



Boundary Submission

Theoretical Physics Student Association

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1 Introduction

This is the first commission to be established under the Electoral Reform Act 2022 to review the constituencies for Dáil and European Parliament elections. This commission will also be providing recommendations for the largest Dáil since the foundation of the state. Our submission will be focusing on the Dáil constituencies.

This commission is faced with a significant challenge, which what appears to be potentially the most challenging review in recent memory. As we approach the upper limit of the 30,000 per person constitutional requirement.

This submission will focus on all counties within the republic, excluding Dublin and Cork. This submission seeks to provide a set of potential solutions that would allow the commission to meet the terms of reference. With a focus on maintaining county boundaries.

We believe that the establishment of this commission presents a significant opportunity to improve the role of open data and open government in contributing to the state. By leveraging open data and engaging citizens in the review process, we can enhance transparency, accountability, and public participation in the electoral system.

Open data initiatives provide access to a wealth of information that can be analysed and visualised to gain insights into various aspects of the electoral system, such as voter demographics, candidate performance, and historic election data. By making this data available in a standardised and machine-readable format, citizens and researchers can use it to develop and test hypotheses, perform analyses, and create visualisations that provide insights and recommendations. Open government, on the other hand, offers an opportunity for the public to contribute to the review process by sharing their knowledge and expertise in a collaborative and participatory manner. By engaging citizens in this way, we can not only increase public awareness and understanding of the review process but also improve the accuracy, completeness, and relevance of the data being used. In conclusion, we believe that the establishment of this commission provides a unique opportunity to improve the role of open data and open government in contributing to the state. By leveraging these approaches, we can enhance transparency, accountability, and public participation in the electoral system, and ensure that the review process is as inclusive and informed as possible. We encourage the commission to embrace these opportunities and look forward to seeing the impact this can have on the review process.

2 Summary of recommendations for Dáil constituencies

- We suggest that a Dáil with 178-181 seats would provide the most effective representation and meet the requirements outlined in the terms of reference.
- We have recommended 26 constituencies. Table 24 provides an explicit list and outline of all recommendations.
- In our recommendations, we took into account 24 counties within the Republic, with a particular emphasis on minimizing the breaking of county boundaries.

2.1 Recommendations of the Submission: Southeast region (Group 1)

We recommend the following:

- This grouping is to be allocated 42 seats, with a total of 9 constituencies.
- Waterford is to form a 5-seater, by accepting a transfer of population and area from the South of Kilkenny. This would then allow Carlow and Kilkenny to join to form the 5-seater Carlow-Kilkenny.
- The county of Wexford should form a 5-seater by transferring a population and area from North Wexford to South Wicklow. This would then allow Wicklow to form two 3-seaters, Wicklow South and Wicklow North.
- The counties of Laois and Offaly should both form two standalone 3-seaters, such that county boundaries are maintained at 178 seats. But if the commission is not willing to accept a higher variance of 6.14%, which is outside the $\pm 5\%$ variance from the National Average, then we recommend a transfer of population and area from Laois into Offaly such that they both form 3-seaters within the $\pm 5\%$.
- The county of Tipperary is to be divided into two 3-seat constituencies, Tipperary North and Tipperary south.
- The county of Kildare should be split into two constituencies. That of Kildare North and Kildare South. There should be a total of 9 seats assigned, with Kildare North being assigned 5 seats and Kildare South being assigned 4.

If our proposed approach for the handling of Wicklow and Wexford is not accepted, we recommend considering the following alternative option:

- Our proposed approach involves breaking county boundaries once in the grouping of Wicklow and Wexford to ensure each county can form valid constituencies. However, if this is not feasible, we suggest breaking county boundaries in a different location.
- Specifically, Kildare could absorb a portion of Wicklow (Blessington), which would be entitled to 9 seats. This new combined area of Kildare and Blessington could be joined with Kildare North to form two constituencies: Kildare North (5 seats) and Kildare South (4 seats)
- Table 10 makes it clear that Wexford can form two 3-seaters and thus maintain county boundaries in this situation from 179-181 seat Dáil. At 178 seats the variance from the National Average is -5.31% which is just outside the $\pm 5\%$.

- From the perspective of maintaining county boundaries, we consider both options to be equivalent, as they result in the same number of county boundary breaks, but in different locations.
- Kildare could absorb a part of Wicklow, specifically Blessington. This new combined area of Kildare and Blessington would be entitled to 9. With this new area from Wicklow likely being joined into Kildare North.
- It is worth noting that we have taken into consideration the ripple effect that changing a boundary could have in our proposed groupings.

2.2 Recommendations of the Submission: Northeast region (Group 2)

We recommend the following

- This grouping is to be allocated 23 seats. With a total of 5 constituencies.
- The counties of Cavan and Monaghan join to form the Constituency of Cavan-Monaghan a 5-seat constituency.
- The counties of Longford and Westmeath join to form the Constituency of Longford-Westmeath a 5-seat constituency.
- The county of Louth is to be left as a standalone 5-seat constituency.
- The county of Meath is to be split into two constituencies, Meath East and Meath West such that the total combined seats of the two constituencies is 8 seats (4+4 , 3 + 5).

2.3 Recommendations of the Submission: North and Southwest region (Group 3)

Unlike the other two groups we will be providing Observations and Recommendations

Observations:

- Kerry cannot form a standalone constituency without breaking county boundaries within the recommended range of 178-181 seats for the Dáil.
- Clare must break county boundaries to form a 4 or 5-seater constituency.
- Galway can be split into two 5-seat constituencies within a 177-181 seat Dáil if Roscommon, Sligo, and Leitrim are contained, otherwise Galway would have to interact with Roscommon.
- Roscommon, Sligo, and Leitrim do not have large enough populations to form standalone constituencies.
- Donegal can form two 3-seaters in a Dáil with 176-181 seats, while maintaining county boundaries and continuity.

Recommendations:

- This grouping should be allocated 43-44 seats, depending on how high the commission goes in the recommended 178-181 seat range, with a total of 10-11 constituencies.
- Limerick can form a 3 and a 4-seater within the permitted variance from the National Average. However, some areas of Kerry and Clare may be absorbed into Limerick's constituencies.
- Mayo can form a 5-seater within a 178-181 seat Dáil without breaking county boundaries.
- Join Roscommon and Sligo together to form a five-seat constituency, while keeping the county boundaries intact, or join all three counties (Roscommon, Sligo, and Leitrim) together in a way that creates two 3-seater constituencies.
- If the counties of Roscommon and Sligo are joined together then Donegal should be divided into two constituencies, one consisting of South Donegal and Leitrim as a 3 or 4-seater and the remaining part of Donegal as a 4 or 3-seater respectively, in a 175-181 seat Dáil. If not then Donegal should form two 3-seaters. This would maintain county boundaries.

3 Considerations

In this section of this submission, we will outline several key points that form the foundation of our positions and arguments which support our constituency recommendations. These points are critical to understanding our perspective and reasoning, and we will use them to support our recommendations throughout the submission.

3.1 Definitions/Nomenclature

In this section, we outline how the calculated values used within this submission are defined. We will provide the formulas and use examples of their implementation and how to interpret them.

3.1.1 National Ratio & Seat Equivalent Representation

Firstly, we will introduce the notion of a **National Ratio**. This is defined as

$$\text{National Ratio} = \frac{\text{Recorded Census Population}}{\text{Number of Dáil seats}} \quad (1)$$

The National Ratio captures the number of people each TD would represent in an ideal world, with perfectly equal representation. The National Ratio metric admits the following units:

$$[\text{National Ratio}] = \frac{[\text{People}]}{[\text{Seats}]} \quad (2)$$

In the course of determining appropriate boundaries, we must quantify the extent of representation for the proposed constituencies. We will refer to the number of constituents of a given hypothetical constituency as the **Proposed Population**. With this in mind, we introduce a metric called **Seat Equivalent Representation**. It is defined as follows:

$$\text{Seat Equivalent Representation} = \frac{\text{Proposed Population}}{\text{National Ratio}} \quad (3)$$

To double-check the validity of this metric, we analyse its units:

$$[\text{Seat Equivalent Representation}] = \frac{[\text{Proposed Population}]}{[\text{National Ratio}]} = \frac{[\text{People}]}{\frac{[\text{People}]}{[\text{Seats}]}} = [\text{Seats}] \quad (4)$$

For a given Proposed Population, Seat Equivalent Representation quantifies the deserved representation of said population in seats. In simpler terms, the Seat Equivalent Representation tells us how many TDs should be assigned to a proposed constituency, given the population of said constituency. We can rearrange the above formula to deduce the Proposed Population given the Seat Equivalent Representation of the Constituency and the National Ratio if need be.

$$\text{Proposed Population} = \text{Seat Equivalent Representation} \times \text{National Ratio} \quad (5)$$

In this report, we are tasked with finding constituencies whose assigned seats deviate minimally from the constituencies' respective Seat Equivalent Representations. The greater the discrepancy of a constituency's assigned seats and the Seat Equivalent Representation, the more severe the over-/under-representation of its constituents.

As a simple, hypothetical example (as only 3,4 and 5 seat constituencies are permitted currently) to illustrate the concept, if the National Ratio was 30,000 people per seat, and the Proposed Population of a hypothetical constituency was 45,000 people, then the Seat Equivalent Representation for that constituency would be 1.5 seats. This would mean that in order for the constituents to experience exactly the same level of representation as the national average, they would need 1.5 TDs. If 1 seat were assigned to the constituency, the constituents would be severely under-represented, if 2 seats were assigned they would be severely over-represented. This tells us that the proposed constituency should be ruled out.

Practically speaking, we cannot propose constituencies and assign seats such that it exactly lines up with the Seat Equivalent Representations of the underlying populations. We must define, quantitatively, the deviation of a constituency’s assigned seats from the Seat Equivalent Representation, and set a threshold deviation that then lets us rule out constituencies that deviate too far from the national average representation (the National Ratio).

3.1.2 Acceptable Variance

The concept of “variance” is a fundamental metric utilized in prior reports to determine the viability of potential constituencies (when endeavouring to achieve equality of representation, also the term “variation” was also used). The previous Constituency Commission Reports from 2017 (1, p. 14) and 2012 (2, p. 12) have emphasized minimizing the variance from the National Average Population per TD in each recommended constituency. We provide a definition for “Variance from the National Average Representation” in terms of Seat Equivalent Representation. Which we will refer to as “Variance from the National Average” ;

$$\text{Variance from the National Average} = \frac{\text{Seat Equivalent Representation} - \text{Assigned Seats}}{\text{Assigned Seats}} \quad (6)$$

A positive value of 0.05 indicates a variance of 5% above the National Average Representation, while a negative value of -0.05 indicates a variance of 5% below the National Average.

We will now examine Table 18, to see equation 6 in action. We can see that all the values coloured orange have a variance from the National Average within the $\pm 5\%$ range. The values that are left uncoloured are values outside of this range. For example, the recommended Constituency Louth has a variance from the National Average of 7.15% at a 171 member Dáil and is thus outside the 5% range and is thus not coloured orange.

3.2 Consistency with Previous Reports

3.2.1 Reproducing Past Results with Chosen Metrics

We were unable to find within the four previous reports (2004, 2007, 2012, and 2017) any explicit definition of how to calculate the variance from The National Average. We arrived at the equations in 3 by checking to see if we could reproduce the values of the tables within the previous reports, see Ref. A.3.

In line with previous reports, we will refer to “variance from the National Average” as simply “variance” from here on interchangeably. We believe that past and future reports would be more accessible if there was a section within the appendices, which outlines explicitly how the commission mathematically defines metrics such as the variance. The way it is defined, Eq. 6, is not the usual mathematical use of the term “variance”, which would be the expectation of the squared deviation of a random variable from its population mean or sample mean, so this is a source of ambiguity. Even if we completely ignore the usual statistical meaning of variance,

there are alternatives to Eq. 6 that are arguably more representative which we will touch on later.

3.2.2 Variance Threshold

Determining an appropriate recommendation for a constituency relies heavily on the accepted value for its variance from the National Average. Throughout various reports the commission has emphasized the importance of minimizing the deviation of a recommended constituency's variance from the National Average. Therefore, this submission will similarly focus on reducing the variance from the National Average in each constituency and keeping any deviation within $\pm 5\%$. This selected value (in this case $\pm 5\%$ variance from the National Average) will be used as a means of evaluating the viability of existing and proposed constituencies.

Report Name	Min Variance	Max Variance
report 2004	-7.501	7.869
report 2007	-6.033	4.730
report 2012	-4.935	4.931
report 2017	-5.252	5.067

Table 1: The Range of Variance from the National Average for Previous Electoral Commission Recommendations: The table displays the minimum and maximum variance from the National Average for constituencies recommendations made by the Electoral Commission in four previous reports (2004, 2007, 2012, and 2017).

There is no hard and fast rule or figure for the permitted variation from the national average. Thus, our submission is based on the historical pattern of past reports Table 1, which have consistently cited a 5% variance (used interchangeably with $\pm 5\%$) as an acceptable standard for ensuring equality of representation across constituencies, while allowing for some flexibility in the formation and revision of constituencies. We can see in Table 2 that only two recommended constituencies were actually outside the range of $\pm 5\%$ variation in 2017. The 2004 report stands out with 7 recommendations (7 out of 43 their recommendations constituting approximately 16%) falling outside the $\pm 5\%$ range and with the largest minimum and maximum value for the variation from the national average. However, the subsequent three reports (2007, 2012, and 2017) saw only 3 out of 122 recommendations falling outside the $\pm 5\%$ variation from the national average. This represents less than 3% of all recommendations made in those reports.

Adhering to this 5% value provides a solid basis for our recommendations on what constituencies should be adopted, while also giving the commission flexibility to take into consideration other relevant factors, such as county boundaries, as well as the distribution of the population in each constituency. Ultimately, our goal is to ensure that the parliamentary representation of the population is as close to equality as possible while taking into account practical difficulties and other relevant factors. Adhering to this value also provides the commission with the facility to accept a few higher variance recommendations if there is a need. This might be necessary due to a few complexities arising from the dividing the counties of Cork, Dublin, and some other counties.

Report Name	Number of Constituencies	Number of Constituencies Outside of Range
report 2004	43	7
report 2007	43	1
report 2012	40	0
report 2017	39	2

Table 2: Number of Historical Constituency Recommendations Outside the $\pm 5\%$ Variance Range: This table shows the number of constituency recommendations from previous Electoral Commission reports (2004, 2007, 2012, and 2017) that fell outside the $\pm 5\%$ variation from the National Average.

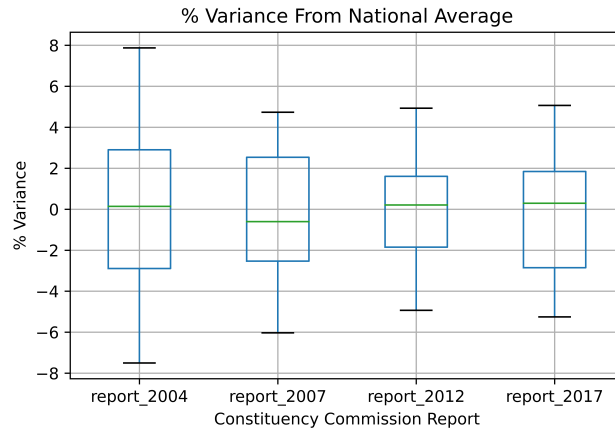


Figure 1: Box plot of the variance in representation across Constituencies from 2004-2017. The top and bottom of the error bars indicate Constituencies with the most extreme departures from equal representation for that year. The blue boxes are an indication of the spread of representation disparity (variance in the usual statistical definition).

Summary: The basis for the arguments presented in this submission regarding the size of existing and proposed constituencies and their suitability will centre on minimizing the variance from the National Average, with an upper and lower bound of $\pm 5\%$.

3.3 Constituency Sizes

Section 57(2)(b) of the Electoral Reform Act 2022 states constituencies are required to have 3, 4, or 5 members. In this submission, we use the term “seater” to describe constituencies of a specific size. Instead of using phrases like “8-seat constituency”, we use “8-seater” to allow for the grouping of areas and allocation of a certain number of seats before dividing them into permitted constituency sizes based on Section 57(2)(b). The term “seater” followed by a number denotes a constituency of a particular size. For instance, a 3-seater refers to a constituency with three seats, also known as a 3-seat constituency. When we refer to seaters outside the 3-5 size range, we are referring to 5+ seaters, which are comprised of a combination of permitted constituency sizes to meet the desired representation based on the Seat Equivalent Representation metric.

It’s worth noting that there are several possible combinations of the permitted seat sizes that can be used to reach the total number of TDs an area deserves based on the Seat Equivalent Representation metric. For instance, a 10-seater could be two 5-seaters or a 4-seater and two 3-seaters. An 8-seater could be two 4-seaters or a 3-seater and a 5-seater, and so on. The bottom line is that each area should receive the representation it deserves in terms of seats, based on the Seat Equivalent Representation metric. The options outlined in the Keys give the total representation an area could be allocated. For details on the combinations see appendix [A.4.1](#).

3.3.1 In terms of Population

By tracking the National Ratio over the years, we can observe an increase in the national average population per member of the Dáil, Table 3. The National Ratio for the 2023 report will determine what the minimum and maximum population sizes for a constituency can be under a $\pm 5\%$ variance.

Report Name	National Ratio
2004 report	23,598
2007 report	25,541
2012 report	29,040
2017 report	29,762
2023 report	28,306.83 - 29,962.20

Table 3: National Average Population per Member of the Dáil (National Ratio) from 2004-2017, Including Projected Average for 2023’s Report

$$\text{Min People/TD} = (\text{National Ratio}) \times (1 - 5\%) = 0.95 \times \text{National Ratio} \quad (7)$$

$$\text{Max People/TD} = (\text{National Ratio}) \times (1 + 5\%) = 1.05 \times \text{National Ratio} \quad (8)$$

Section 57(2)(a) of the Electoral Reform Act 2022 provides that the total number of members of Dáil Éireann, subject to Article 16.2.2° of the Constitution, shall be not less than 171 and not more than 181. Using this and our proposed value for the acceptable variance form the National Average of $\pm 5\%$, together with Eq. 1 (knowing the National Ratio depends on the number of seats), Eq. 7, Eq. 8, we get the following:

Seats	National Ratio	Min Number of People	Max Number of People
171	29,962.20	28,464.09	31,460.31
172	29,788.00	28,298.60	31,277.40
173	29,615.82	28,135.02	31,096.61
174	29,445.61	27,973.33	30,917.89
175	29,277.35	27,813.48	30,741.22
176	29,111.00	27,655.45	30,566.55
177	28,946.53	27,499.20	30393.86
178	28,783.91	27,344.71	30223.11
179	28,623.11	27,191.95	30054.26
180	28,464.09	27,040.88	29887.29
181	28,306.83	26,891.49	29,722.17

Table 4: National Average Population per TD (National Ratio) for Dáils with 171-181 Seats, with the threshold $\pm 5\%$ variation.

3.3.2 In terms of Seat Equivalent Representation

Ultimately constituencies must be assigned a whole number of seats (i.e. the “Assigned Seats” in Eq. 6 must always be a whole number). We can find the limits of the Seat Equivalent Representation values for, let’s say, a 3 seater, by solving the following equation;

$$\text{Max Variance} = \pm 0.05 = \frac{\text{Extremal Seat Equivalent Representation} - 3}{3},$$

and we find that for a proposed constituency it must have a Seat Equivalent Representation of greater than 2.85, but less than 3.15 to afford its constituents a level of representation within 5% of the National Average. This information is gathered in Table 5.

