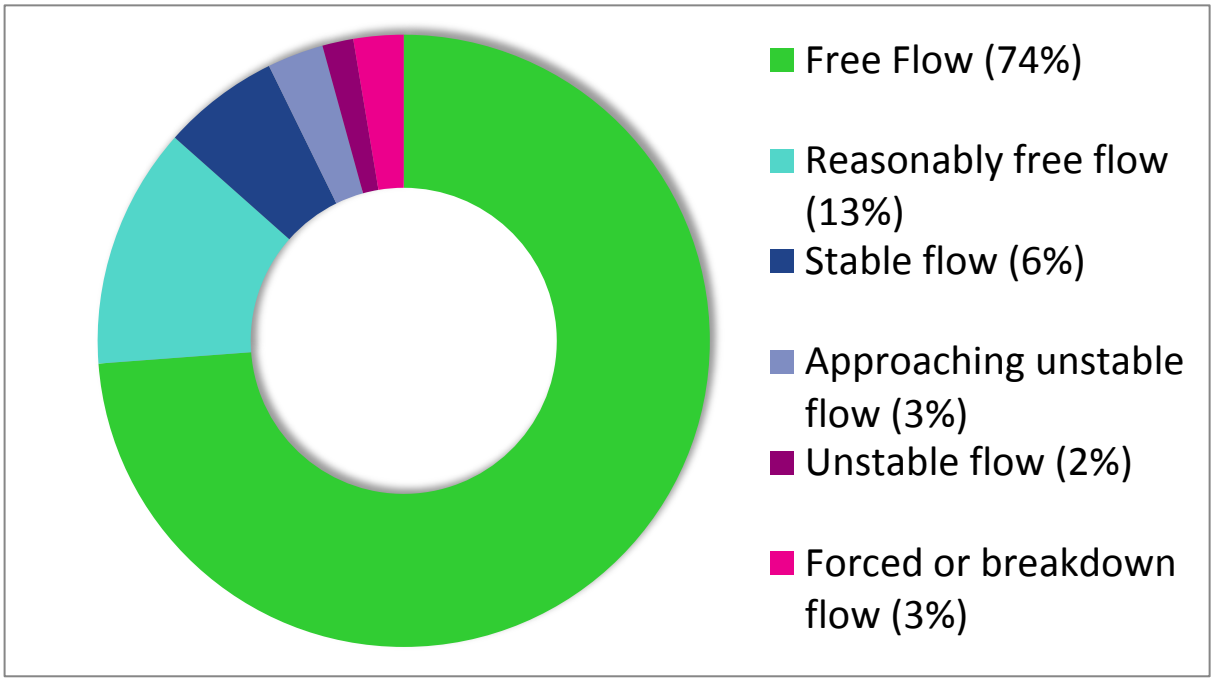

Figure 15: 2040 Level of Service All National

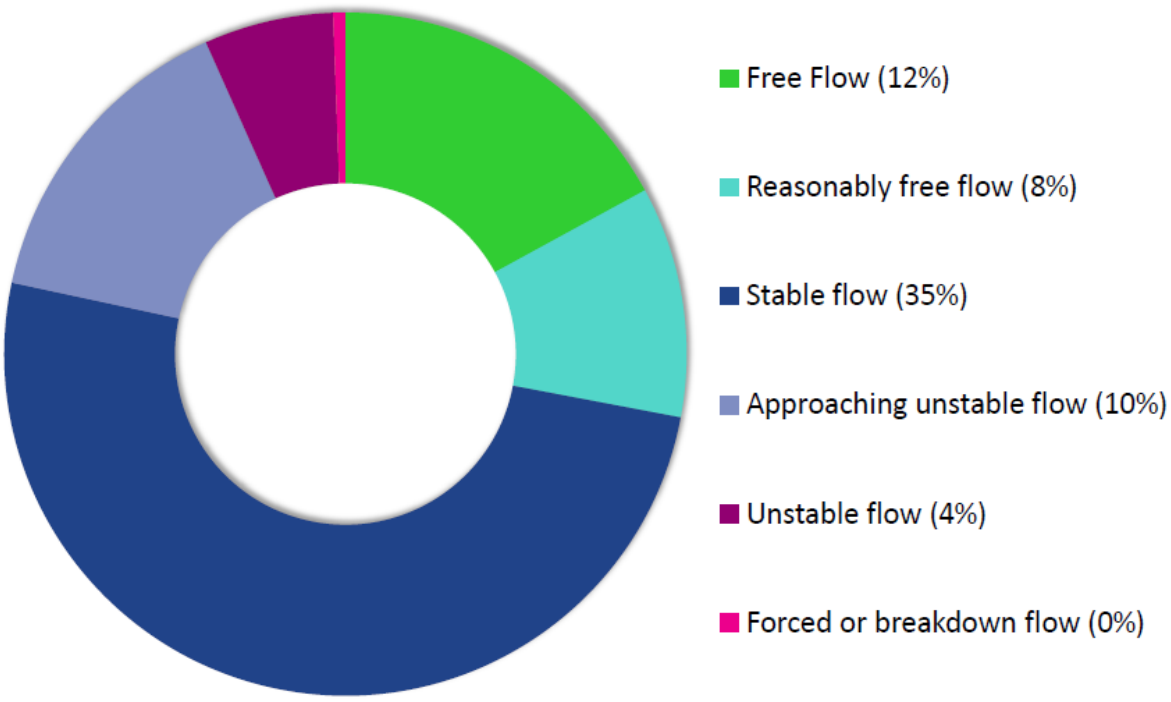

Figure 16: 2013 Level of Service M50 Dublin