Configuration	Min	Max
3-seater	2.85	3.15
4-seater	3.8	4.2
5-seater	4.75	5.25
6-seater	5.7	6.3
7-seater	6.65	7.35
8-seater	7.6	8.4

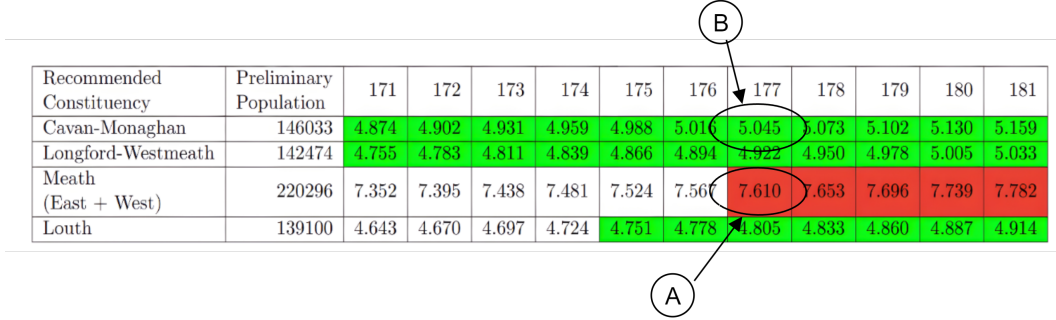
Table 5: Size of 3-8 seater Constituencies based of the $\pm 5\%$ variance from the National Average.

3.4 Interpreting Tables and Plots

In this submission, tables and plots are utilized to develop and support various positions. They help to visually convey important information, highlight patterns and trends, and provide a clear representation of data. In this section we will provide a detailed explanation of how to interpret and read these tables and plots. This will include an overview of the purpose they serve, as well as guidance on how to effectively analyse and interpret the information presented.

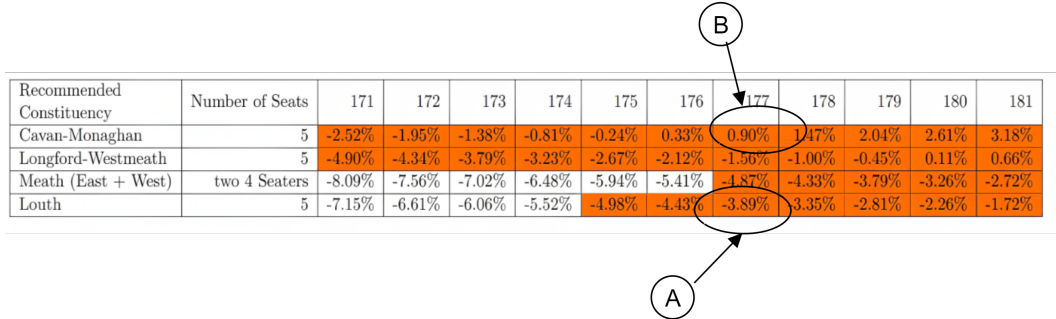
3.4.1 Tables

The tabular data is presented either in terms of Seat Equivalent Representation, or % variance. Examples of each are below.



Recommended Constituency	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Cavan-Monaghan	146033	4.874	4.902	4.931	4.959	4.988	5.016	5.045	5.073	5.102	5.130	5.159
Longford-Westmeath	142474	4.755	4.783	4.811	4.839	4.866	4.894	4.922	4.950	4.978	5.005	5.033
Meath (East + West)	220296	7.352	7.395	7.438	7.481	7.524	7.567	7.610	7.653	7.696	7.739	7.782
Louth	139100	4.643	4.670	4.697	4.724	4.751	4.778	4.805	4.833	4.860	4.887	4.914

Figure 2: This table is given in terms of Seat Equivalent Representation. Green represents a valid 5-seater. Red represents a valid 8-seater. White is an invalid constituency under a 5% variance cut-off. Let's consider entry A. When Meath East and Meath West are jointly considered as one constituency, it admits a population of 220,296 constituents. At point A, the population's Seat Equivalent Representation, in light of there being 177 Dáil seats (column header), is 7.610 seats. This means 177 seats is the lowest number at which Meath East + West can combine their population to form a valid combination such that 8 seats can be assigned to the combined population. Point B similarly tells that Cavan-Monaghan forms a valid 5-seater at 177 Dáil seats, although as indicated by the entirely green row, Cavan-Monaghan will form a valid 5-seater for any sized Dáil between 171 and 181 seats.



Recommended Constituency	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Cavan-Monaghan	5	-2.52%	-1.95%	-1.38%	-0.81%	-0.24%	0.33%	0.90%	1.47%	2.04%	2.61%	3.18%
Longford-Westmeath	5	-4.90%	-4.34%	-3.79%	-3.23%	-2.67%	-2.12%	-1.56%	-1.00%	-0.45%	0.11%	0.66%
Meath (East + West)	two 4 Seaters	-8.09%	-7.56%	-7.02%	-6.48%	-5.94%	-5.41%	-4.87%	-4.33%	-3.79%	-3.26%	-2.72%
Louth	5	-7.15%	-6.61%	-6.06%	-5.52%	-4.98%	-4.43%	-3.89%	-3.35%	-2.81%	-2.26%	-1.72%

Figure 3: This table is given in terms of variance, expressed in percentage form. An orange entry forms a valid constituency, whereas white tells us that the constituency is invalid under the definition of variance, 6, together with the 5% national threshold. Point A tells us that Louth forms a valid 5-seater at 177 seats, and that its constituents are under represented by -3.89% compared to the National Ratio. We see Louth cannot form a standalone constituency between 171 and 174 seats. Point B tells us that the Cavan-Monaghan combined constituency is valid at 177 seats, and over-represented by 0.90% .

It is important when reading the tables to note that all constituencies in the column must be valid simultaneously for the constituencies to collectively be valid. In the Table shown in Fig. 3, and in other tables given in terms of variance, if the entry is negative and invalid, this suggests the constituency is probably a good candidate to accept a population until it becomes valid under the size suggested in the “Number of Seats” category. Equally, if an entry is positive and invalid, this suggests the constituency is possibly suit to transfer population outwards until it becomes valid, see 4-seater Clare in Table 21.

Plots

There are two types of plot that require some form of explanation; the first of which are the **min/max population transfer** plots, plots such as 10,12,13,14a and 14b.

The function of these plots is to solve the following problem: An area must be split (either internally within a county or a transfer of an area + population from one county to another) such that the two resulting constituencies formed respect the $\pm 5\%$ variance from the National Average. These plots help provide us with the following information that we need:

- The minimum number of people that **must** be transferred.
- The maximum number of people that **can** be transferred.

The blue line in each plot indicates the minimum population that must be transferred from the area giving up population, while the orange line shows the maximum that can be transferred. An accompanying table can be found in the Appendix A.4.2, along with tables for any other similar plot in the report.

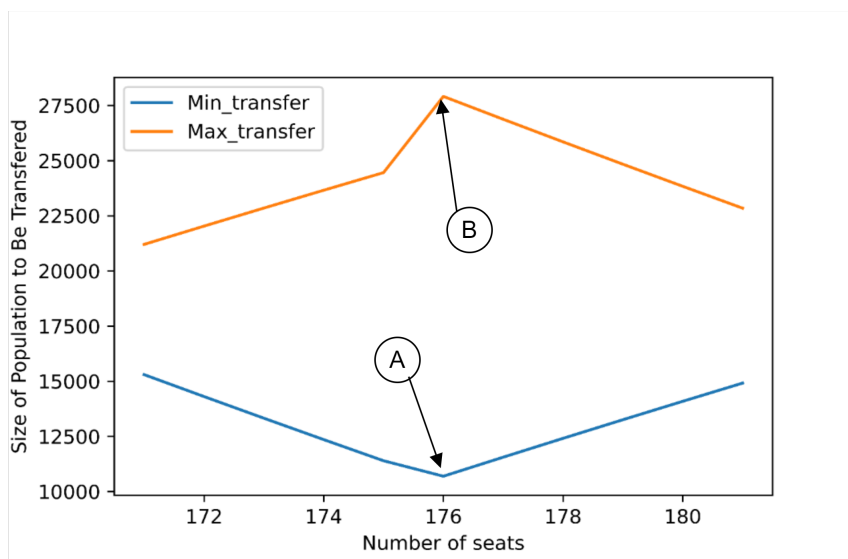


Figure 4: This figure illustrates the minimum and maximum population transfers from one area to another, such that a certain constituency size is maintained at a fixed Dáil size. We interpret point **A** as being the minimum population that is required to be transferred and **B** is the corresponding maximum population that can be transferred for a 176 seat Dáil (a 176 seat Dáil also happens to be the Dáil size that necessitates the greatest and least population transfer between these two areas).

The plot shown in Fig. 4 is a solution generated by the following question: We have a linear programming problem related to population distribution and constituency formation. The goal

is to determine how much population should be transferred between two areas, one giving and one receiving, in order to create valid constituencies that adhere to specific constraints.

The constraints are based on the representational requirements of the constituencies, measured in Seat Equivalent Representation, which is determined by the acceptable variance from the national average. The extremal variance values are represented by the red dashed and blue dotted lines on the graph, which are horizontal lines with fixed y-values. Constituencies outside the min-max region are invalid. In Fig. 4, for example, consider the giving (orange constituency) in the 171-seater Dáil. For this constituency to form a valid 5-seater (region **A**), it must transfer at least roughly 7,000 population out, or at most roughly 21,000 population out. Similarly, for region **B**, the constituency receiving population can form a valid 6-seater after having received at least roughly 15,000 people. We are interested in the case where the giving constituency forms a 5-seater (is in region **A**), and simultaneously the giving constituency forms a valid 6-seater (is in region **B**). The population transfer which provides the simultaneous fulfilment of the constraints for both constituencies is highlighted by the red region.

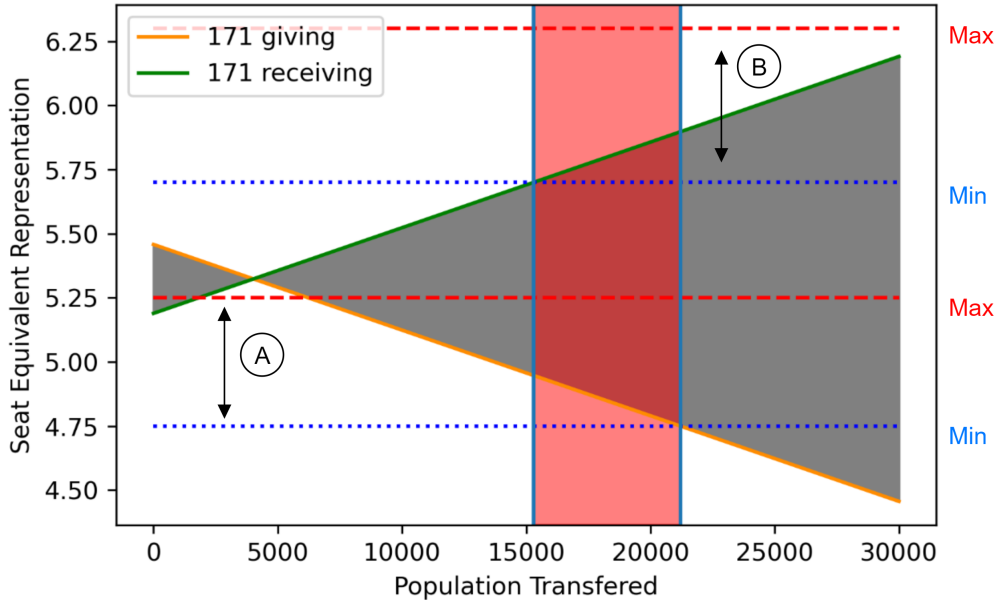


Figure 5: A transfer plot illustrating the conditions for the simultaneous validity (red region) of the giving and receiving constituencies. Both constituencies must lie within the bounds of acceptable representation as dictated by the chosen variance threshold in order for a given population transfer to “solve” the problem. The bounds for a 5-seater is region **A**, the bounds for a 6-seater is region **B**.

In mathematical, we can frame this puzzle as a linear programming problem, which requires that we formulate a set of constraints and an objective function. We can then use a linear programming solver to find the optimal solution that satisfies these constraints and maximises the objective function. The constraints in this case are the acceptable variance from the National Average for valid constituencies, and the objective is to find the feasible region(range for the required population transfer). By finding the minimum and maximum value for the Population transferred, this range will then be used to guide how the electoral divisions required for transfer will be selected.

Overall, these plots help to demonstrate how the minimum and maximum population transfers from one area to another can be calculated to form constituencies with a certain size, while adhering to the $\pm 5\%$ variation from the National Average.

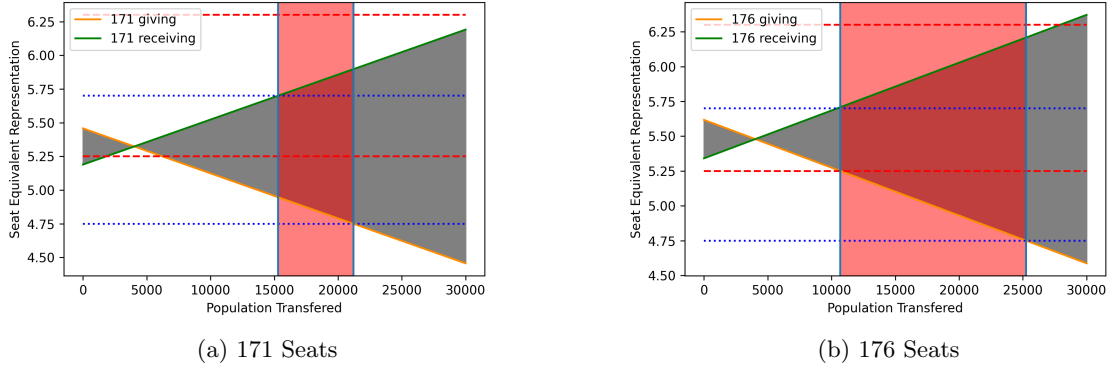
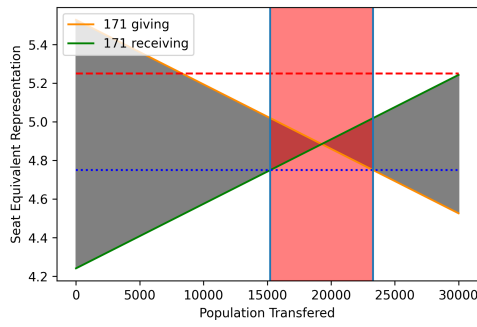
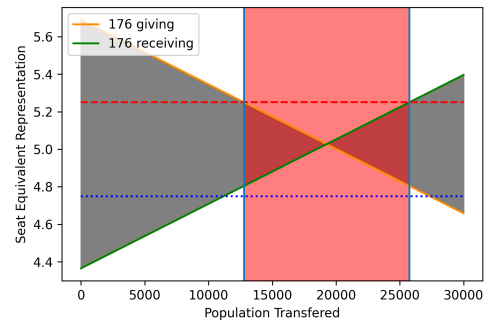


Figure 6: Plots show the regions for which Wexford to Wicklow Transfer works within the $\pm 5\%$ variation from the National Average. Such that Wexford forms a 5-seater and Wicklow (and the population being transferred from Wexford) can form a constituency equivalent to a 6-seater (two 3-seaters).



(a) 171 Seats



(b) 176 Seats

Figure 7: Plots show the regions for which Kilkenny to Waterford Transfer works within the $\pm 5\%$ variation from 5-seater constituencies. Such that Carlow-Kilkenny forms a 5-seater and Waterford (and the population being transferred from Kilkenny) can form a 5-seater.

Note: Ideally, the commission would be able to input their constraints, including the terms of reference and other rules governing how constituencies can form, into a piece of software. This software could then be supplied with the new Census figures each time, and would produce a suggested starting point for how the boundaries should be redrawn. This is something the Electoral Commission could set as an objective, for developing in the future.

3.5 Heuristics for Assigning Constituencies from Past Reports

Joining two entire counties

As stated in previous Constituency Commission Reports in 2017 (1, p. 16), 2012 (2, p. 13), 2007 (3, p. 12) and (4, p. 11) the Commission has adhered to the view and practice of previous commissions namely that joining two entire counties in a single constituency does not constitute a breach of the boundary between them. This is an important precedent that we will be using throughout our submission. As we assume this view and practice will be continued by this commission.

Balance Between The Three Constituency Sizes

As stated in previous Constituency Commission Reports in 2017 (1, p. 15) and the report in 2012 (2, p. 13) it is not a constitutional or statutory criterion that the arrangement of constituencies should seek to achieve any particular number of, or balance between, the three constituency sizes. This will be guiding our recommendations, which seek to meet the terms of reference.

Importance of Provincial Boundaries

Within previous commissions reports and their terms of reference (4),(3),(2), and(1), there has not been any explicit reference to the consideration of maintaining provincial boundaries.

Previous Constituency Commission reports have not explicitly stated the importance of maintaining provincial boundaries. However, in earlier reports such as those in 2002 and 2007, the Commission did make statements acknowledging the significance of provincial boundaries, and that they did take them into consideration. For example, the 2007 report stated, “Either option would involve a breach of a county and a provincial boundary” and the 2002 report acknowledged that the existing Longford-Roscommon constituency breached a provincial boundary. In contrast, the reports from 2012 and 2017 did not mention provincial boundaries in a similar manner.

It should be noted that previous Commissions were not required to avoid breaching provincial boundaries. While past reports indicate that provincial boundaries have been considered in the formation of constituencies, they have not necessarily been weighted as heavily as other factors. For instance, in 2017, provincial boundaries were broken when an area in Offaly was added to the Tipperary constituency. Similarly, in 2012, part of Donegal was transferred to Sligo-Leitrim, and parts of Cavan were transferred to the same constituency. Additionally, in 2012, a portion of Tipperary was transferred to Offaly. Thus, we believe that breaching provincial boundaries should not preclude a potential constituency recommendation.

3.6 Continuity

When we look at how the previous reports have handled the topic of endeavouring to maintain continuity in relation to the arrangement of constituencies. We see that there has been some slight differences in the wording across the different sections from different years (1, p. 15),(2, p. 13) ,(3, p. 13) and (4, p. 12) . But we have also seen that the overall message and themes have stayed consistent. Each report acknowledges the challenge of maintaining continuity in the arrangement of constituencies in the face of population growth and distribution, and the need to balance this with other requirements such as constitutional and geographical considerations. The idea that changes in constituency arrangements may be necessary due to population changes and the possibility of breaching county and provincial boundaries is mentioned consistently across the different sections. So, while the language and details around the discussion of continuity differ slightly between the different reports, the overall approach and view the commissions takes to it remain similar. As a result of this trend the theme of dealing with population growth and distribution as a theme is very much to the fore of this submission. Our submission will provide solutions that allow for this and other provisions within the terms of reference to be met. As we will mainly see in section 5.1, changes in constituency arrangements are unavoidable.

3.7 Number of Seats

As stated in 3.3 the potential size of the next Dáil is set at 171-181. All our calculations take into consideration this full range. But as will become clear as one examines the numbers, the range of 178 - 181 seats is the only range that allows for boundaries that make sense, when accounting for the terms of reference. Within all our recommendations, we provide a range for which our recommendation is valid.

3.8 Size of Transfers

Unlike with variance from the National Average, there are no rules or explicit guidelines on whether there are limits on the maximum or recommended population transfer that is possible. Therefore, we will defer to historical precedence. Given the fact that we foresee the commission needing to generate valid constituencies by engaging in the process of transferring populations and areas between counties to form constituencies, we have included transfer plots and tables outlining the minimum and maximum population required to be transferred within our own recommendations. We thought it would be helpful to use past transfers to guide our decision-making, when deciding if a transfer of a certain size population was reasonable.