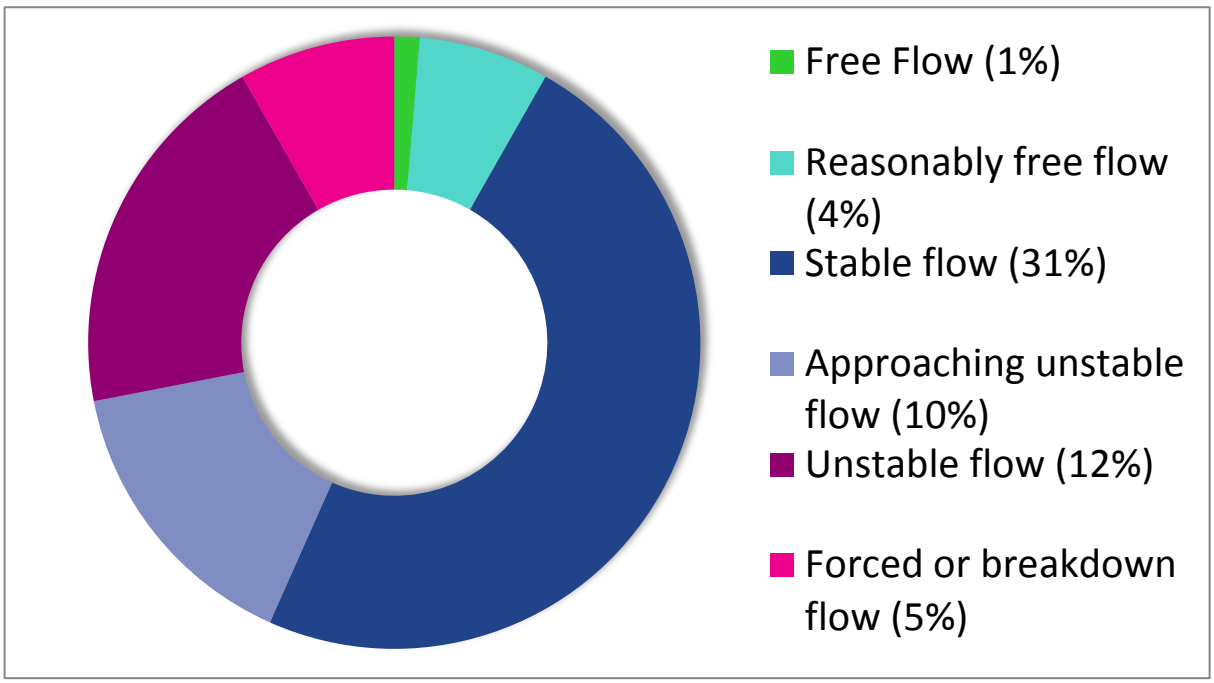

Figure 17: 2040 Level of Service M50 Dublin

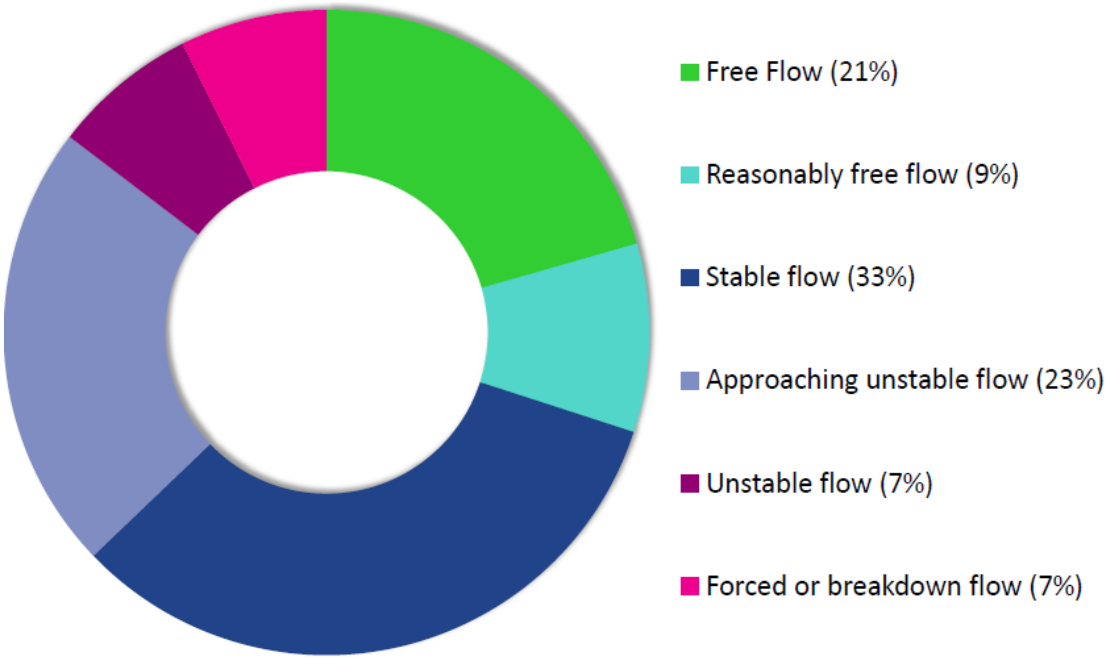

Figure 18: 2013 Level of Service N40 Cork

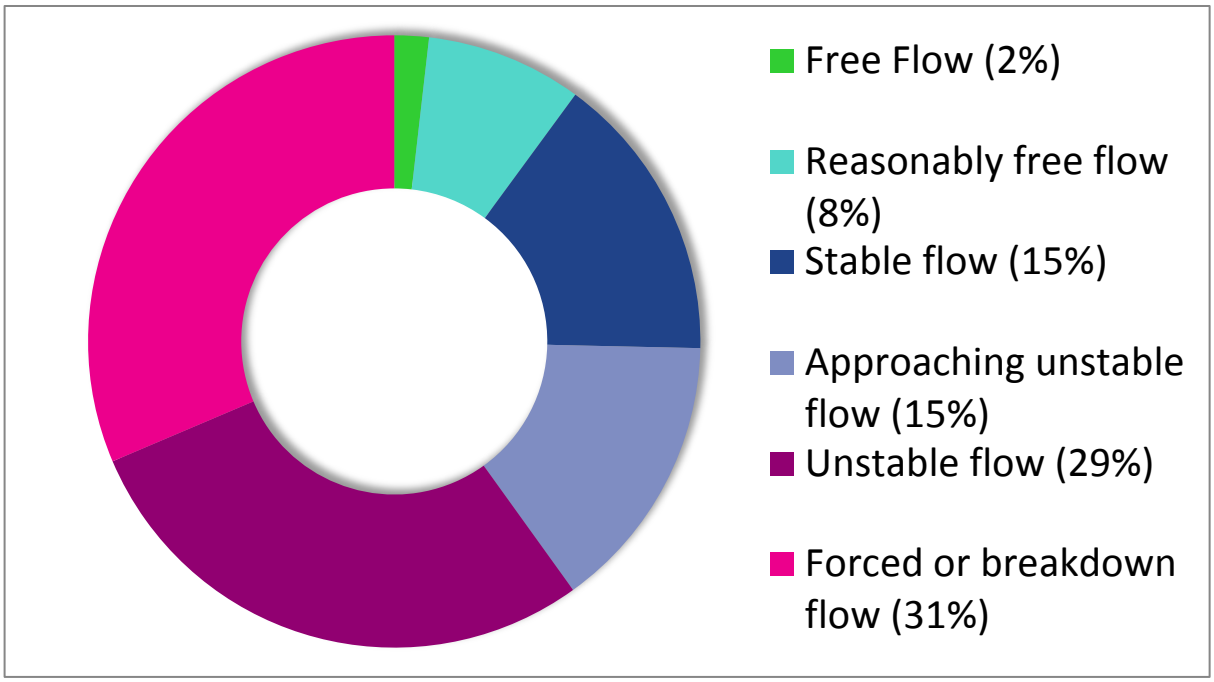

Figure 19: 2040 Level of Service N40 Cork

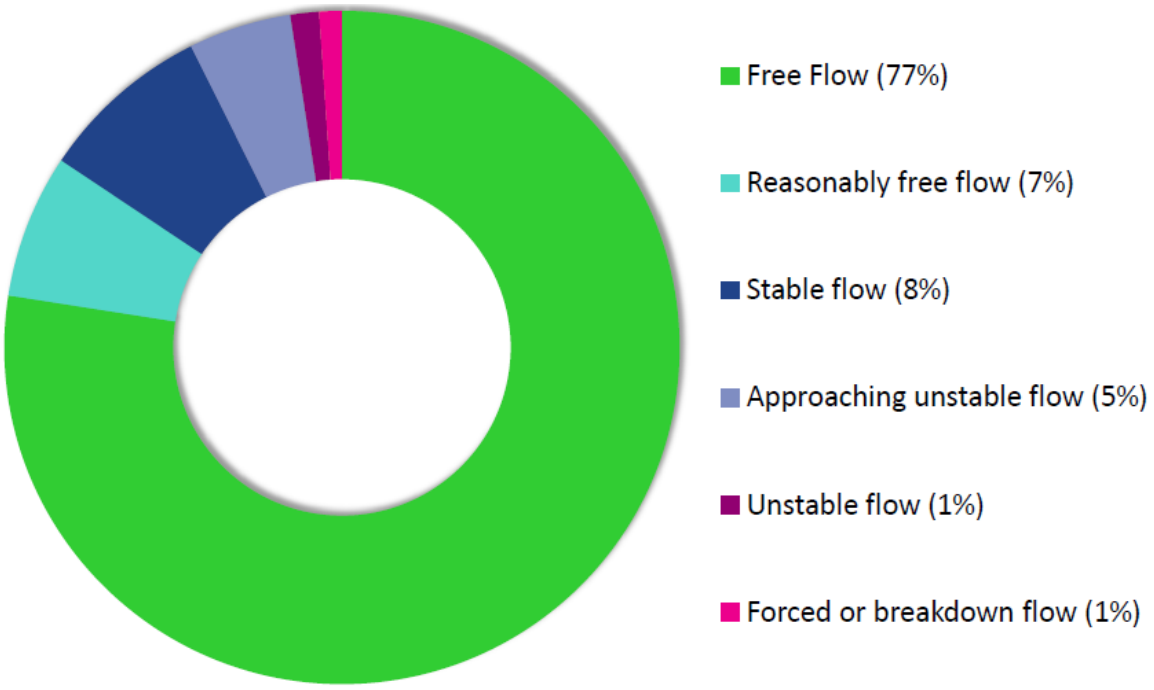

Figure 20: 2013 Level of Service N11/M11