Year	Max Transferred	Giver	Receiver
2004	25,918	Cork North-Central	Cork South-Central
2007	17,333	Meath East	Louth
2012	39,311	Dublin South	Dublin South-West
2017	13,150	Sligo-Leitrim	Cavan-Monaghan

Table 6: Table showing the maximum number of people transferred, the giving area, and the receiving area from 2004-2017.

For details on every single transfer from 2004-2017 please see the Section A.4.2 within the appendix.

3.9 Alternative Definition to Variance

Our definition of variance, 6 could just as easily have been formulated in terms of population. This would have yielded exactly the same analysis and results, because it is essentially the same functional form. This functional form was matched to the results of previous reports, see Section 3.2.1. There is another alternative functional form, the output of which varies only slightly from the previous version of variance, but it is formulated in a more voter- and representation-centric manner. In the interest of brevity, let “variance” be denoted by v , “seat equivalent representation” be denoted by s , and “assigned seats” be denoted by a . We have:

$$v_{\text{old}}(s) = \frac{s - a}{a} \quad v_{\text{new}}(s) = \frac{s - a}{s}$$

What is the effect of swapping the variable in the denominator? To illustrate this, let us consider the maximum and minimum s afforded by the old definition of variance, for fixed a , and v .

$$\begin{aligned} v &= \frac{s_{\text{max}} - a}{a} & -v &= \frac{s_{\text{min}} - a}{a} \\ \implies s_{\text{max}} &= a + va & \implies s_{\text{min}} &= a - va \end{aligned} \tag{9}$$

The problem with the old definition is most obvious when we speak in terms of population, so we rewrite the equations by multiplying by the National Ratio, as in Eq. 5.

$$\implies p_{\text{max}} = p + vp \quad \implies p_{\text{min}} = p - vp \tag{10}$$

Now for a maximally under-represented population, we find the number of TDs per constituent, and find the discrepancy with the number of TDs per constituent in the ideal, national average case. We do the same for a constituent in a maximally over-represented population. In the old definition of variance, we find that the overall misrepresentation (absolute value of representational discrepancy) of extremal populations in the under- and over-represented cases **are not equal**. In other words, the bounds provided by the old definition of variance do not signify the same degree of misrepresentation.

$$\begin{aligned} \text{Misrep.}(p_{\text{max}}) &= \left| \frac{a}{p_{\text{max}}} - \frac{a}{p} \right| & \text{Misrep.}(p_{\text{min}}) &= \left| \frac{a}{p_{\text{min}}} - \frac{a}{p} \right| \\ &= \left| \frac{a}{p + vp} - \frac{a}{p} \right| & &= \left| \frac{a}{p - vp} - \frac{a}{p} \right| \\ &= a \left| \frac{p - (p + vp)}{(p + vp)p} \right| & &= a \left| \frac{p - (p - vp)}{(p - vp)p} \right| \\ &= a \left| \frac{-vp}{p^2(1 + v)} \right| & &= a \left| \frac{vp}{p^2(1 - v)} \right| \\ &= \frac{av}{p(1 + v)} & &= \frac{av}{p(1 - v)} \end{aligned} \tag{11}$$

As we can see, they are not equal. Let us follow the same procedure with the alternative, new definition for variance; we find the extremal populations, and contrast the extent of the misrepresentation of constituents in such over- and under-represented populations.

$$\begin{aligned}
v &= \frac{s_{\max} - a}{s_{\max}} & -v &= \frac{s_{\min} - a}{s_{\min}} \\
\Rightarrow s_{\max} &= \frac{a}{1 - v} & \Rightarrow s_{\min} &= \frac{a}{1 + v} \\
\Rightarrow p_{\max} &= \frac{p}{1 - v} & \Rightarrow p_{\min} &= \frac{p}{1 + v}
\end{aligned}$$

$$\begin{aligned}
\text{Misrep.}(p_{\max}) &= \left| \frac{a}{p_{\max}} - \frac{a}{p} \right| & \text{Misrep.}(p_{\min}) &= \left| \frac{a}{p_{\min}} - \frac{a}{p} \right| \\
&= a \left| \frac{1 - v}{p} - \frac{1}{p} \right| & &= a \left| \frac{1 + v}{p} - \frac{1}{p} \right| \tag{12} \\
&= a \left| \frac{1 - v - 1}{p} \right| & &= a \left| \frac{1 + v - 1}{p} \right| \\
&= a \left| \frac{-v}{p} \right| & &= a \left| \frac{+v}{p} \right| \\
&= \frac{av}{p} & &= \frac{av}{p}
\end{aligned}$$

Under the new definition of variance, we find the populations at the bounds experience the same degree of misrepresentation, which is much more transparent. The generality of the derivation means this result holds for any a -seater constituency or choice of threshold, v . This happens because by putting the deserved constituency representation, (i.e. the seat equivalent representation, s) in the denominator, deserved representation acts as the reference, rather than assigned representation.

Configuration	Min	Max
3-seater	2.8571	3.1579
4-seater	3.810	4.2105
5-seater	4.761	5.263
6-seater	5.7143	6.3158
7-seater	6.666	7.3684
8-seater	7.6190	8.4211

Table 7: Size of 3-8 seater Constituencies based of the alternative definition of variation with a 5% threshold, calculated using the equation $s_{\max} = a/(1 + v)$ and $s_{\min} = a/(1 - v)$

4 Boundaries

This section outlines the approach taken to develop recommendations for the constituency boundaries.

4.1 Overall Approach

Our objective was to present a balanced approach to address the challenge faced by the commission, along with potential ideas and suggestions for future issues and their solutions. The following steps were taken to accomplish this goal:

1. The current boundaries were considered. We demonstrate they did not provide a satisfactory solution.
2. Consideration was given to the possibilities of adhering to county boundaries in the drawing of the constituency boundaries. Saw that this did not provide a satisfactory solution.
3. A focus was given to adhering to county boundaries and keeping recommendations as close as possible to being within the $\pm 5\%$ variance from the National Average. After grouping the counties we were considering (24 out of 26), we developed recommendations at the group level for how to divide them into potential constituencies. In this case we generated three groupings : Southeast region (Group 1), Northeast region (Group 2) and North and South west region (Group 3).
4. Generate recommendations at the group level, providing a range of seat sizes for which they are valid, accompanied by calculations in tables and plots.

This is the general overview of the approach taken. More details can be found in the following sections.

4.2 Developing The Argument

4.2.1 Consider The Current Boundaries

If we examine Table 36, we see that the current constituencies are no longer valid with respect to the terms of reference. The white cells indicate the at what size Dáil a constituency is no longer valid, and as we can see only a handful of constituencies are still valid (this is indicated by cell being coloured. Please see the key to see what size consistency it is valid for). From this it is clear that a substantial amount of alterations will have to occur.

4.2.2 Consider County Boundaries

The first step we took in generating recommendations that respect the terms of reference was to consider all the counties (excluding Dublin and Cork). When examining Table 37 we saw that a pattern emerges; that of a general trend of improved validity for a Dáil of at least 176 plus members.

To further investigate this pattern, we then joined counties that have a history of being joined as permitted by 3.5. The results of which can be seen in Table 38. We can see that this allows counties such as Cavan and Monaghan to join to form Cavan–Monaghan in such a way that allows the constituency to form such that no county boundaries are breached (unlike last time). This goes for a number of counties. Its clear that this again does not provide a complete solution, but it does provide us with a good starting point. Following on from this we then

grouped the counties in such a way that we could maximise the amount of county boundaries that could be maintained and continuity. It also seems this will allow certain configurations to restore breaches in their county boundaries, but this is at the expense of some others which were previously not breached (Some examples include Wicklow, Wexford, and Waterford).

As evident from the initial tables and our subsequent recommendations, creating a Dáil with fewer than 176 seats poses practical challenges and requires significant breaking of county boundaries, resulting in a loss of continuity. However, it's worth noting that a Dáil comprising 176 seats may still be inadequate to meet the terms of reference, and indeed this is what our analysis seems to suggest later. This is made clear in Section 5, which demonstrates this through the calculations and arguments which helped to generate our recommendations. We suggest that a Dáil with 178-181 seats would provide the most effective representation and meet the requirements outlined in the terms of reference.

4.2.3 Developing Recommendations: Groupings

Making a decision about how to generate a single constituency can have a significant impact on all the surrounding counties, and it can be challenging to determine how they should be combined or arranged to form valid constituencies. To manage the knock-on effects of this decision-making process, we have chosen to group counties together in a way that makes it easier to process and manage.

In this case, we have found that grouping counties into three groups has been the best approach. This has been very similar to how the previous reports have gone about generating their recommendations. By using this method, we believe we can create constituencies that are both fair and practical.

4.2.4 Boundary Recommendations

For this overall submission, we do not recommend an exact number of seats. We provide a range for which our suggestions are valid. By doing this we believe we provide the commission with a degree of flexibility.

There are a significant number of variations in configurations that are not suitable due to their knock on effects on the boundaries surrounding them. Thus, when considering the options we layout within our submission, please note that they are being suggested as they (from our perspective) minimize the knock-on effect on the surrounding boundaries. To see how we suggest using these recommendations, please see section 6 where we walk through an example, step by step.

4.3 Variance Trade-off

The trade-off is choosing between equality of representation and respecting the terms of reference. This trade off looks like, from a mathematical perspective, increasing the acceptable variance up from $\pm 5\%$ to some higher threshold for inhomogeneity of representation to facilitate a lesser population transfers and disruption of county boundaries. The tighter the bound on the variance threshold, the less mathematical flexibility there is to adhere to terms of reference such as maintaining county boundaries. In this sense, the holistic view of representation aimed at in the terms of reference, and representation from a mathematical perspective are at odds.

An example of where this trade off might occur is with Laois and Offaly, see [5.1.1](#) for more details. In short, when the two counties are grouped together they should collectively be assigned a total of 6 seats. But at no point can the two counties independently form standalone 3 seat constituencies within the permitted $\pm 5\%$. A transfer of population and area must occur under the mathematical purview, the question is does strictly sticking to this perspective actually achieve greater representation? By contrast, does willingly departing from acceptable variance in order to have the counties form standalone constituencies, adhering more closely to the terms of reference, actually result in better representation in the holistic sense?

5 Recommendations

In this section, we outline our recommendations to the Commission. Our recommendations provide solutions that meet the commission’s terms of reference. We can see in Table 8 for each number within the range 171 – 181 the equivalent allocation of seats in a 171 to 181 member Dáil for each grouping.

Group	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Southeast region (Group 1)	1,200,676	40.073	40.307	40.542	40.776	41.010	41.245	41.479	41.713	41.948	42.182	42.416
Northeast region (Group 2)	647,903	21.624	21.750	21.877	22.003	22.130	22.256	22.383	22.509	22.636	22.762	22.889
North and Southwest region (Group 3)	1,243,025	41.486	41.729	41.972	42.214	42.457	42.699	42.942	43.185	43.427	43.670	43.913
Dublin	1,450,701	48.418	48.701	48.984	49.267	49.550	49.833	50.117	50.400	50.683	50.966	51.249
Cork	581,231	19.399	19.512	19.626	19.739	19.853	19.966	20.079	20.193	20.306	20.420	20.533
Total	5,123,536	171	172	173	174	175	176	177	178	179	180	181

Table 8: Statistics for groupings being considered within this submission including Cork and Dublin

Since we are excluding Cork and Dublin we will turn our attention to Table 9, which shows that the total population of the 24 counties being considered is 3,091,604, which is equivalent to 103 – 109 seats within a 171 to 181 member Dáil.

Group	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Group 1	1,200,676	40.073	40.307	40.542	40.776	41.010	41.245	41.479	41.713	41.948	42.182	42.416
Group 2	647,903	21.624	21.750	21.877	22.003	22.130	22.256	22.383	22.509	22.636	22.762	22.889
Group 3	1,243,025	41.486	41.729	41.972	42.214	42.457	42.699	42.942	43.185	43.427	43.670	43.913
Total	3,091,604	103.183	103.787	104.390	104.994	105.597	106.201	106.804	107.407	108.011	108.614	109.218

Table 9: Stats for groupings being considered within this submission

Our recommendations are organized into three distinct county groupings, which provide the commission with a comprehensive and flexible solution for redrawing constituency boundaries. These groupings are as follows:

- Southeast region (Group 1): This recommendation is very involved, consisting of extensive calculations and detailed arguments based on maintaining county boundaries, continuity and local factors that the commission should take into consideration.
- Northeast region (Group 2): This recommendation is robust, offering suggestions and supporting data/calculations. Its aim is to provide the commission with a flexible solution over a wide range of Dáil sizes.
- North and Southwest region (Group 3): This recommendation briefly touches on potential solutions without in-depth analysis or supporting arguments.

To provide a clear visual representation of the groupings, we have included a map, see Fig. 8, that shows each group’s members in different colours. Additionally, Table 43 provides a summary of counties that make up each grouping.

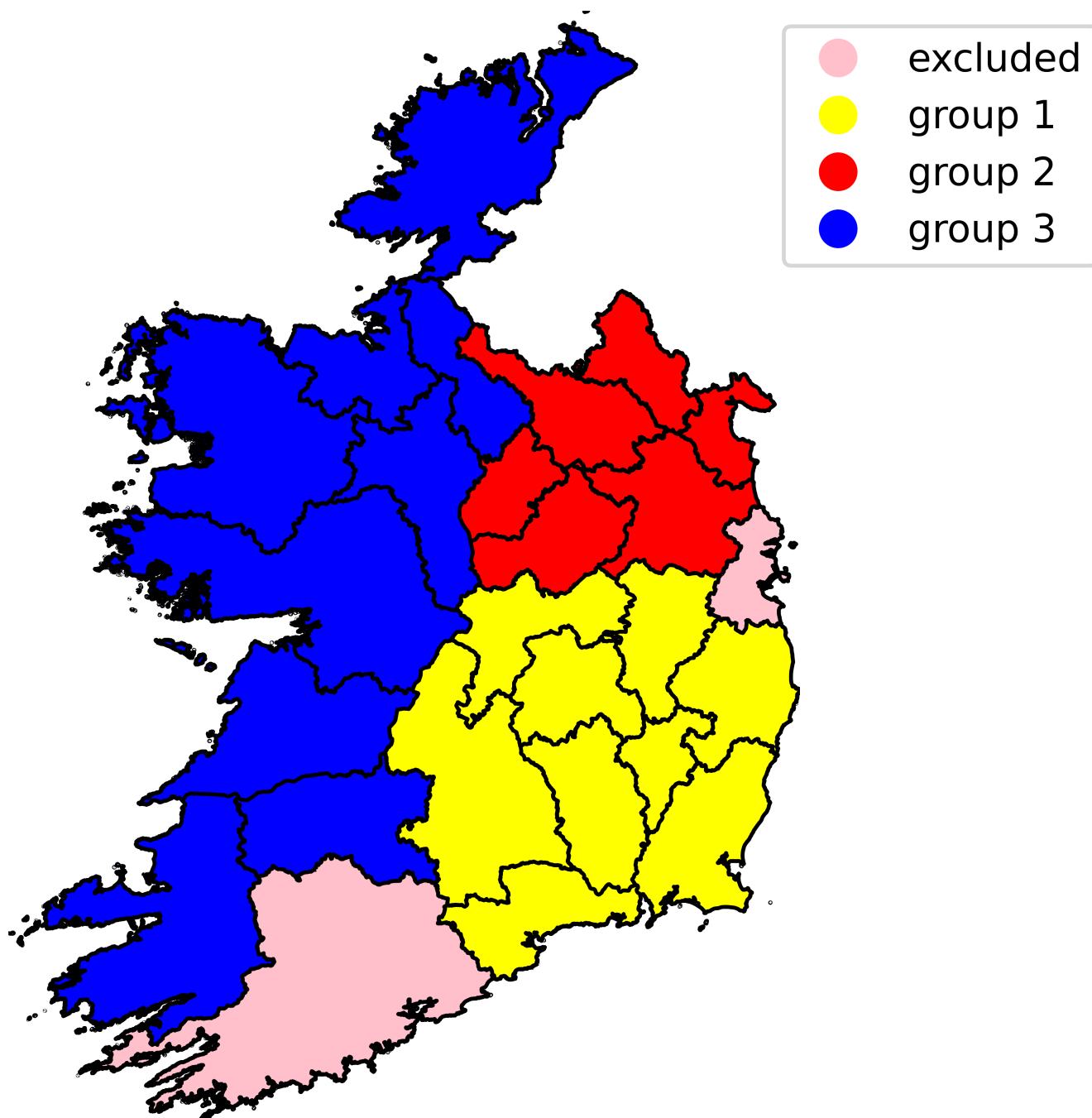


Figure 8: Colour-coded map of groupings: This visualization shows the various groups and their individual members through a unique colour scheme.

5.1 Southeast region (Group 1)

The central problem of this grouping will be the fact that **at no point within the range of 171 to 181 seats will the counties of Waterford, Wicklow, and Wexford** be able to form standalone constituencies under the $\pm 5\%$ variance from the National Average. This fact has a ripple effect that requires a degree of care when formulating new boundaries. Containing the impact of this will be key to providing appropriate recommendations for potential constituencies that meet the terms of reference.

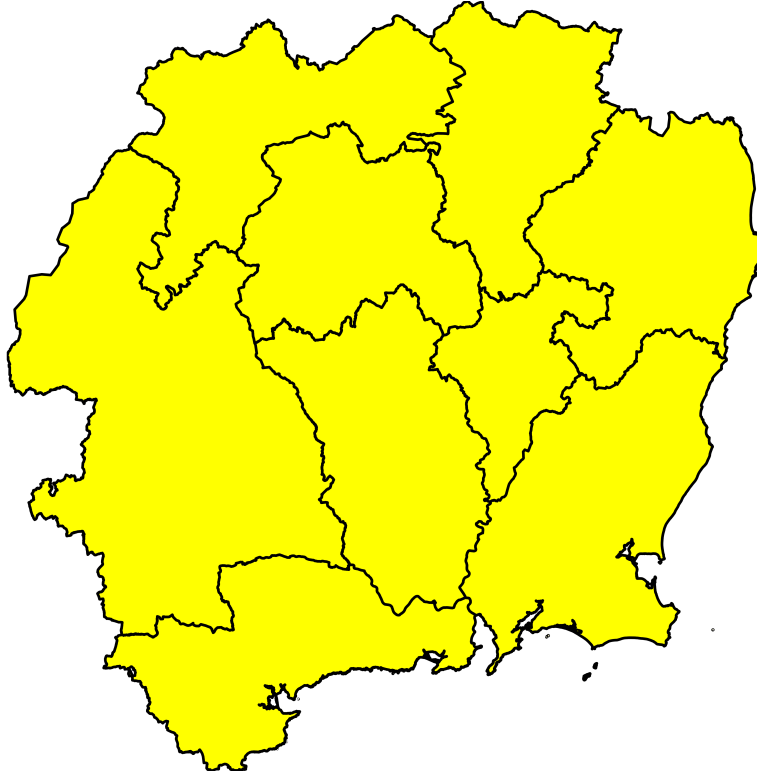


Figure 9: Map of Southeast region (Group 1), displaying only those counties.

We start by considering each county by itself within the grouping. By examining the following Table 10, we see the following for each County:

Waterford

Is unable to exist as a standalone 4 or 5-seater constituency. Even if we consider a variance from the National Average inline with the largest recorded of 7.87% from Table 1 for Louth in the 2004 report (see Table 31), it is clear adjustments to the boundaries are required.