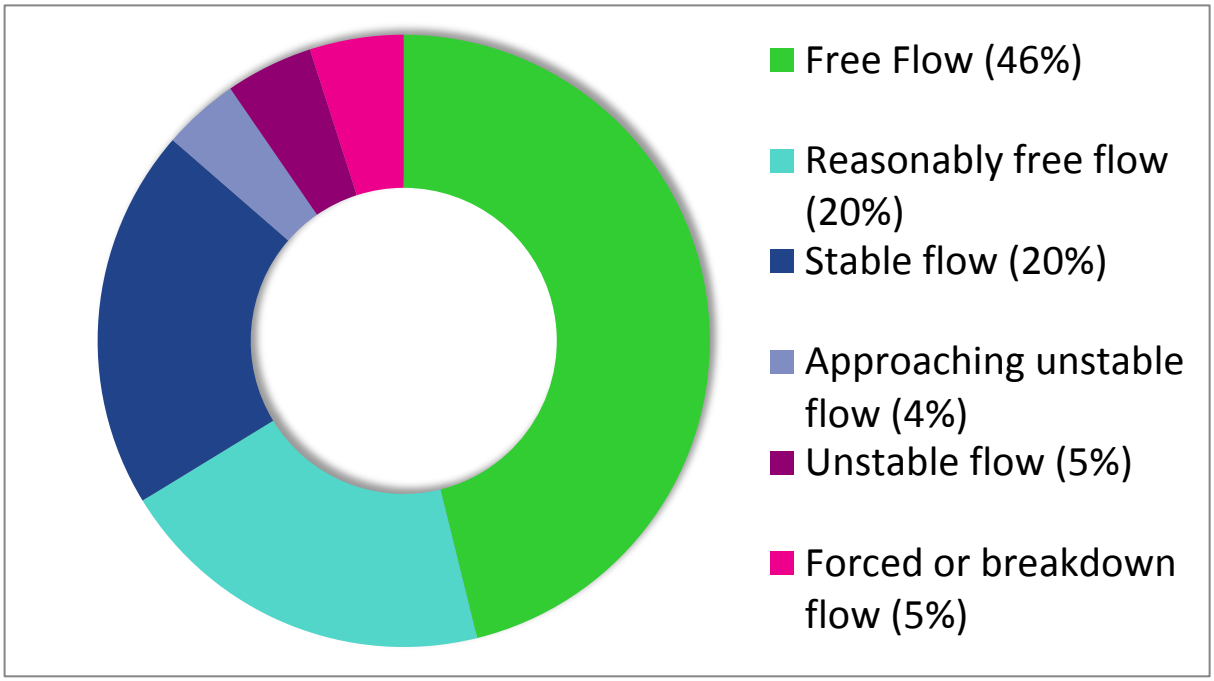

Figure 21: 2040 Level of Service N11/M11

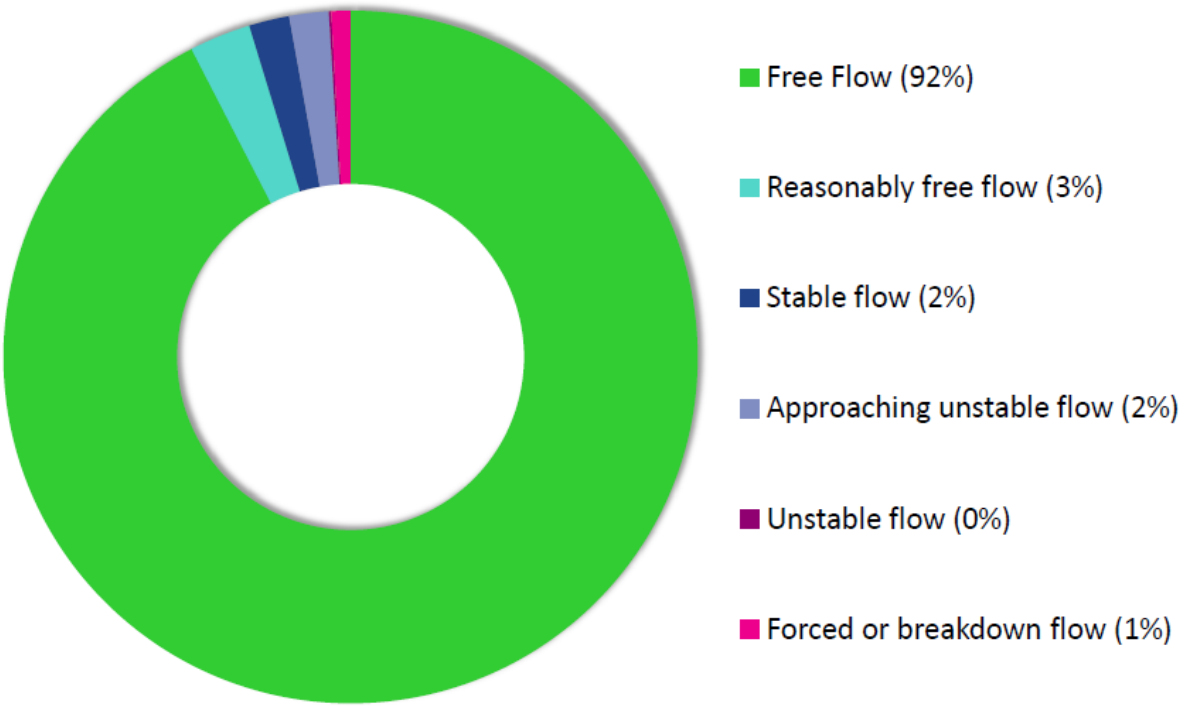

Figure 22: 2013 Level of Service N20 (Cork to Limerick)

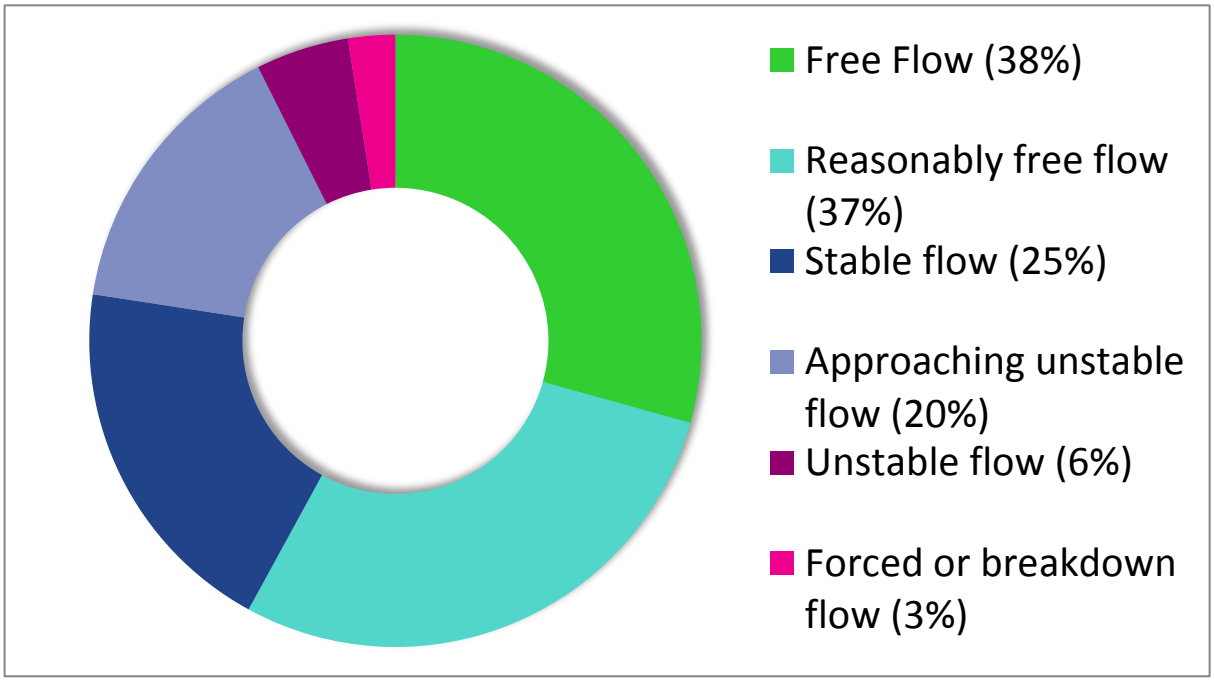

Figure 23: 2040 Level of Service N20

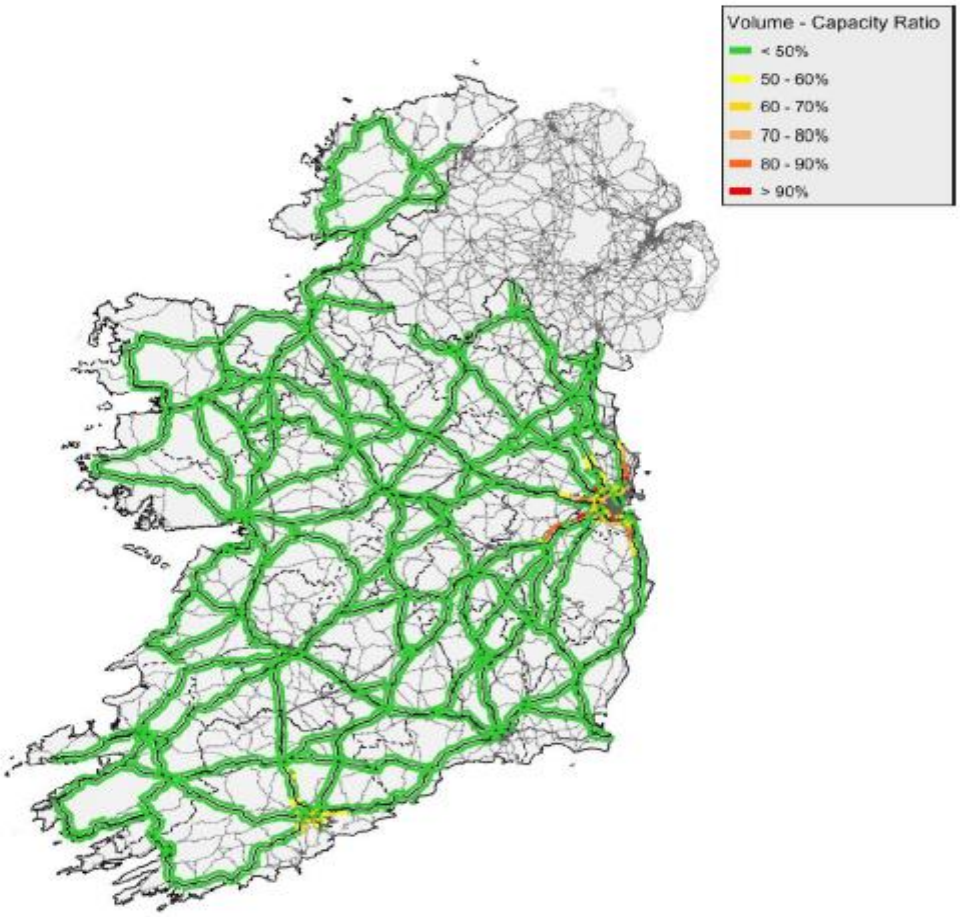

Figure 24: 2013 V/C Ratios National