Wexford

Even at an extreme and unprecedented variance of 9% variance from the National Average Wexford is unable to form a standalone constituency. While two 3-seaters can be formed without breaking county boundaries for 179-181 seats, the effects would be wide-ranging on surrounding counties (See Section 3.2 and Wicklow below). For the first time since the Electoral Amendment Act of 1981, a degree of boundary alteration is now required.

Wicklow

Is only able to form a standalone 5-seater at 171-173 seats, however as established in section 4.2, a Dail of this size is not practicable. Thus some degree of breaking of county boundaries is needed. The most reasonable solution would be transferring a proportion of another county into Wickow and splitting the county into two 3-seaters.

Kilkenny

Is unable to sustain itself at the $\pm 5\%$ variance from the National Average. Can become a 4-seater at a -9% variance at 180 plus seats, but otherwise will be required to be joined or split between other counties.

Carlow

It lacks the population to be a standalone constituency. Forming a constituency with a proportion of Kilkenny, being transferred to another county, seems to be the best solution, however it will require a large degree of re-drawing.

Tipperary

Under no circumstance (even at unprecedented values for variance from the National Average) can Tipperary form a standalone constituency that is permissible under the current terms of reference. A potential solution could be the return of the Tipperary South and North boundaries of old and made into two 3-seaters.

Kildare

Kildare as a pure county can sustain two 4-seaters at a 171-174 and a 5 and a 4-seater at 178-181 seats. If we now consider Table 13, where we have recommended Kildare be assigned 9 seats, we can see that at 176 seats the variance from the national average would only be 5.73%, which would be acceptable if necessary.

Laois and Offaly

We have a problem here as only one county at a time can sustain/form a constituency that is withing the $\pm 5\%$ variance from the National Average, which is clearly shown in in Table 14. From 171-176 seats, Laois is able to form a 3-seater, but Offaly is not, and once there are 177 seats, the opposite is true. If we examine Table 14 further and are willing to, then we can see that at 178 seats Laois can exist as a 3-seater at a variance of 6.022% with Offaly remaining within the $\pm 5\%$.

County	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Carlow	61,931	2.067	2.079	2.091	2.103	2.115	2.127	2.139	2.152	2.164	2.176	2.188
Co. Kildare	246,977	8.243	8.291	8.339	8.388	8.436	8.484	8.532	8.580	8.629	8.677	8.725
Co. Kilkenny	103,685	3.461	3.481	3.501	3.521	3.541	3.562	3.582	3.602	3.622	3.643	3.663
Co. Laois	91,657	3.059	3.077	3.095	3.113	3.131	3.149	3.166	3.184	3.202	3.220	3.238
Co. Offaly	82,668	2.759	2.775	2.791	2.807	2.824	2.840	2.856	2.872	2.888	2.904	2.920
Co. Tipperary	167,661	5.596	5.628	5.661	5.694	5.727	5.759	5.792	5.825	5.858	5.890	5.923
Co. Waterford	127,085	4.242	4.266	4.291	4.316	4.341	4.366	4.390	4.415	4.440	4.465	4.490
Co. Wexford	163,527	5.458	5.490	5.522	5.554	5.585	5.617	5.649	5.681	5.713	5.745	5.777
Co. Wicklow	155,485	5.189	5.220	5.250	5.280	5.311	5.341	5.371	5.402	5.432	5.462	5.493

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Table 10: Group 1: Hypothetical Dáil Constituencies composed only of pure counties, with viable Constituencies based on the $\pm 5\%$ variance.

County	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Carlow	3	-31.10%	-30.70%	-30.30%	-29.89%	-29.49%	-29.09%	-28.68%	-28.28%	-27.88%	-27.47%	-27.07%
Co. Kildare	9	-8.41%	-7.88%	-7.34%	-6.80%	-6.27%	-5.73%	-5.20%	-4.66%	-4.13%	-3.59%	-3.06%
Co. Kilkenny	3	15.35%	16.03%	16.70%	17.37%	18.05%	18.72%	19.40%	20.07%	20.75%	21.42%	22.10%
Co. Laois	3	1.97%	2.57%	3.16%	3.76%	4.35%	4.95%	5.55%	6.14%	6.74%	7.34%	7.93%
Co. Offaly	3	-8.03%	-7.49%	-6.96%	-6.42%	-5.88%	-5.34%	-4.80%	-4.27%	-3.73%	-3.19%	-2.65%
Co. Tipperary	6	-6.74%	-6.19%	-5.65%	-5.10%	-4.56%	-4.01%	-3.47%	-2.92%	-2.37%	-1.83%	-1.28%
Co. Waterford	5	-15.17%	-14.67%	-14.18%	-13.68%	-13.19%	-12.69%	-12.19%	-11.70%	-11.20%	-10.71%	-10.21%
Co. Wexford	5	9.16%	9.79%	10.43%	11.07%	11.71%	12.35%	12.99%	13.62%	14.26%	14.90%	15.54%
Co. Wicklow	5	3.79%	4.39%	5.00%	5.61%	6.22%	6.82%	7.43%	8.04%	8.64%	9.25%	9.86%

Table 11: Group 1: Hypothetical Dáil Constituencies composed only of pure counties, Variance From The National Average

Recommended Groupings	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Wexford + Co. Wicklow	319012	10.647	10.709	10.772	10.834	10.896	10.958	11.021	11.083	11.145	11.208	11.270
Co. Waterford + Co. Carlow + Co. Kilkenny	292701	9.769	9.826	9.883	9.940	9.998	10.055	10.112	10.169	10.226	10.283	10.340
Co. Kildare	246977	8.243	8.291	8.339	8.388	8.436	8.484	8.532	8.580	8.629	8.677	8.725
Co. Tipperary	167661	5.596	5.628	5.661	5.694	5.727	5.759	5.792	5.825	5.858	5.890	5.923

Table 12: Group 1: Proposed Seat Equivalent for recommended groupings

Recommended Groupings	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Wexford + Co. Wicklow	11	-3.21%	-2.64%	-2.08%	-1.51%	-0.94%	-0.38%	0.19%	0.75%	1.32%	1.89%	2.45%
Co. Waterford + Co. Carlow + Co. Kilkenny	10	-2.31%	-1.74%	-1.17%	-0.60%	-0.02%	0.55%	1.12%	1.69%	2.26%	2.83%	3.40%
Co. Kildare	9	-8.41%	-7.88%	-7.34%	-6.80%	-6.27%	-5.73%	-5.20%	-4.66%	-4.13%	-3.59%	-3.06%
Co. Tipperary	6	-6.74%	-6.19%	-5.65%	-5.10%	-4.56%	-4.01%	-3.47%	-2.92%	-2.37%	-1.83%	-1.28%

Table 13: Grouping 1: Recommended groupings Variance From The National Average

County	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Laois	3	1.97%	2.57%	3.16%	3.76%	4.35%	4.95%	5.55%	6.14%	6.74%	7.34%	7.93%
Co. Offaly	3	-8.03%	-7.49%	-6.96%	-6.42%	-5.88%	5.34%	-4.80%	-4.27%	-3.73%	-3.19%	-2.65%

Table 14: Grouping 1: Laois and Offaly Variance From The National Average

County	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Laois + Co. Offaly	174325	5.818	5.852	5.886	5.920	5.954	5.988	6.022	6.056	6.090	6.124	6.158

Table 15: Grouping 1: Proposed Seat Equivalent for Laois and Offaly

5.1.1 Sub-groupings

We will now outline our suggestions for potential constituencies. It is important to note that a loss of continuity is inevitable for this grouping and resulting sub-groupings. As a criterion of the terms of reference is that of endeavouring to maintain continuity in relation to the arrangement of constituencies. While this criterion is “subject to” the other requirements, the previous Commissions have been of the view that it is nonetheless a very important consideration. We have made every effort to maintain continuity while remaining practical.

As stated in the beginning the main problem for this grouping is dealing with the counties Waterford, Wexford, and Wicklow. A departure from our suggested sub-grouping here transgresses sharply against the terms of reference. This is why we have chosen the following sub-groupings.

Carlow-Kilkenny cannot remain a 5-seater, Wicklow cannot (reasonably) stay a 5-seater, Wexford cannot remain a 5-seater, Waterford cannot remain a 4-seater. Alterations of boundaries and transferring of populations between counties is necessary. We feel the following recommendation provides a stable answer that best meets the terms of reference.

Carlow-Kilkenny and Waterford

Carlow-Kilkenny are in a position to transfer population such that it can become a 5-seater and Waterford is in a position to accept a transfer such that it can form a 5-seater. The grouping has a combined population of 292,701 and a Seat Equivalent Representation of ≈ 10 .

Carlow-Kilkenny has a longstanding history of being combined into a single constituency through various commissions (3.5). However, as demonstrated in Tables 10 and 11, this approach is insufficient to sustain a 5-seat constituency. To address this, a proportion of Kilkenny’s population can be transferred to Waterford to create a viable 5-seat constituency. This solution is reasonable for several reasons, including Waterford’s need to either lose or gain population to maintain its status as a 4 or 5-seat constituency, and the fact that Carlow and Kilkenny are unable to form constituencies on their own or meet the $\pm 5\%$ variance from the National Average for a 3 or 4-seat constituency.

This solution provides 10 seats for a population of **292,701** people within the 171-181 seat range, while respecting some degree of continuity and minimizing boundary breaks and their ballooning effect on surrounding areas. We suggest as with all recommendations that a Dáil size from 178-181 seats is considered. If we examine the Fig. 10 and Table 39, we see that at 176 seats a minimum of 14,500 people will need to be transferred from Kilkenny to Waterford to enable a Waterford constituency to form a 5-seater and Carlow-Kilkenny to form a 5-seater, with a maximum of 24,031 transfer being permitted. As we move up in the recommended range of seats from $178 \rightarrow 181$, we see the minimum required transfer of population increases while the maximum decreases. Given what is outlined in 3.5, breaking Provincial boundaries is not unprecedented. Thus does not preclude this recommendation in our opinion. This required population transfer is not without precedent, as evidenced by Tables 44 and 45 in the Appendix.

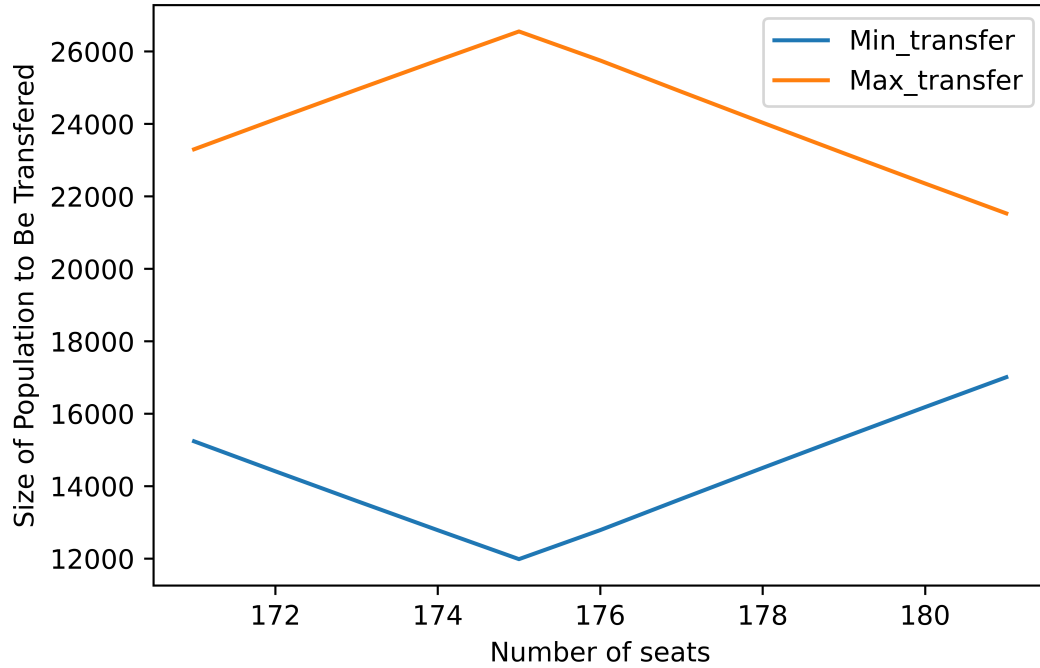


Figure 10: The minimum and maximum population that can be transferred from Kilkenny to Waterford such that Carlow-Kilkenny will always be a 5-seat constituency and Waterford will also always be a 5-seater. For all possible Dáil sizes available to the commission

Wicklow and Wexford

Our proposed solution is to join the two counties together and to then proceed to transfer an area and its population from Wexford into Wicklow such that the following occurs:

- A standalone 5-seat Wexford constituency can form, which is within the $\pm 5\%$ variance from the National Average.
- Two 3-seaters can form. One in North Wicklow (only containing areas within Wicklow) and a second composed of South Wicklow plus the area and population of Wexford being transferred into Wicklow, from the North of Wexford.

The sub-grouping we're examining serves as an excellent example to illustrate the issue of **uneven population distributions**. This problem has been highlighted in previous reports (1, p. 16), (2, p. 14), and is expected to worsen in the future. The uneven distribution of populations affects not only the drawing of boundaries, leading to fragmentation of county boundaries and loss of continuity, but also has knock on ramifications for **adequate geographical representation of constituents**. This can take the form of rural constituents being represented by a TD living in an urban area, who may not fully able to understand and provide adequate representation. Wicklow provides a perfect example of this.

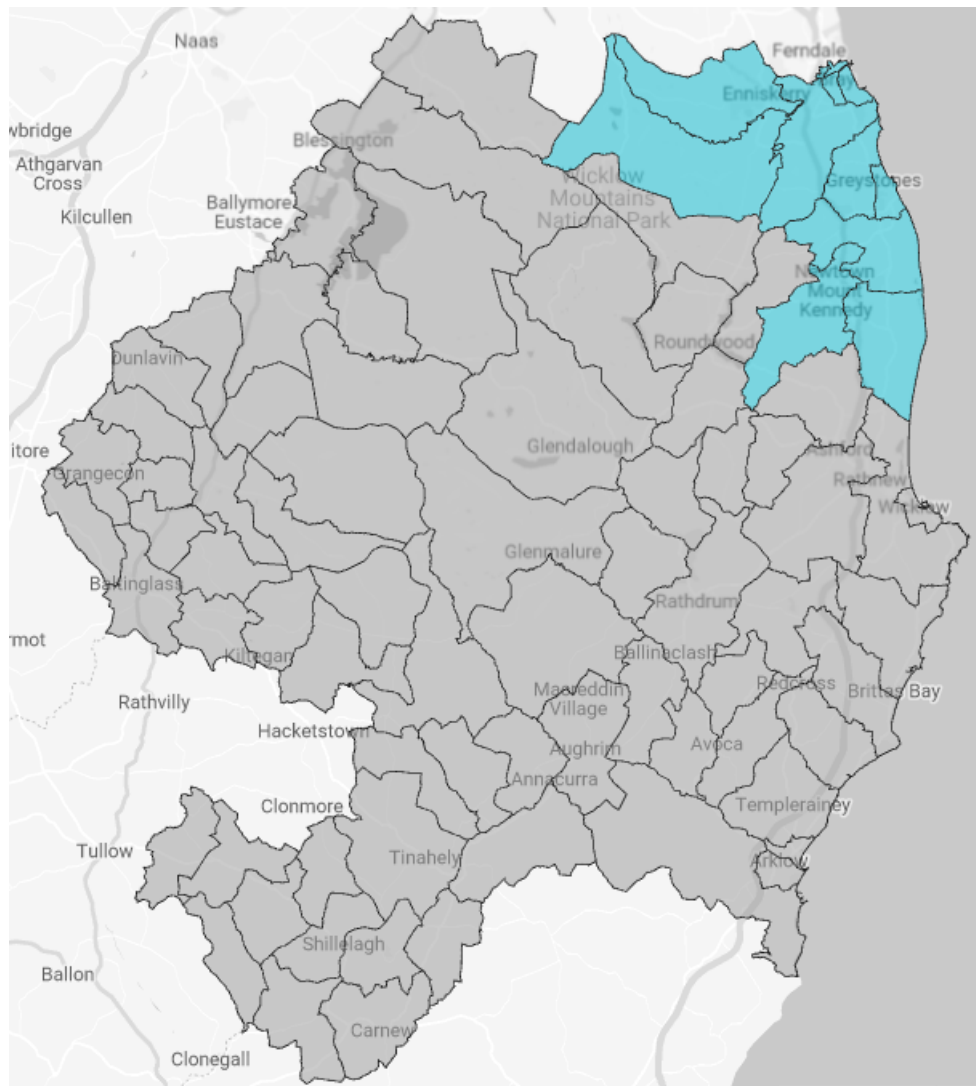


Figure 11: Map of Wicklow displaying the Electoral Districts from which current TDs in the 33rd Dáil are based

It is noteworthy that all five of Wicklow's sitting TDs (33rd Dáil) reside within the Blue region highlighted in Fig. 11. This region, according to the preliminary census results, is home to 71,762 individuals, which represents 46.15% of Wicklow's total population. However, it is also important to note that this region comprises only 12 of the 82 electoral divisions in Wicklow, accounting for just 14.63% of the county's electoral divisions. This concentration of political power raises concerns about adequate representation for the remaining 53.85% of the population living in the remaining 85.37% electoral divisions. We think this fact should be taken to account within this sub-grouping and others. When the commission is deciding how to split up counties.

We will take this opportunity to highlight some generalized local factors that we expect many submissions to touch on.

- The alienation of non-urban areas. This can be seen in the fact that the south of Wicklow was without a sitting TD in the 33rd Dáil. Which some might argue goes against the constitutional entitlement of all people to equal representation. This is repeated across many other areas. This configuration guarantees 3 TD's for the area.
- Consideration of other boundaries such as Local Authority Boundaries, Garda Divisions and Housing departments but to name but a few.
- Continuity, and local identities being preserved.

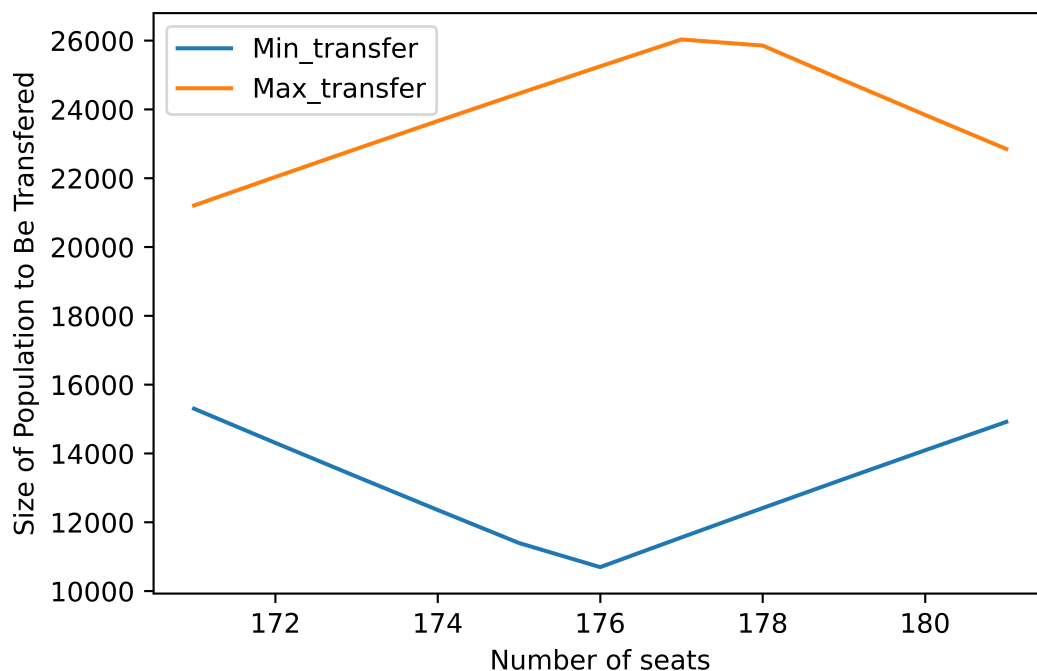


Figure 12: The minimum and maximum population that can be transferred from Wexford to Wicklow such that Wexford will always be a 5-seat constituency and Wicklow will also always be able to form two 3-seaters. For all possible Dáil sizes available to the commission

If we examine Fig. 12 and Table 40, we see that for a 178 seat Dáil that at a minimum 12,411 people will need to be transferred with a maximum of 25,854, such that Wexford can form a 5-seater and Wicklow can form two 3-seaters. We see that as we move up in the 178-181 range that the minimum required population transfer increases as we add seats. This required population transfer is not without precedent, as evidenced by Tables 44 and 45 in the appendix.

Laois and Offaly

As mentioned previously and clearly shown in Table 15 and mentioned above, these two counties are in an interesting position. The area has a Seat Equivalent Representation of 6.022 as shown in Table 15, so two counties should be assigned 6 seats in total.

There are two options:

1. The commission accepts an instance of variance from the National Average being outside the $\pm 5\%$ range. This would allow for county boundaries to be maintained at the expense of accepting a higher variance. At 178 seats this would mean a variance of 6.14%. If we go by the high water mark from that would permit up to a $\pm 7.869\%$ variance (going by the 2004 report).
2. Transfer an area and population from Laois into Offaly as Laois is in a position to lose population and Offaly is in a position to accept. This would break county boundaries, but this option would lead to less variance from the National Average.

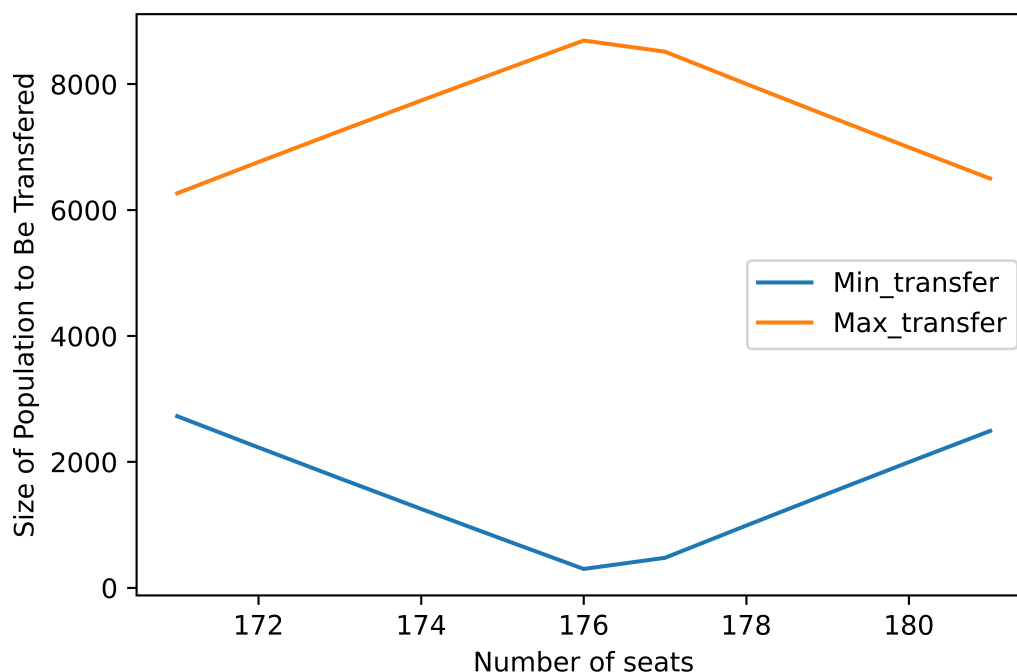


Figure 13: The minimum and maximum population that can be transferred from Laois to Offaly such that Each county can form a 3-seater, while respecting the $\pm 5\%$ threshold. For all possible D ail sizes available to the commission

If we examine Fig. 13 and Table 41, we can see the minimum and maximum transfer of population required if the commission decides to go with option 2.

The commission faces an intriguing decision, as both options guarantee that the area receives its fair share of TD's. While choosing to maintain county boundaries may result in a higher variance from the National Average, the trade-off appears worthwhile at the lower end of the recommended range of 178-181 seats. See subsection 4.3 for further discussion.

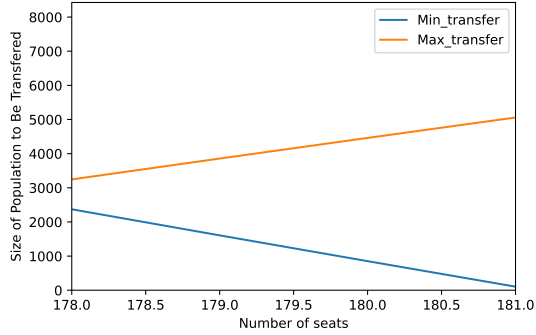
Tipperary

As a standalone county, Tipperary is able to form two 3-seaters without breaking county boundaries. Doing this also respects continuity as there is a history of the county being split into north and south. This solution also would lead to the restoration in breaches of county boundaries (Offaly and Limerick). This solution provides 6 seats for a population of **167661** people within the 175-181 seat range. We think this is a promising recommendation.

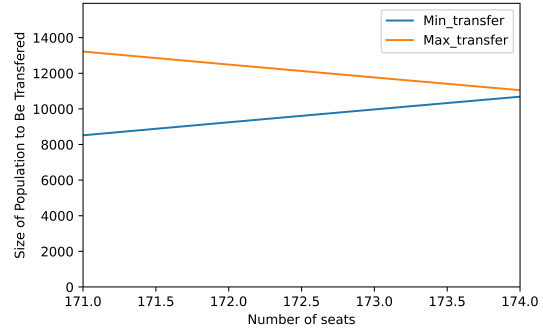
Kildare

Currently Kildare is divided into two constituencies, one of which breaks county boundaries (Kildare South) and other which does not (Kildare North). The county has experienced a significant increase in population since the last report. It is now in a position to potentially not need to break county boundaries for a 178 - 181 seat Dáil.

- Kildare North should be allocated 5-seats. With the boundary as defined in the 2017 report plus a small population taken from the south of the county.
- Kildare South should be allocated 4-seats.



(a) Internal transfer within Kildare such that Kildare North forms a 5-seater. With Kildare being allocated 9 seats



(b) Internal transfer within Kildare such that Kildare North forms a 4-seater. With Kildare being allocated 8 seats

Figure 14: Kildare Internal Transfer

If we examine the Fig. 14a it shows the internal transfer such that Kildare North is a 5-seater and Kildare South forming a 4-seater. Table 42 shows the minimum and maximum population that can be transferred such for the 178-181 seat range.

5.1.2 Recommendations of the Submission

5.2 Recommendations of the Submission: Southeast region (Group 1)

We recommend the following:

- This grouping is to be allocated 42 seats, with a total of 9 constituencies.
- Waterford is to form a 5-seater, by accepting a transfer of population and area from the South of Kilkenny. This would then allow Carlow and Kilkenny to join to form the 5-seater Carlow-Kilkenny.
- The county of Wexford should form a 5-seater by transferring a population and area from North Wexford to South Wicklow. This would then allow Wicklow to form two 3-seaters, Wicklow South and Wicklow North.
- The counties of Laois and Offaly should both form two standalone 3-seaters, such that county boundaries are maintained at 178 seats. But if the commission is not willing to accept a higher variance of 6.14%, which is outside the $\pm 5\%$ variance from the National Average, then we recommend a transfer of population and area from Laois into Offaly such that they both form 3-seaters within the $\pm 5\%$.
- The county of Tipperary is to be divided into two 3-seat constituencies, Tipperary North and Tipperary south.
- The county of Kildare should be split into two constituencies. That of Kildare North and Kildare South. There should be a total of 9 seats assigned, with Kildare North being assigned 5 seats and Kildare South being assigned 4.

If our proposed approach for the handling of Wicklow and Wexford is not accepted, we recommend considering the following alternative option:

- Our proposed approach involves breaking county boundaries once in the grouping of Wicklow and Wexford to ensure each county can form valid constituencies. However, if this is not feasible, we suggest breaking county boundaries in a different location.
- Specifically, Kildare could absorb a portion of Wicklow (Blessington), which would be entitled to 9 seats. This new combined area of Kildare and Blessington could be joined with Kildare North to form two constituencies: Kildare North (5 seats) and Kildare South (4 seats)
- Table 10 makes it clear that Wexford can form two 3-seaters and thus maintain county boundaries in this situation from 179-181 seat Dáil. At 178 seats the variance from the National Average is -5.31% which is just outside the $\pm 5\%$.
- From the perspective of maintaining county boundaries, we consider both options to be equivalent, as they result in the same number of county boundary breaks, but in different locations.
- Kildare could absorb a part of Wicklow, specifically Blessington. This new combined area of Kildare and Blessington would be entitled to 9. With this new area from Wicklow likely being joined into Kildare North.
- It is worth noting that we have taken into consideration the ripple effect that changing a boundary could have in our proposed groupings.

5.3 Northeast region (Group 2)

This recommendation involves no breaches of county boundaries in the counties considered in this grouping. The county boundaries of Westmeath, Meath and Louth are no longer breached. Each of the suggested constituencies comprises of entire counties. They provide for very good equality of representation and adhere to the terms of reference.

The total population of the six counties being considered is 647903. Which is equivalent to $21.624 - 22.889$ seats which rounds to $22 - 23$ seats within a 171 to 181 member Dáil. We recommend that 23 seats are allocated to this grouping in the following manner.

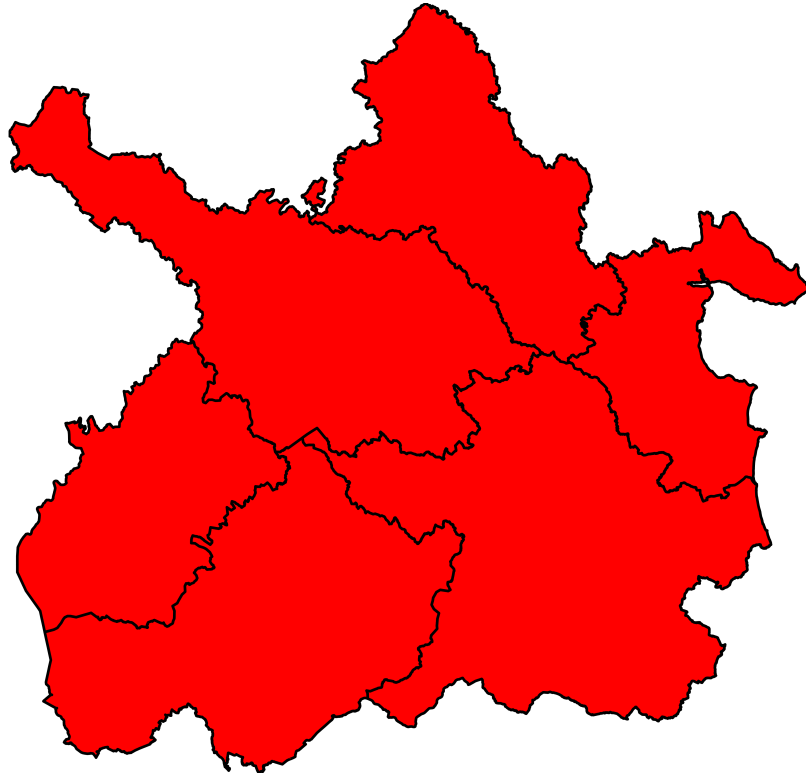


Figure 15: Map of Northeast region (Group 2), displaying only those counties.

5.3.1 Sub-groupings

By examining Table 16 it is clear to see that a degree of joining of counties together will need to occur. This is carried out in Table 17, and one can see that reasonable solutions emerge.

Cavan-Monaghan

By joining these two counties together we are able to:

- Form a Constituency that is viable **at all** values that the Dáil could take. This can be seen by examining Table 17, in which we see that for all sizes of the Dáil the Constituency remains within the $\pm 5\%$ variance from the National Average. For the exact variance from the National Average please refer to Table 18.
- It restores Meath's county boundary by returning the area that was previously contained within the previous version of Cavan-Monaghan.

Longford-Westmeath

By joining these two counties together we are able to:

- Form a Constituency that is viable at all values that the Dáil could take.
- Maintain county boundaries.

Meath(East + West)

In this case if we consider the county of Meath by itself it is in a position to be allocated 8 seats. We recommend that it be split into Meath East and Meath West, with either a 3 and a 5 seater being formed or two 4 seaters. We make no recommendations on how to go about dividing Meath, bar the West East split of previous Dáil's. This enables us to:

- Maintain county boundaries.
- Maintain continuity.

Louth

We recommend that Louth forms its own standalone 5 seat constituency, which it is able to do in the 175 - 181 range as seen in Table [18](#). This enables us to:

- Maintains county boundaries. It restores Meath's county boundary by returning the area that was previously contained within the previous version of Louth.
- Maintain continuity.

County	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Meath	220,296	7.352	7.395	7.438	7.481	7.524	7.567	7.610	7.653	7.696	7.739	7.782
Co. Louth	139,100	4.643	4.670	4.697	4.724	4.751	4.778	4.805	4.833	4.860	4.887	4.914
Co. Westmeath	95,840	3.199	3.217	3.236	3.255	3.274	3.292	3.311	3.330	3.348	3.367	3.386
Co. Cavan	81,201	2.710	2.726	2.742	2.758	2.774	2.789	2.805	2.821	2.837	2.853	2.869
Co. Monaghan	64,832	2.164	2.176	2.189	2.202	2.214	2.227	2.240	2.252	2.265	2.278	2.290
Co. Longford	46,634	1.556	1.566	1.575	1.584	1.593	1.602	1.611	1.620	1.629	1.638	1.647

Table 16: Group 2: Hypothetical Dáil Constituencies composed only of pure counties, with viable Constituencies based on the $\pm 5\%$ variance.

Recommended Constituency	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Cavan-Monaghan	146,033	4.874	4.902	4.931	4.959	4.988	5.016	5.045	5.073	5.102	5.130	5.159
Longford-Westmeath	142,474	4.755	4.783	4.811	4.839	4.866	4.894	4.922	4.950	4.978	5.005	5.033
Meath (East + West)	220,296	7.352	7.395	7.438	7.481	7.524	7.567	7.610	7.653	7.696	7.739	7.782
Louth	139,100	4.643	4.670	4.697	4.724	4.751	4.778	4.805	4.833	4.860	4.887	4.914

Table 17: Grouping 2: Proposed Seat Equivalent for recommended Dáil Constituencies

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Recommended Constituency	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Cavan-Monaghan	5	-2.52%	-1.95%	-1.38%	-0.81%	-0.24%	0.33%	0.90%	1.47%	2.04%	2.61%	3.18%
Longford-Westmeath	5	-4.90%	-4.34%	-3.79%	-3.23%	-2.67%	-2.12%	-1.56%	-1.00%	-0.45%	0.11%	0.66%
Meath (East + West)	two 4 -seaters	-8.09%	-7.56%	-7.02%	-6.48%	-5.94%	-5.41%	-4.87%	-4.33%	-3.79%	-3.26%	-2.72%
Louth	5	-7.15%	-6.61%	-6.06%	-5.52%	-4.98%	-4.43%	-3.89%	-3.35%	-2.81%	-2.26%	-1.72%

Table 18: Grouping 2: Variance From The National Average

5.3.2 Recommendations of the Submission

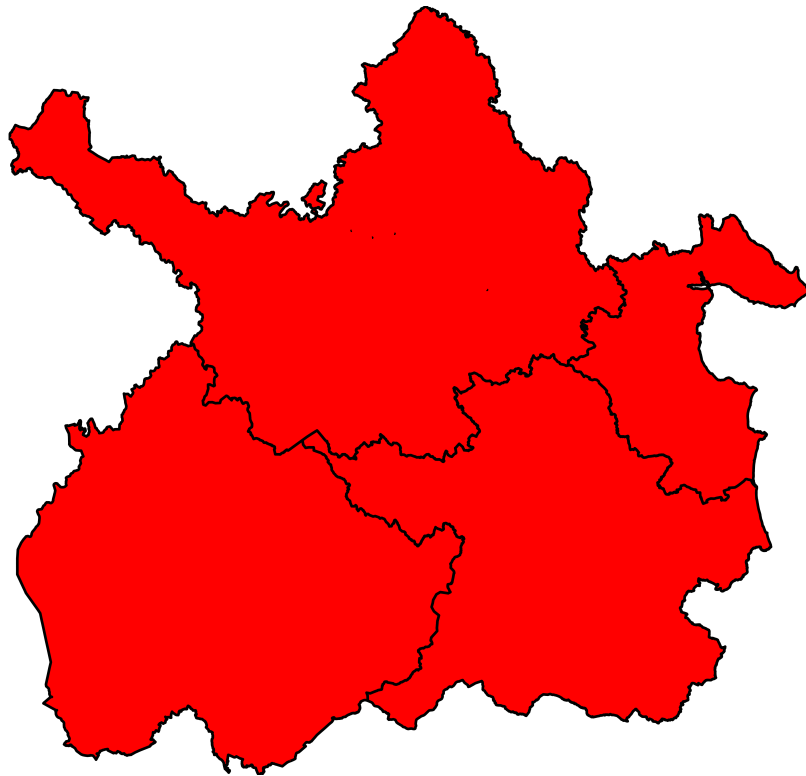


Figure 16: Map of Group 2, recommendation.

- This grouping is to be allocated 23 seats. With a total of 5 constituencies.
- The counties of Cavan and Monaghan join to form the Constituency of Cavan-Monaghan a 5-seat constituency.
- The counties of Longford and Westmeath join to form the Constituency of Longford-Westmeath a 5-seat constituency.
- The county of Louth is to be left as a standalone 5-seat constituency.
- The county of Meath is to be split into two constituencies, Meath East and Meath West such that the total combined seats of the two constituencies is 8 seats (4+4 , 3 + 5).

The relevant statistics for the recommended constituencies of Cavan-Monaghan, Longford-Westmeath, Meath (East + West) and Louth are shown in Table 18 and Table 17. The map 16 shows the configuration.

5.4 North and Southwest region (Group 3)

For this grouping we only provide some observations and their associated calculations. We will mainly comment on the problems/challenges that might be faced when trying generate constituencies that respect the terms of reference for this grouping. There really is not a clear-cut solution for this grouping.

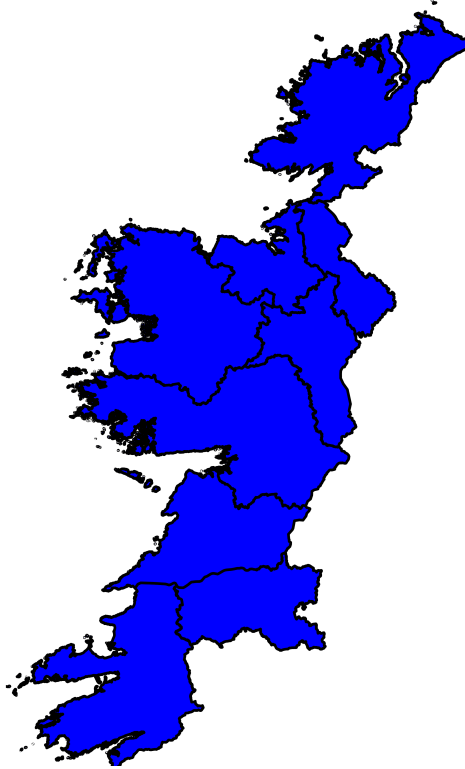


Figure 17: Map of North and Southwest region (Group 3), displaying only those counties.