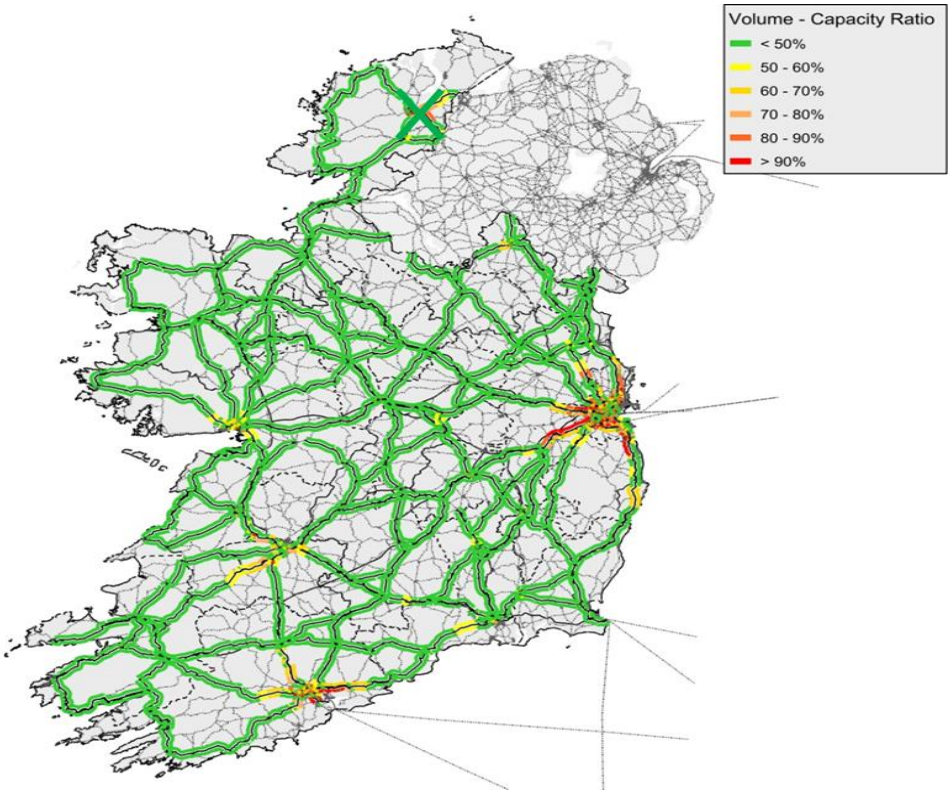

Figure 25: 2040 V/C Ratios National

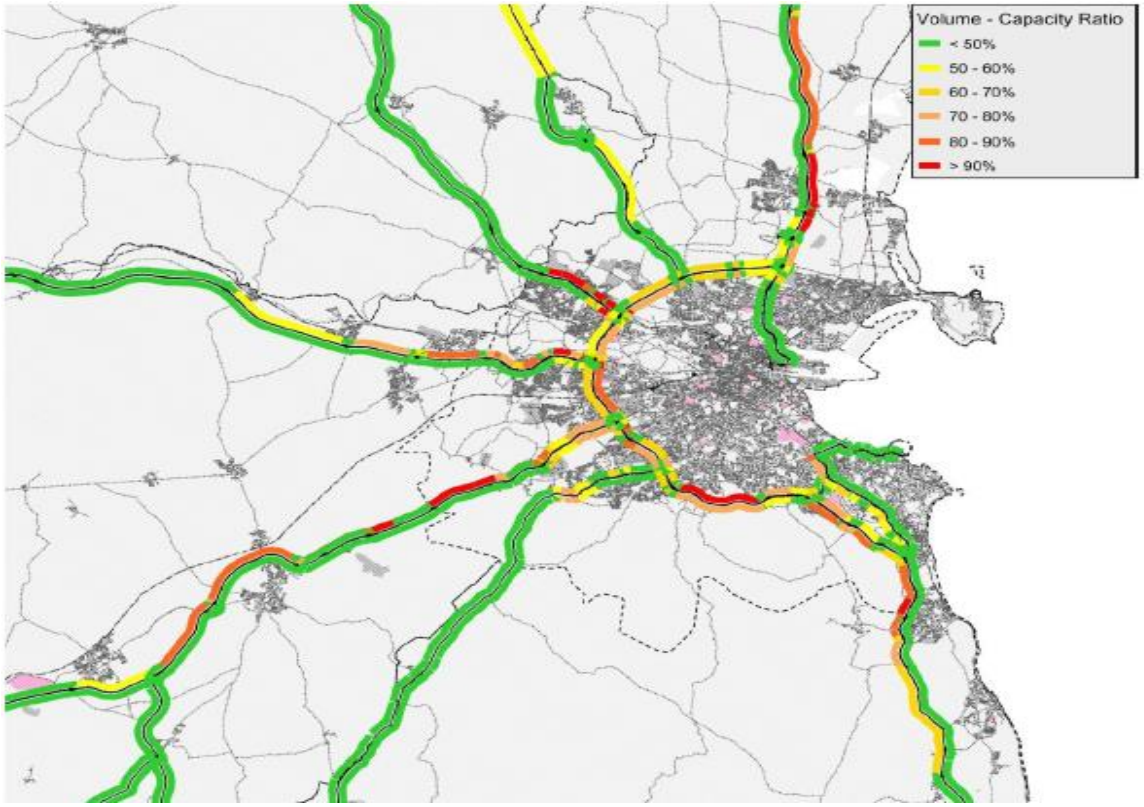

Figure 26: 2013 V/C Ratios GDA

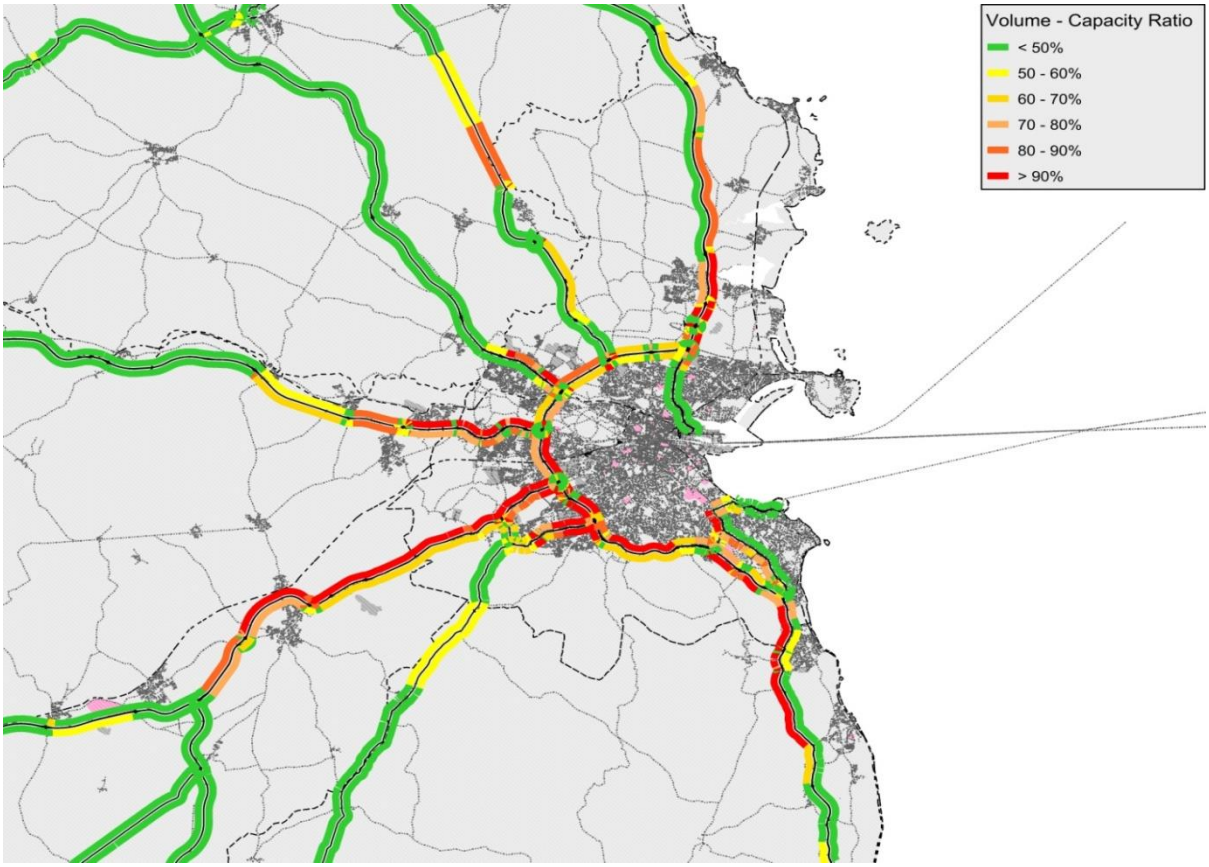