If we examine Fig. 17 and Table 19 we can see the following is probably how this process should go. One thing to note as well is that for Table 21 we have included, in some cases the same grouping twice but with a different number of seats. We will work our way up from the southern tip of Kerry to Donegal.

Kerry

Cannot sustain itself as a standalone constituency without breaking county boundaries, within a 174-181 seat Dáil. Requiring 173 seats or less is well outside our recommend range of 178-181 seats.

Limerick

Can form a 3 and a 4-seater that are within the permitted variance from the National Average. But given the fact Kerry and Clare are unable to form standalone constituencies, as well as Limerick's history of interacting with both Clare and Kerry. It is likely that that some areas of Kerry and Clare will be absorbed into constituencies within Limerick.

Clare

Clare must gain population to form a 5-seater or loss some population to form a 4-seater and such must break county boundaries. There is no situation in which the county boundaries are not breached. If we examine Table 21, we see that an extreme value for the variance would have to be accepted, which is out of the question.

Galway

At 177-181 seats, Galway can be split into two 5-seaters. This would maintain county boundaries and would restore county boundaries, that were previously broken if Roscommon, Sligo and Leitrim are contained then this would be a reasonable option. But if not, then Galway would have to interact with Roscommon just like in the last commission.

Mayo

Can comfortably form a 5-seater within a 178-181 seat Dáil, without breaking county boundaries.

Roscommon, Sligo and Leitrim

None of the counties in this group have a sufficiently large population to form a standalone constituency. However, there are two options for dealing with this sub-grouping, as shown in Table 20:

- Join all three counties together in a way that creates two 3-seaters constituencies.
- Join Roscommon and Sligo together to form a five-seat constituency, while keeping the county boundaries intact. Leitrim would then be joined with Donegal to form two 3-seaters.

Both options have their advantages and disadvantages, and the final decision will depend on various factors, such as electoral boundaries, local demographics, and political considerations. Nonetheless, these two options provide a useful starting point.

Donegal

Donegal is able to form two 3-seaters for at 176-181 seats. This would result in county boundaries and a degree of continuity being maintained. However it may be necessary to create two constituencies involving Leitrim. This is due to the fact that Roscommon and Sligo can join together to form a 5-seater that does not break county boundaries, as shown in Table 20. If this is the case a possible solution to deal with Leitrim would be as follows:

- South Donegal and Leitrim would form a 3-seater, while the remaining part of Donegal would form a 4-seater.
- South Donegal and Leitrim would form a 4-seater, while North Donegal would form a 3-seater.

If this were to happen, it would enable Roscommon and Sligo to join together in a 5-seater in a 175-181 seat Dáil.

5.4.1 Recommendations of the Submission

Unlike the other two groups we will be providing Observations and Recommendations

Observations:

- Kerry cannot form a standalone constituency without breaking county boundaries within the recommended range of 178-181 seats for the Dáil.
- Clare must break county boundaries to form a 4 or 5-seater constituency.
- Galway can be split into two 5-seat constituencies within a 177-181 seat Dáil if Roscommon, Sligo, and Leitrim are contained; otherwise, Galway would have to interact with Roscommon.
- Roscommon, Sligo, and Leitrim do not have large enough populations to form standalone constituencies.
- Donegal can form two 3-seaters in a Dáil with 176-181 seats, while maintaining county boundaries and continuity.

Recommendations:

- This grouping should be allocated 43-44 seats, depending on how high the commission goes in the recommended 178-181 seat range, with a total of 10-11 constituencies.
- Limerick can form a 3 and a 4-seater within the permitted variance from the National Average. However, some areas of Kerry and Clare may be absorbed into Limerick's constituencies.
- Mayo can form a 5-seater within a 178-181 seat Dáil without breaking county boundaries.
- Join Roscommon and Sligo together to form a five-seat constituency, while keeping the county boundaries intact, or join all three counties (Roscommon, Sligo, and Leitrim) together in a way that creates two 3-seater constituencies.
- If the counties of Roscommon and Sligo are joined together then Donegal should be divided into two constituencies, one consisting of South Donegal and Leitrim as a 3 or 4-seater and the remaining part of Donegal as a 4 or 3-seater respectively, in a 175-181 seat Dáil. If not then Donegal should form two 3-seaters. This would maintain county boundaries.

County	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Galway	276,451	9.227	9.281	9.335	9.389	9.442	9.496	9.550	9.604	9.658	9.712	9.766
Co. Limerick	205,444	6.857	6.897	6.937	6.977	7.017	7.057	7.097	7.137	7.178	7.218	7.258
Co. Donegal	166,321	5.551	5.583	5.616	5.648	5.681	5.713	5.746	5.778	5.811	5.843	5.876
Co. Kerry	155,258	5.182	5.212	5.242	5.273	5.303	5.333	5.364	5.394	5.424	5.455	5.485
Co. Mayo	137,231	4.580	4.607	4.634	4.660	4.687	4.714	4.741	4.768	4.794	4.821	4.848
Co. Clare	127,419	4.253	4.278	4.302	4.327	4.352	4.377	4.402	4.427	4.452	4.476	4.501
Co. Roscommon	69,995	2.336	2.350	2.363	2.377	2.391	2.404	2.418	2.432	2.445	2.459	2.473
Co. Sligo	69,819	2.330	2.344	2.357	2.371	2.385	2.398	2.412	2.426	2.439	2.453	2.467
Co. Leitrim	35,087	1.171	1.178	1.185	1.192	1.198	1.205	1.212	1.219	1.226	1.233	1.240

Table 19: Group 3: Hypothetical Dáil Constituencies composed only of pure counties, with viable Constituencies based on the $\pm 5\%$ variance.

Recommended Groupings	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Roscommon + Co. Leitrim + Co. Sligo	174,901	5.837	5.872	5.906	5.940	5.974	6.008	6.042	6.076	6.110	6.145	6.179
Co. Roscommon + Co. Sligo	139,814	4.666	4.694	4.721	4.748	4.776	4.803	4.830	4.857	4.885	4.912	4.939
Co. Leitrim + Co. Donegal	201,408	6.722	6.761	6.801	6.840	6.879	6.919	6.958	6.997	7.037	7.076	7.115

Table 20: Grouping 3: Sub-groupings involving Roscommon, Sligo and Leitrim

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Recommended Groupings	Number of Seats	171	172	173	174	175	176	177	178	179	180	181
Co. Galway	10	-7.73%	-7.19%	-6.65%	-6.11%	-5.58%	-5.04%	-4.50%	-3.96%	-3.42%	-2.88%	-2.34%
Co. Limerick	7	-2.05%	-1.47%	-0.90%	-0.33%	0.25%	0.82%	1.39%	1.96%	2.54%	3.11%	3.68%
Co. Limerick	8	-14.29%	-13.79%	-13.29%	-12.79%	-12.29%	-11.78%	-11.28%	-10.78%	-10.28%	-9.78%	-9.28%
Co. Donegal	5	11.02%	11.67%	12.32%	12.97%	13.62%	14.27%	14.92%	15.57%	16.21%	16.86%	17.51%
Co. Donegal	6	-7.48%	-6.94%	-6.40%	-5.86%	-5.32%	-4.78%	-4.24%	-3.70%	-3.15%	-2.61%	-2.07%
Co. Kerry	5	3.64%	4.24%	4.85%	5.45%	6.06%	6.67%	7.27%	7.88%	8.48%	9.09%	9.70%
Co. Mayo	5	-8.40%	-7.86%	-7.33%	-6.79%	-6.25%	-5.72%	-5.18%	-4.65%	-4.11%	-3.58%	-3.04%
Co. Clare	4	6.32%	6.94%	7.56%	8.18%	8.80%	9.43%	10.05%	10.67%	11.29%	11.91%	12.53%
Co. Clare	5	-14.95%	-14.45%	-13.95%	-13.45%	-12.96%	-12.46%	-11.96%	-11.47%	-10.97%	-10.47%	-9.97%

Table 21: Grouping 3: Variance From The National Average

6 Southeast region (Group 1): Wicklow and Wexford

As our submission is focused on providing recommendations to the commission, we believe it would be helpful to provide an example of how our recommendations can be applied in practice. In this section, we will present a case study demonstrating how the information in this report can be utilized to form a valid constituency that adheres to the terms of reference and the $\pm 5\%$ variance from the National Average.

To provide a concrete example, we will focus on the sub-grouping within the Southeast region (Group 1) of Wicklow and Wexford. This sub-grouping involves transferring between two counties to create three constituencies, and will serve as the basis for our case study. While there are other options available, for the purposes of this exercise we have chosen to examine this sub-grouping in detail. Other potential options can be classified as follows:

- Internal transfer within a region, as demonstrated in Fig. 14 using Kildare as a primary example (other examples include Tipperary).
- Transfer between two counties to form two constituencies (example: Laois and Offaly).

We will now walk through the process. In this case we have decided on a Dáil size of between **178 and 181 seats**.

6.1 Calculations

Since we are now equipped with a range for the size of the Dáil we are considering, we will now do the following:

- First see the Proposed Seat Equivalent for the sub-grouping, which can be found in Table 10 and 12. Which we see shows that our grouping should be allocated ≈ 11 seats.
- Since this sub-grouping has been consider not in isolation but in the wider context of the area around it and the impacts this would have on attempting to form other valid constituencies. We would focus on this sub-grouping in isolation of its group as this has already been accounted for in coming up with the sub-grouping.
- We check to see that we have opted to create a 5-seater in Wexford and two 3-seaters. One in North Wicklow and one in South Wicklow plus a small area in Wexford. This option is covered within 5.1.1
- See the minimum and maximum are for each Dáil size within the range we are considering.

We first refer to Fig. 12 and Table 40 to see the minimum and maximum population that we need to transfer. We also check in Table 6 to get any idea about how reasonable the size of the transfer is.

Seats	Min Transfer	Max Transfer
178	12,411	25,854
179	13,256	24,841
180	14,091	23,839
181	14,916	22,848

Table 22: Transfer from Wexford to Wicklow for a 178-181 seat Dáil

6.2 Transfer

With the knowledge of the population transfer ranges, including the minimum required population to be transferred and the maximum allowable amount, the next step is to initiate the transfer of a particular area and its associated population from Wexford to Wicklow. To facilitate this process, a tool such as a dashboard can be very useful [Dashboard](https://lookerstudio.google.com/reporting/de831cc2-b7f1-46f8-a65c-3c8499c3a26e) (or go to the url: <https://lookerstudio.google.com/reporting/de831cc2-b7f1-46f8-a65c-3c8499c3a26e>).

Two potential options for forming Wicklow South (and, consequently, Wexford and North Wicklow) have been generated (for illustrative purposes only). These options are depicted in the maps shown in Fig. 18 and 19.

Option	Constituency	Seats	Population	178	179	180	181
Option 1	North Wicklow	3	83,519	2.902	2.918	2.934	2.950
Option 1	South Wicklow	3	87,079	3.025	3.042	3.059	3.076
Option 1	Wexford	5	148,414	5.156	5.185	5.214	5.243
Option 2	North Wicklow	3	87,942	3.055	3.072	3.090	3.107
Option 2	South Wicklow	3	90,366	3.139	3.157	3.175	3.192
Option 2	Wexford	5	140,704	4.888	4.916	4.943	4.971

Table 23: Southeast region (Group 1) : Wicklow and Wexford Proposed Seat Equivalent Representation for the for recommended Dáil Constituencies for hypothetical options Option 1 and Option 2

From Table 23, we can draw the following conclusions:

- Option 1 is valid for all values within a 178-181 seat D'ail, as all constituencies fall within the permitted $\pm 5\%$ variance range.
- Option 2 is not valid for all ranges, as South Wicklow falls outside the permitted $\pm 5\%$ variance range. However, the variations for North Wicklow and Wexford are valid for all values within a 178-181 seat Dáil.
- It is important to note that there are other potential options to consider, and the two presented here are just examples.

6.3 Recommendation

Once the mathematical considerations have been taken into account, other factors such as local considerations will also be given due consideration. We would then accept one of the proposed recommendations and contain it within our report.

It would be ideal if there was some other quantitative metrics that could be developed to help decide on if a constituency is valid. Such as projecting will it likely remain the same in the next redraw (could use planning permission data, department of housing new builds that have started and all sorts of stats that might help predict the population change within an area) as this would help potential with maintaining continuity in the long run.

Map: Option 1

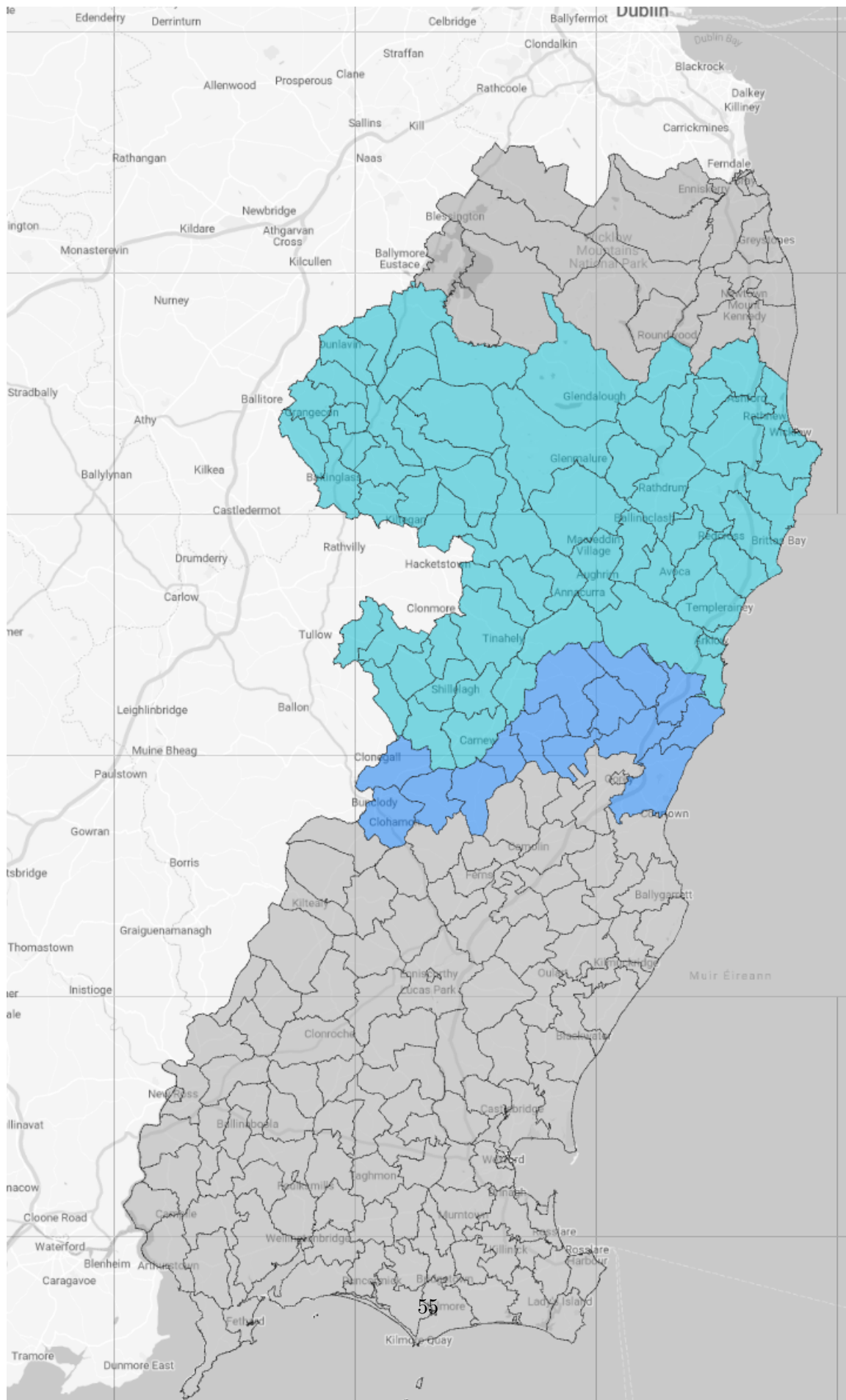


Figure 18: Map: Option 1

Map: Option 2

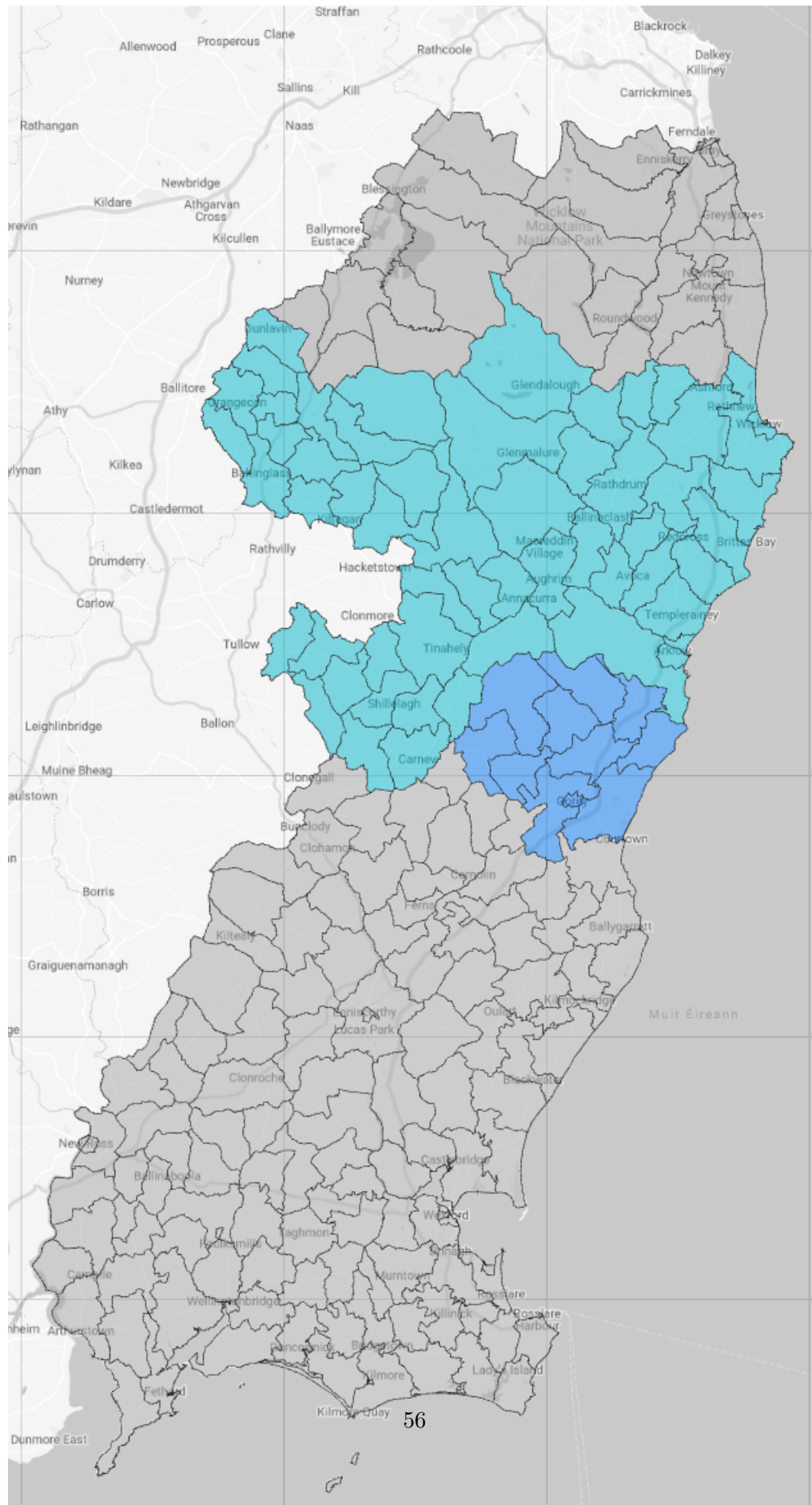


Figure 19: Map: Option 2

References

- [1] Constituency Commission. Constituency commission report 2017, 2017. URL <https://www.constituency-commission.ie/cc/docs/Constituency%20Commission%20Report%202017.pdf>.
- [2] Constituency Commission. Constituency commission report 2012, 2012. URL <https://www.constituency-commission.ie/docs/report2012.pdf>.
- [3] Constituency Commission. Constituency commission report 2007, 2007. URL <https://constituency-commission.ie/cc/docs/con2007.pdf>.
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A Appendix

A.1 Specification of recommended Daíl constituencies

Name of Proposed Constituency	Area	Number of Seats	grouping
Waterford	The county of Waterford and, in the county of Kilkenny the Electoral divisions required to ensure Waterford forms a 5-seater.	5	group 1
Carlow-Kilkenny	The county of Carlow and Kilkenny. Excluding the part of Kilkenny being transferred to Wexford.	5	group 1
North Wicklow	North of Wicklow County, starting from Bray until a 3-seater can be formed.	3	group 1
South Wicklow	South Wicklow and in county Wexford, the electoral divisions removed from Wexford such that it can form a 5-seater.	3	group 1
Wexford	The county of Wexford, excluding the electoral divisions transferred to Wicklow South	5	group 1
Laois	The county of Laois if the commission is willing to accept a variance outside the $\pm 5\%$. Otherwise, would consist of the county Laois, with a small population from being transferred to Offaly.	3	group 1
Offaly	The county of Offaly if the commission is willing to accept a variance outside the $\pm 5\%$. Otherwise, would consist of the county Offaly, with a small population from being transferred in from Laois. Such that two 3-seaters could form.	3	group 1
Tipperary North	Split in a similar manner as in 2004 and 2007 report.	3	group 1
Tipperary South	Split in a similar manner as in 2004 and 2007 report.	3	group 1
Kildare North	The county of Kildare split between North and South.	Total of 9	group 1
Kildare South	Split in a similar manner as in previous report.		group 1
Cavan-Monaghan	The county of Cavan and the county of Monaghan.	5	group 2
Longford-Westmeath	The county of Longford and the county of Westmeath.	5	group 2
Louth	The county of Louth.	5	group 2
Meath East	The county of Meath.Split in a similar manner as previous reports.	Total of 8	group 2
Meath West			group 2
Kerry	Please see section 5.4	Total of 17	group 3
Limerick			group 3
Limerick City			group 3
Clare			group 3
Mayo	The county of Mayo.	5	group 3
Galway West	Split in a similar manner as previous reports.	Total of 8	group 3
Galway East	But this time only containing Electoral divisions from Galway.		group 3
Roscommon-Sligo	The county of Roscommon and the County of Sligo.	5	group 3
South Donegal-Leitrim	The county Leitrim and the south of county Donegal.	4	group 3
North Donegal	North Donegal & The North of county Donegal, not contained in South Donegal-Leitrim.	3	group 3

Table 24: Specification of recommended Dáil constituencies

A.2 Variance From The National Average

Within this section you can find the population sizes for the possible constituency configurations, based off the $\pm 5\%$ variance from the National Average. Where Min, Max, Min Number of People and Max Number of People are defined in section 3.1. It also contains historical information on the variance as defined in 6, for each recommended constituencies form the past four reports.

Size of Potential Constituencies In terms of Seat Equivalent Representation

Configuration	Min	Max
3-seater	2.85	3.15
4-seater	3.8	4.2
5-seater	4.75	5.25
6-seater	5.7	6.3
8-seater	7.6	8.4
9-seater	8.55	9.45
10-seater	9.5	10.5

Table 25: Size of Constituencies based of the 5% variance from the National Average.

Configuration	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
3-seater	3.03	3.06	3.09	3.12	3.15	3.18	3.21	3.24	3.27
4-seater	4.04	4.08	4.12	4.16	4.2	4.24	4.28	4.32	4.36
5-seater	5.05	5.1	5.15	5.2	5.25	5.3	5.35	5.4	5.45
6-seater	6.06	6.12	6.18	6.24	6.3	6.36	6.42	6.48	6.54
8-seater	8.08	8.16	8.24	8.32	8.4	8.48	8.56	8.64	8.72
9-seater	9.09	9.18	9.27	9.36	9.45	9.54	9.63	9.72	9.81
10-seater	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9

Configuration	-0.01	-0.02	-0.03	-0.04	-0.05	-0.06	-0.07	-0.08	-0.09
3-seater	2.97	2.94	2.91	2.88	2.85	2.82	2.79	2.76	2.73
4-seater	3.96	3.92	3.88	3.84	3.8	3.76	3.72	3.68	3.64
5-seater	4.95	4.9	4.85	4.8	4.75	4.7	4.65	4.6	4.55
6-seater	5.94	5.88	5.82	5.76	5.7	5.64	5.58	5.52	5.46
8-seater	7.92	7.84	7.76	7.68	7.6	7.52	7.44	7.36	7.28
9-seater	8.91	8.82	8.73	8.64	8.55	8.46	8.37	8.28	8.19
10-seater	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1

Table 26: Size of Constituencies based on a $\pm 1 - 9\%$ variance from the National Average. With the top row indicating the variance from the National Average

Size of Potential Constituencies In terms of Number of People

Seats	National Ratio	Min Number of People	Max Number of People
171	29,962.20	85,392	94,381
172	29,788.00	84,896	93,832
173	29,615.82	84,405	93,290
174	29,445.61	83,920	92,754
175	29,277.35	83,440	92,224
176	29,111.00	82,966	91,700
177	28,946.53	82,498	91,182
178	28,783.91	82,034	90,669
179	28,623.11	81,576	90,163
180	28,464.09	81,123	89,662
181	28,306.83	80,674	89,167

Table 27: Size of 3-seater Constituencies for various Dáil sizes based of the $\pm 5\%$ variance from the National Average.

Seats	National Ratio	Min Number of People	Max Number of People
171	29,962.20	113,856	125,841
172	29,788.00	113,194	125,110
173	29,615.82	112,540	124,386
174	29,445.61	111,893	123,672
175	29,277.35	111,254	122,965
176	29,111.00	110,622	122,266
177	28,946.53	109,997	121,575
178	28,783.91	109,379	120,892
179	28,623.11	108,768	120,217
180	28,464.09	108,164	119,549
181	28,306.83	107,566	118,889

Table 28: Size of 4-seater Constituencies for various Dáil sizes based of the $\pm 5\%$ variance from the National Average.

Seats	National Ratio	Min Number of People	Max Number of People
171	29,962.20	142,320	157,302
172	29,788.00	141,493	156,387
173	29,615.82	140,675	155,483
174	29,445.61	139,867	154,589
175	29,277.35	139,067	153,706
176	29,111.00	138,277	152,833
177	28,946.53	137,496	151,969
178	28,783.91	136,724	151,116
179	28,623.11	135,960	150,271
180	28,464.09	135,204	149,436
181	28,306.83	134,457	148,611

Table 29: Size of 5-seater Constituencies for various Dáil sizes based of the $\pm 5\%$ variance from the National Average.

Seats	National Ratio	Min Number of People	Max Number of People
171	29,962.20	170,785	188,762
172	29,788.00	169,792	187,664
173	29,615.82	168,810	186,580
174	29,445.61	167,840	185,507
175	29,277.35	166,881	184,447
176	29,111.00	165,933	183,399
177	28,946.53	164,995	182,363
178	28,783.91	164,068	181,339
179	28,623.11	163,152	180,326
180	28,464.09	162,245	179,324
181	28,306.83	161,349	178,333

Table 30: Size of an area composed of Two 3-seaters (6-seater) for various Dáil sizes based of the $\pm 5\%$ variance from the National Average.

A.3 Historical Variance From The National Average From Past Reports

Constituency	Report Name	Variance
Carlow-Kilkenny	report 2004	4.01
Cavan-Monaghan	report 2004	-7.50
Clare	report 2004	4.18
Cork East	report 2004	-3.76
Cork North-Central	report 2004	-5.03
Cork North-West	report 2004	2.28
Cork South-Central	report 2004	4.95
Cork South-West	report 2004	0.44
Donegal North-East	report 2004	-3.14
Donegal South-West	report 2004	-2.53
Dublin Central	report 2004	4.94
Dublin Mid-West	report 2004	-0.64
Dublin North	report 2004	4.74
Dublin North-Central	report 2004	3.82
Dublin North-East	report 2004	2.94
Dublin North-West	report 2004	-3.24
Dublin South	report 2004	-2.30
Dublin South-Central	report 2004	0.83
Dublin South-East	report 2004	2.86
Dublin South-West	report 2004	1.08
Dublin West	report 2004	3.38
Dún Laoghaire	report 2004	-1.45
Galway East	report 2004	-3.90
Galway West	report 2004	0.32
Kerry North	report 2004	-6.22
Kerry South	report 2004	-6.58
Kildare North	report 2004	0.67
Kildare South	report 2004	-2.65
Laois-Offaly	report 2004	3.77
Limerick East	report 2004	-4.70
Limerick West	report 2004	-4.24
Longford-Westmeath	report 2004	2.18
Louth	report 2004	7.87
Mayo	report 2004	-0.46
Meath East	report 2004	-0.78
Meath West	report 2004	-0.79
Roscommon - South Leitrim	report 2004	0.14
Sligo-North Leitrim	report 2004	-5.53
Tipperary North	report 2004	-0.52
Tipperary South	report 2004	0.47
Waterford	report 2004	6.07
Wexford	report 2004	-1.18
Wicklow	report 2004	0.27

Table 31: Variance From The National Average of recommended Dáil constituencies from the 2004 report

Constituency	Report Name	Variance
Carlow-Kilkenny	report 2007	4.73
Cavan-Monaghan	report 2007	-6.03
Clare	report 2007	3.34
Cork East	report 2007	-1.95
Cork North-Central	report 2007	-1.94
Cork North-West	report 2007	-2.62
Cork South-Central	report 2007	1.31
Cork South-West	report 2007	0.43
Donegal North-East	report 2007	-3.59
Donegal South-West	report 2007	-4.22
Dublin Central	report 2007	2.45
Dublin Mid-West	report 2007	-1.73
Dublin North	report 2007	-3.74
Dublin North-Central	report 2007	-1.76
Dublin North-East	report 2007	-0.60
Dublin North-West	report 2007	-4.30
Dublin South	report 2007	2.09
Dublin South-Central	report 2007	-4.33
Dublin South-East	report 2007	-1.82
Dublin South-West	report 2007	-4.09
Dublin West	report 2007	3.43
Dún Laoghaire	report 2007	0.32
Galway East	report 2007	-1.50
Galway West	report 2007	2.61
Kerry North-West Limerick	report 2007	1.14
Kerry South	report 2007	-1.48
Kildare North	report 2007	4.24
Kildare South	report 2007	4.19
Laois-Offaly	report 2007	4.66
Limerick City	report 2007	-1.15
Limerick County	report 2007	-1.73
Longford-Westmeath	report 2007	3.96
Louth	report 2007	0.70
Mayo	report 2007	-3.03
Meath East	report 2007	0.01
Meath West	report 2007	-0.30
Roscommon - South Leitrim	report 2007	-2.92
Sligo-North Leitrim	report 2007	-3.12
Tipperary North	report 2007	4.67
Tipperary South	report 2007	-2.45
Waterford	report 2007	4.27
Wexford	report 2007	3.17
Wicklow	report 2007	2.08

Table 32: Variance From The National Average of recommended Dáil constituencies from the 2007 report

Constituency	report_name	Variance
Carlow-Kilkenny	report 2012	0.32
Cavan-Monaghan	report 2012	3.72
Clare	report 2012	-4.15
Cork East	report 2012	-1.55
Cork North-Central	report 2012	0.86
Cork North-West	report 2012	-0.61
Cork South-Central	report 2012	1.55
Cork South-West	report 2012	-4.78
Donegal	report 2012	4.93
Dublin Bay North	report 2012	0.20
Dublin Bay South	report 2012	2.19
Dublin Central	report 2012	0.90
Dublin Fingal	report 2012	-2.78
Dublin Mid-West	report 2012	-4.93
Dublin North-West	report 2012	3.92
Dublin Rathdown	report 2012	0.40
Dublin South-Central	report 2012	-1.29
Dublin South-West	report 2012	-0.20
Dublin West	report 2012	-2.57
Dún Laoghaire	report 2012	2.27
Galway East	report 2012	2.81
Galway West	report 2012	3.91
Kerry	report 2012	0.21
Kildare North	report 2012	-0.70
Kildare South	report 2012	0.75
Laois	report 2012	0.72
Limerick City	report 2012	-2.00
Limerick County	report 2012	-3.77
Longford-Westmeath	report 2012	0.55
Louth	report 2012	-1.33
Mayo	report 2012	3.59
Meath East	report 2012	-0.63
Meath West	report 2012	-1.80
Offaly	report 2012	0.60
Roscommon - Galway	report 2012	-2.91
Sligo-Leitrim	report 2012	2.58
Tipperary	report 2012	1.79
Waterford	report 2012	-2.04
Wexford	report 2012	0.08
Wicklow	report 2012	-2.89

Table 33: Variance From The National Average of recommended Dáil constituencies from the 2012 report

Constituency	Report Name	Variance
Carlow-Kilkenny Constituency	report 2017	4.94
Cavan-Monaghan Constituency	report 2017	-4.89
Clare Constituency	report 2017	-0.19
Cork East Constituency	report 2017	2.00
Cork North-Central Constituency	report 2017	4.83
Cork North-West Constituency	report 2017	-0.23
Cork South-Central Constituency	report 2017	2.69
Cork South-West Constituency	report 2017	-4.46
Donegal Constituency	report 2017	1.24
Dublin Bay North Constituency	report 2017	-0.62
Dublin Bay South Constituency	report 2017	1.79
Dublin Central Constituency	report 2017	-4.44
Dublin Fingal Constituency	report 2017	2.20
Dublin Mid-West Constituency	report 2017	-0.89
Dublin North-West Constituency	report 2017	-5.25
Dublin Rathdown Constituency	report 2017	4.09
Dublin South Central Constituency	report 2017	0.29
Dublin South-West Constituency	report 2017	1.18
Dublin West Constituency	report 2017	2.39
Dún Laoghaire Constituency	report 2017	5.07
Galway East Constituency	report 2017	0.29
Galway West Constituency	report 2017	-2.62
Kerry Constituency	report 2017	-0.74
Kildare North Constituency	report 2017	0.42
Kildare South Constituency	report 2017	-3.56
Laois-Offaly Constituency	report 2017	1.34
Limerick City Constituency	report 2017	-4.73
Limerick County Constituency	report 2017	-3.84
Longford-Westmeath Constituency	report 2017	1.61
Louth Constituency	report 2017	1.42
Mayo Constituency	report 2017	4.98
Meath East Constituency	report 2017	-2.37
Meath West Constituency	report 2017	1.41
Roscommon-Galway Constituency	report 2017	-3.83
Sligo-Leitrim Constituency	report 2017	-4.31
Tipperary Constituency	report 2017	4.28
Waterford Constituency	report 2017	-2.41
Wexford Constituency	report 2017	0.61
Wicklow Constituency	report 2017	-4.29

Table 34: Variance From The National Average of recommended Dáil constituencies from the 2017 report

A.4 Calculations

This section contains the calculations and supporting notes/comments that were used to help support arguments within the submission.

A.4.1 Seat Equivalent Representation Tables

This section contains some of the tables used within this submission. We will also outline how to interpret the key that is attached to these tables.

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Table 35: Key for interpreting the tables that display Seat Equivalent Representation. The table shows the colour and the corresponding number of seats that a grouping could be allocated while staying within the $\pm 5\%$ variance from the National Average threshold

These number of seats can be reached by combining our valid constituencies sizes in the following manner

- 10-seater : Can be composed of 5+5, 4+3+3
- 9-seater : Can be composed of 4+5, 3+3+3
- 8-seater : Can be composed of 4+4, 3 + 5
- 6-seater : Composed of two 3-seat constituencies (3+3)
- 5-seater : Just a standalone 5-seat constituency
- 4-seater : Just a standalone 4-seat constituency
- 3-seater : Just a standalone 3-seat constituency

Number of Seats	Constituency	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
5	Louth	167,012	5.574	5.607	5.639	5.672	5.704	5.737	5.770	5.802	5.835	5.867	5.900
5	Carlow-Kilkenny	165,616	5.527	5.560	5.592	5.624	5.657	5.689	5.721	5.754	5.786	5.818	5.851
5	Wexford	163,527	5.458	5.490	5.522	5.554	5.585	5.617	5.649	5.681	5.713	5.745	5.777
5	Tipperary	162,987	5.440	5.472	5.503	5.535	5.567	5.599	5.631	5.662	5.694	5.726	5.758
5	Laois-Offaly	161,245	5.382	5.413	5.445	5.476	5.508	5.539	5.570	5.602	5.633	5.665	5.696
5	Donegal	156,990	5.240	5.270	5.301	5.332	5.362	5.393	5.423	5.454	5.485	5.515	5.546
5	Wicklow	155,485	5.189	5.220	5.250	5.280	5.311	5.341	5.371	5.402	5.432	5.462	5.493
5	Kerry	155,258	5.182	5.212	5.242	5.273	5.303	5.333	5.364	5.394	5.424	5.455	5.485
5	Galway West	154,596	5.160	5.190	5.220	5.250	5.280	5.311	5.341	5.371	5.401	5.431	5.461
5	Cavan-Monaghan	150,238	5.014	5.044	5.073	5.102	5.132	5.161	5.190	5.220	5.249	5.278	5.307
4	Kildare North	134,354	4.484	4.510	4.537	4.563	4.589	4.615	4.641	4.668	4.694	4.720	4.746
4	Longford-Westmeath	133,056	4.441	4.467	4.493	4.519	4.545	4.571	4.597	4.623	4.649	4.675	4.700
4	Mayo	131,353	4.384	4.410	4.435	4.461	4.487	4.512	4.538	4.563	4.589	4.615	4.640
4	Clare	127,419	4.253	4.278	4.302	4.327	4.352	4.377	4.402	4.427	4.452	4.476	4.501
4	Waterford	127,085	4.242	4.266	4.291	4.316	4.341	4.366	4.390	4.415	4.440	4.465	4.490
4	Kildare South	125,703	4.195	4.220	4.244	4.269	4.294	4.318	4.343	4.367	4.392	4.416	4.441
4	Sligo-Leitrim	122,760	4.097	4.121	4.145	4.169	4.193	4.217	4.241	4.265	4.289	4.313	4.337
4	Limerick City	120,639	4.026	4.050	4.073	4.097	4.121	4.144	4.168	4.191	4.215	4.238	4.262
3	Meath West	98,935	3.302	3.321	3.341	3.360	3.379	3.399	3.418	3.437	3.456	3.476	3.495
3	Meath East	98,662	3.293	3.312	3.331	3.351	3.370	3.389	3.408	3.428	3.447	3.466	3.485
3	Galway East	97,016	3.238	3.257	3.276	3.295	3.314	3.333	3.352	3.370	3.389	3.408	3.427
3	Roscommon-Galway	92,189	3.077	3.095	3.113	3.131	3.149	3.167	3.185	3.203	3.221	3.239	3.257
3	Limerick County	89,479	2.986	3.004	3.021	3.039	3.056	3.074	3.091	3.109	3.126	3.144	3.161