Figure 27: 2040 V/C Ratios GDA

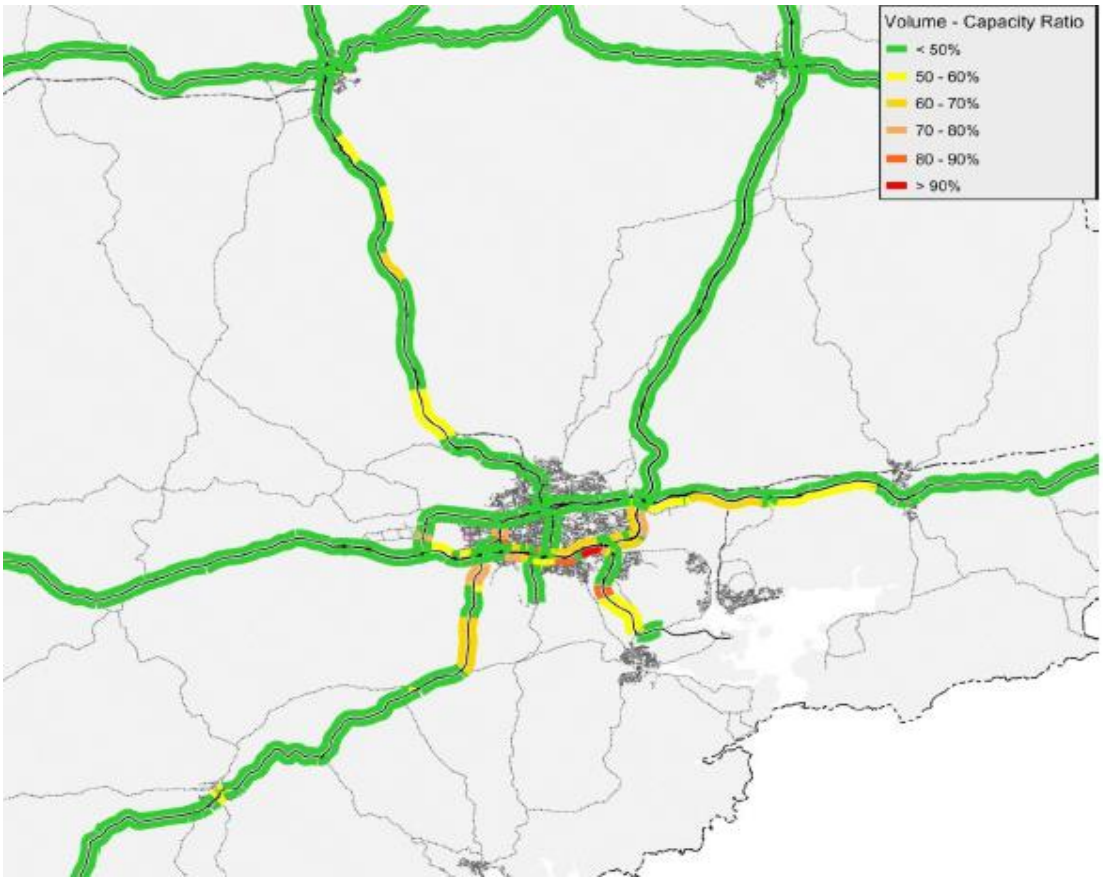

Figure 28: 2013 V/C Ratios Cork

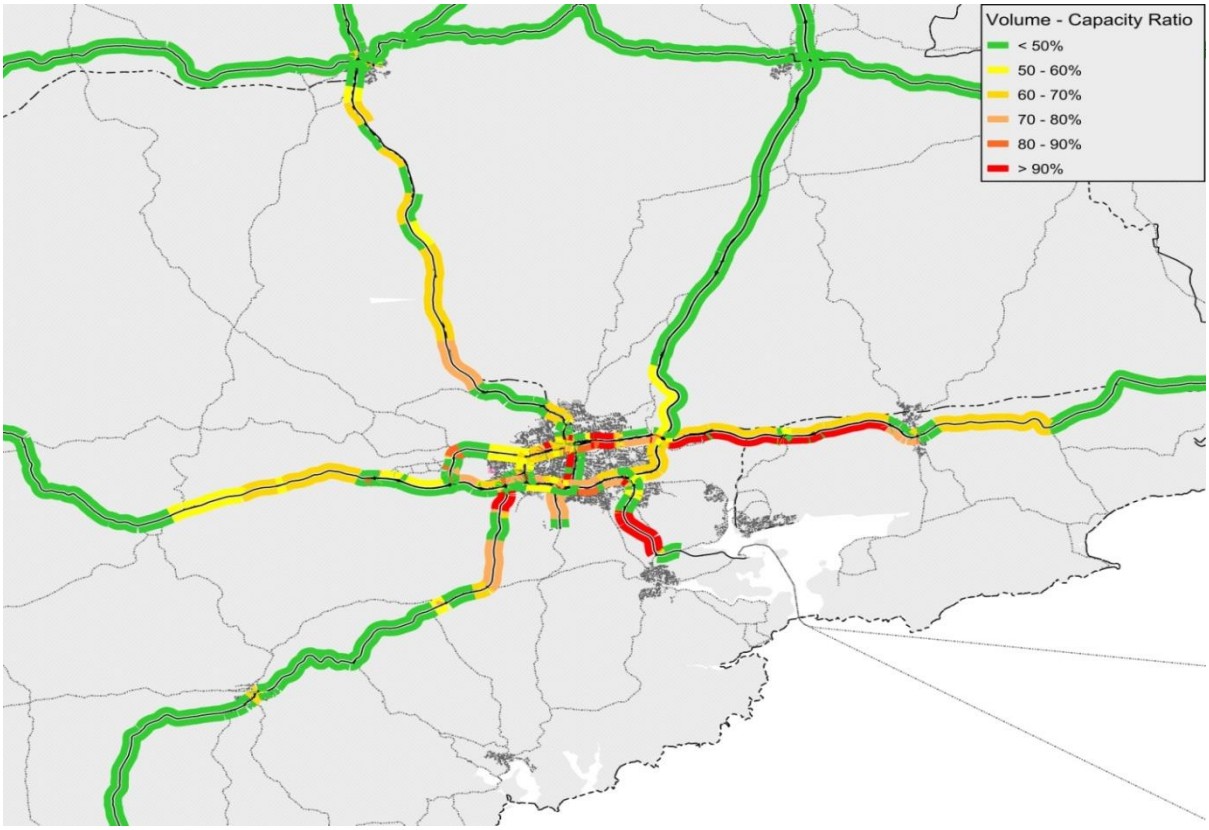

Figure 29: 2040 V/C Ratios Cork

Figure 30: 2013 V/C Ratios Limerick

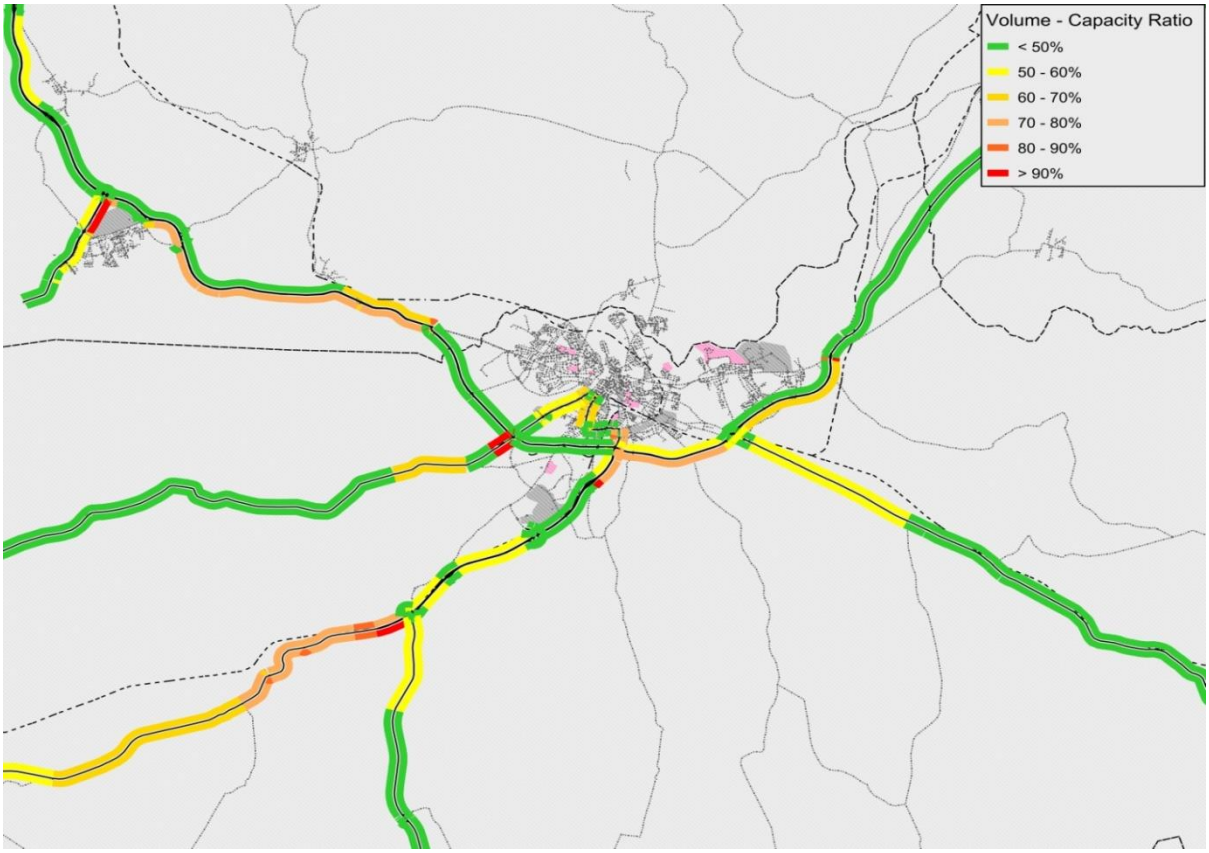

Figure 31: 2040 V/C Ratios Limerick

Figure 32: 2013 V/C Ratios Galway

Figure 33: 2040 V/C Ratios Galway