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Table 36: Existing Constituencies Dáil Constituencies, with viable Constituencies based on the 5% rule of thumb

County	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Carlow	61,931	2.067	2.079	2.091	2.103	2.115	2.127	2.139	2.152	2.164	2.176	2.188
Co. Cavan	81,201	2.710	2.726	2.742	2.758	2.774	2.789	2.805	2.821	2.837	2.853	2.869
Co. Clare	127,419	4.253	4.278	4.302	4.327	4.352	4.377	4.402	4.427	4.452	4.476	4.501
Co. Donegal	166,321	5.551	5.583	5.616	5.648	5.681	5.713	5.746	5.778	5.811	5.843	5.876
Co. Galway	276,451	9.227	9.281	9.335	9.389	9.442	9.496	9.550	9.604	9.658	9.712	9.766
Co. Kerry	155,258	5.182	5.212	5.242	5.273	5.303	5.333	5.364	5.394	5.424	5.455	5.485
Co. Kildare	246,977	8.243	8.291	8.339	8.388	8.436	8.484	8.532	8.580	8.629	8.677	8.725
Co. Kilkenney	103,685	3.461	3.481	3.501	3.521	3.541	3.562	3.582	3.602	3.622	3.643	3.663
Co. Laois	91,657	3.059	3.077	3.095	3.113	3.131	3.149	3.166	3.184	3.202	3.220	3.238
Co. Leitrim	35,087	1.171	1.178	1.185	1.192	1.198	1.205	1.212	1.219	1.226	1.233	1.240
Co. Limerick	205,444	6.857	6.897	6.937	6.977	7.017	7.057	7.097	7.137	7.178	7.218	7.258
Co. Longford	46,634	1.556	1.566	1.575	1.584	1.593	1.602	1.611	1.620	1.629	1.638	1.647
Co. Louth	139,100	4.643	4.670	4.697	4.724	4.751	4.778	4.805	4.833	4.860	4.887	4.914
Co. Mayo	137,231	4.580	4.607	4.634	4.660	4.687	4.714	4.741	4.768	4.794	4.821	4.848
Co. Meath	220,296	7.352	7.395	7.438	7.481	7.524	7.567	7.610	7.653	7.696	7.739	7.782
Co. Monaghan	64,832	2.164	2.176	2.189	2.202	2.214	2.227	2.240	2.252	2.265	2.278	2.290
Co. Offaly	82,668	2.759	2.775	2.791	2.807	2.824	2.840	2.856	2.872	2.888	2.904	2.920
Co. Roscommon	69,995	2.336	2.350	2.363	2.377	2.391	2.404	2.418	2.432	2.445	2.459	2.473
Co. Sligo	69,819	2.330	2.344	2.357	2.371	2.385	2.398	2.412	2.426	2.439	2.453	2.467
Co. Tipperary	167,661	5.596	5.628	5.661	5.694	5.727	5.759	5.792	5.825	5.858	5.890	5.923
Co. Waterford	127,085	4.242	4.266	4.291	4.316	4.341	4.366	4.390	4.415	4.440	4.465	4.490
Co. Westmeath	95,840	3.199	3.217	3.236	3.255	3.274	3.292	3.311	3.330	3.348	3.367	3.386
Co. Wexford	163,527	5.458	5.490	5.522	5.554	5.585	5.617	5.649	5.681	5.713	5.745	5.777
Co. Wicklow	155,485	5.189	5.220	5.250	5.280	5.311	5.341	5.371	5.402	5.432	5.462	5.493

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Table 37: Hypothetical Dáil Constituencies composed only of pure counties, with viable Constituencies based on the $\pm 5\%$ variance from the National Average

County	Preliminary Population	171	172	173	174	175	176	177	178	179	180	181
Co. Cavan + Co. Monaghan	146,033	4.874	4.902	4.931	4.959	4.988	5.016	5.045	5.073	5.102	5.130	5.159
Co. Carlow + Co. Kilkenny	165,616	5.527	5.560	5.592	5.624	5.657	5.689	5.721	5.754	5.786	5.818	5.851
Co. Clare	127,419	4.253	4.278	4.302	4.327	4.352	4.377	4.402	4.427	4.452	4.476	4.501
Co. Donegal	166,321	5.551	5.583	5.616	5.648	5.681	5.713	5.746	5.778	5.811	5.843	5.876
Co. Galway	276,451	9.227	9.281	9.335	9.389	9.442	9.496	9.550	9.604	9.658	9.712	9.766
Co. Kerry	155,258	5.182	5.212	5.242	5.273	5.303	5.333	5.364	5.394	5.424	5.455	5.485
Co. Kildare	246,977	8.243	8.291	8.339	8.388	8.436	8.484	8.532	8.580	8.629	8.677	8.725
Co. Laois + Co. Offaly	174,325	5.818	5.852	5.886	5.920	5.954	5.988	6.022	6.056	6.090	6.124	6.158
Co. Leitrim + Co. Sligo	104,906	3.501	3.522	3.542	3.563	3.583	3.604	3.624	3.645	3.665	3.686	3.706
Co. Limerick	205,444	6.857	6.897	6.937	6.977	7.017	7.057	7.097	7.137	7.178	7.218	7.258
Co. Longford + Co. Westmeath	142,474	4.755	4.783	4.811	4.839	4.866	4.894	4.922	4.950	4.978	5.005	5.033
Co. Louth	139,100	4.643	4.670	4.697	4.724	4.751	4.778	4.805	4.833	4.860	4.887	4.914
Co. Mayo	137,231	4.580	4.607	4.634	4.660	4.687	4.714	4.741	4.768	4.794	4.821	4.848
Co. Meath	220,296	7.352	7.395	7.438	7.481	7.524	7.567	7.610	7.653	7.696	7.739	7.782
Co. Roscommon	69,995	2.336	2.350	2.363	2.377	2.391	2.404	2.418	2.432	2.445	2.459	2.473
Co. Tipperary	167,661	5.596	5.628	5.661	5.694	5.727	5.759	5.792	5.825	5.858	5.890	5.923
Co. Waterford	127,085	4.242	4.266	4.291	4.316	4.341	4.366	4.390	4.415	4.440	4.465	4.490
Co. Wexford	163,527	5.458	5.490	5.522	5.554	5.585	5.617	5.649	5.681	5.713	5.745	5.777
Co. Wicklow	155,485	5.189	5.220	5.250	5.280	5.311	5.341	5.371	5.402	5.432	5.462	5.493

Key	
Colour	Seats
	10-seater
	9-seater
	8-seater
	6-seater
	5-seater
	4-seater
	3-seater

Table 38: Hypothetical Dáil Constituencies composed only of pure counties and Constituencies composed by joining two entire counties into a single constituency, with viable Constituencies based on the 5% rule of thumb

A.4.2 Transfer Tables

Seats	Min Transfer	Max Transfer
171	15,235	23,296
172	14,408	24,123
173	13,590	24,941
174	12,782	25,749
175	11,982	26,549
176	12,783	25,748
177	13,647	24,884
178	14,500	24,031
179	15,345	23,186
180	16,180	22,351
181	17,005	21,526

Table 39: Transfer from Kilkenny and Waterford

Seats	Min Transfer	Max Transfer
171	15,300	21,207
172	14,307	22,034
173	13,325	22,852
174	12,355	23,660
175	11,396	24,460
176	10,694	25,250
177	11,558	26,031
178	12,411	25,854
179	13,256	24,841
180	14,091	23,839
181	14,916	22,848

Table 40: Transfer from Wexford to Wicklow

Seats	Min Transfer	Max Transfer
171	2,724	6,265
172	2,228	6,761
173	1,737	7,252
174	1,252	7,737
175	7,72	8,217
176	298	8,691
177	475	8,514
178	988	8,001
179	1,494	7,495
180	1,995	6,994
181	2,490	6,499

Table 41: Transfer from Laois to Offaly

Seats	Min Transfer	Max Transfer
178	2,369	3,244
179	1,605	3,855
180	850	4,459
181	103	5,057

Table 42: Transfer within Kildare such that Kildare North forms a 5-seater

A.4.3 Groupings Table

CO_ID	ENGLISH	PROVINCE	grouping
80000	KILDARE	Leinster	group 1
250000	WICKLOW	Leinster	group 1
240000	WEXFORD	Leinster	group 1
10000	CARLOW	Leinster	group 1
90000	KILKENNY	Leinster	group 1
180000	OFFALY	Leinster	group 1
100000	LAOIS	Leinster	group 1
210000	TIPPERARY	Munster	group 1
220000	WATERFORD	Munster	group 1
230000	WESTMEATH	Leinster	group 2
130000	LONGFORD	Leinster	group 2
160000	MEATH	Leinster	group 2
140000	LOUTH	Leinster	group 2
20000	CAVAN	Ulster	group 2
170000	MONAGHAN	Ulster	group 2
50000	DONEGAL	Ulster	group 3
190000	ROSCOMMON	Connacht	group 3
150000	MAYO	Connacht	group 3
200000	SLIGO	Connacht	group 3
110000	LEITRIM	Connacht	group 3
60000	GALWAY	Connacht	group 3
30000	CLARE	Munster	group 3
70000	KERRY	Munster	group 3
120000	LIMERICK	Munster	group 3
260000	DUBLIN	Leinster	excluded
40000	CORK	Munster	excluded

Table 43: Groupings considered within this submission, of Counties by CO ID and Province, with Excluded Areas

A.4.4 Historical Population Transfers

This section of the appendix provides a historical account of population transfers between different areas of Ireland, listed by: year, giver, receiver, and the size of the population transferred. The transfers occurred between various constituencies and regions, such as: Cork, Dublin, Donegal, Kildare, and Limerick, among others. The table presents a partial view of how population movement has shaped the Dáil constituents over time.

Year	Giver	Receive	Transferred	Classification
2004	Cork North-Central	Cork South-Central	25,918	Transfer in Cork City
2004	Cork South-Central	Cork South-West	3,757	Transfer in Cork County
2004	Cork South-Central	Cork North-West	15,119	Transfer in Cork County
2004	Cork North-West	Cork North-Central	7,001	Transfer in Cork County
2004	Dublin North	Dublin West	3,927	Transfer in Fingal County
2004	Dublin West	Dublin North-West	1,106	Transfer in Fingal County
2004	Dublin West	Dublin Mid-West	12,059	Transfer in South Dublin County
2004	Dublin North-Central	Dublin North-East	5,820	Transfer in Dublin City
2004	Dublin North-Central	Dublin North-West	5,020	Transfer in Dublin City
2004	Dublin Central	Dublin South-Central	955	Transfer in Dublin City
2004	Dublin South	Dublin South-West	1,995	Transfer in South Dublin
2004	Kildare South	Kildare North	9,554	Transfer in County Kildare
2004	Donegal North-East	Donegal South-West	5,386	Transfer in County Donegal
2004	Clare	Limerick East	1,025	Transfer in County Clare
2004	Limerick East	Limerick West	3,228	Transfer in Limerick County
2004	Kerry South	Kerry North	1,235	Transfer in County Kerry
2007	Cork East	Cork North-Central	4,255	Transfer in County Cork
2007	Cork North-West	Cork North-Central	4,334	Transfer in County Cork
2007	Donegal North-East	Donegal South-West	2,351	Transfer in County Donegal
2007	Dublin North	Dublin North-East	9,201	
2007	Dublin North	Dublin West	12,768	Transfer in Fingal County
2007	Dublin North-East	Dublin North-Central	2,758	Transfer in Dublin City
2007	Dun Laoghaire	Dublin South	11,673	Transfer in Dun Laoghaire-Rathdown
2007	Limerick West	proposed Kerry North-West Limerick	13,146	Transfer in County Limerick
2007	Limerick East	proposed Limerick	17,242	Transfer in County Limerick
2007	Kerry North	Kerry South	5,098	Transfer in County Kerry
2007	Kildare South	Kildare North	1,314	Transfer in County Kildare
2007	Laois-Offaly	Tipperary North	4,276	Transfer in County Offaly
2007	Meath East	Louth	17,333	Transfer in County Meath
2007	Meath West	Meath East	6,776	Transfer in County Meath
2007	Roscommon-South Leitrim	Sligo-North Leitrim	3,376	Transfer in County Leitrim

Table 44: Table of Historical Population Transfers between Dáil Constituencies in Ireland from 2004 to 2007 Classified by Transfer Location.

Year	Giver	Receive	Transferred	Classification
2012	Cork North-Central	Cork North-West	5,048	Transfer in County Cork
2012	Cavan-Monaghan	Sligo-Leitrim	13,183	Transfer in County Cavan
2012	Donegal South-West	Sligo-Leitrim	8,779	Transfer in County Donegal
2012	Dublin South	Dublin South-West	39,311	Transfer in South Dublin County
2012	Dublin South	Dún Laoghaire	13,762	Transfer in Dún Laoghaire-Rathdown
2012	Dublin West	Dublin Fingal	17,291	Transfer in Fingal County
2012	Dublin North-East	Dublin Fingal	9,549	Transfer in Fingal County
2012	Dublin Central	Dublin West	13,256	Transfer in Dublin City
2012	Dublin Central	Dublin North-West	11,506	Transfer in Dublin City
2012	Dublin South-Central	Dublin Bay South	12,563	Transfer in Dublin City
2012	Galway East	Roscommon-Galway	20,521	Transfer in County Galway
2012	Mayo	Galway West	10,306	Transfer in County Mayo
2012	Kerry North-West Limerick	Limerick	13,352	Transfer in County Limerick
2012	Limerick	Limerick City	11,197	Transfer in County Limerick
2012	Tipperary South	Waterford	1,597	Transfer in County Waterford
2012	existing Tipperary North	proposed Offaly	10,953	Transfer in the county of North Tipperary
2012	Kildare North	Kildare South	4,698	Transfer in County Kildare
2012	Kildare South	proposed Laois	7,186	Transfer in County Kildare
2017	Dublin Rathdown	Dún Laoghaire	1,535	Transfer in Dún Laoghaire-Rathdown
2017	Dublin North-West	Dublin Central	12,394	Transfer in Dublin City
2017	Dublin Bay North	Dublin Central	5,064	Transfer in Dublin City
2017	Sligo-Leitrim	Cavan-Monaghan	13,150	Transfer in County Cavan
2017	Meath East	Cavan-Monaghan	3,973	Transfer in County Meath
2017	Roscommon-Galway	Sligo-Leitrim	7,806	Transfer in County Roscommon
2017	Galway West	Mayo	4,893	Transfer in County Mayo
2017	Galway East	Roscommon-Galway	8,650	Transfer in County Galway
2017	Galway West	Galway East	4,547	Transfer in County Galway
2017	Limerick City	Limerick County	2,008	Transfer in Limerick City
2017	Limerick City	Clare	5,994	Transfer in County Clare
2017	Tipperary	Limerick City	4,375	Transfer in County Tipperary
2017	Offaly	Tipperary	10,847	Clare – Limerick – Tipperary
2017	Laois	Kildare South	7,892	Transfer in County Kildare
2017	existing Laois	Kildare South	9,450	Transfer in County Laois
2017	existing Offaly	Kildare South	2,404	Transfer in County Offaly
2017	Kildare North	Kildare South	3,226	Transfer in County Kildare
2017	Wicklow	Carlow-Kilkenny	4,501	Transfer in County Carlow

Table 45: Table of Historical Population Transfers between Dáil Constituencies in Ireland from 2012 to 2017 Classified by Transfer Location.

B Maps

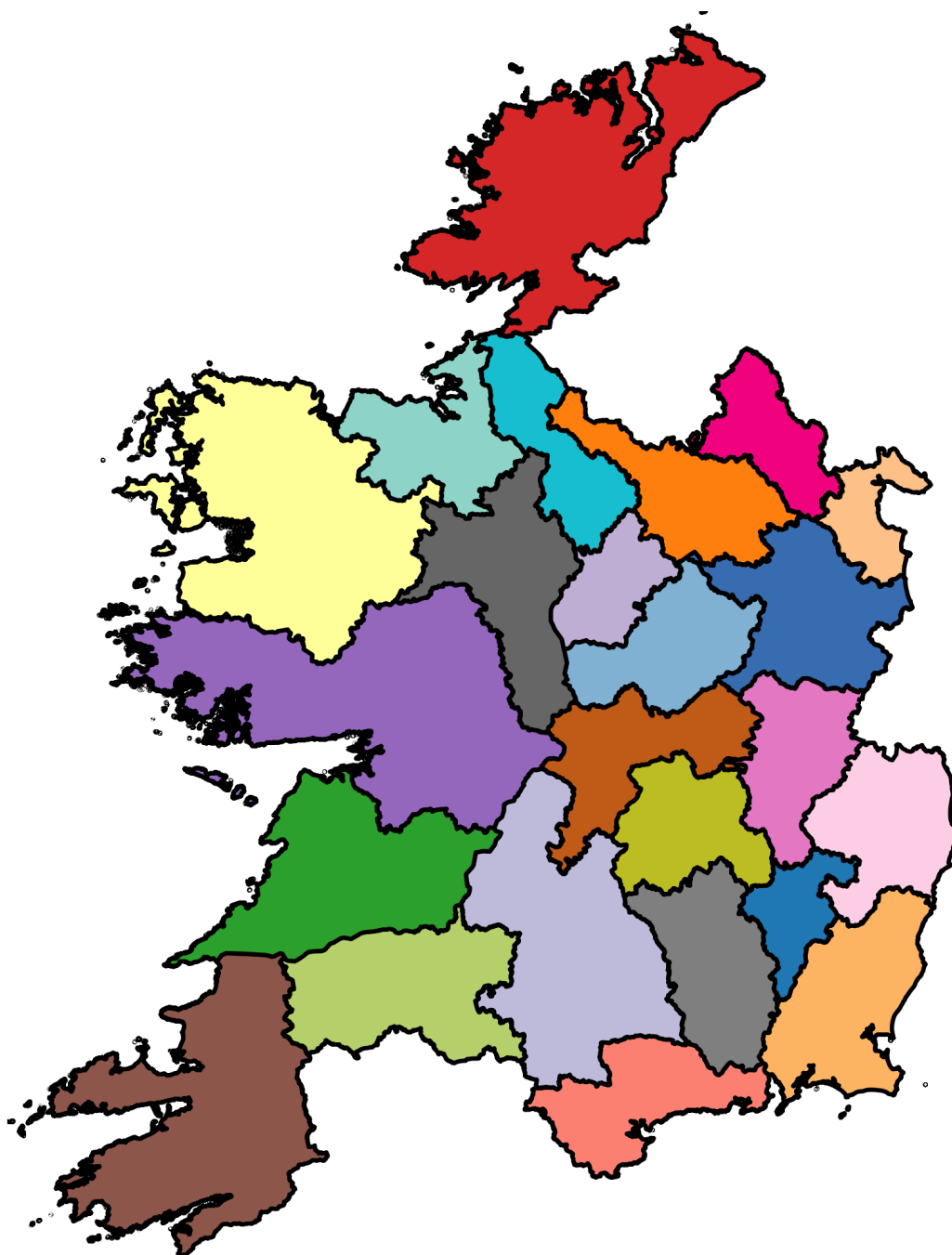


Figure 20: Counties being considered in this submission

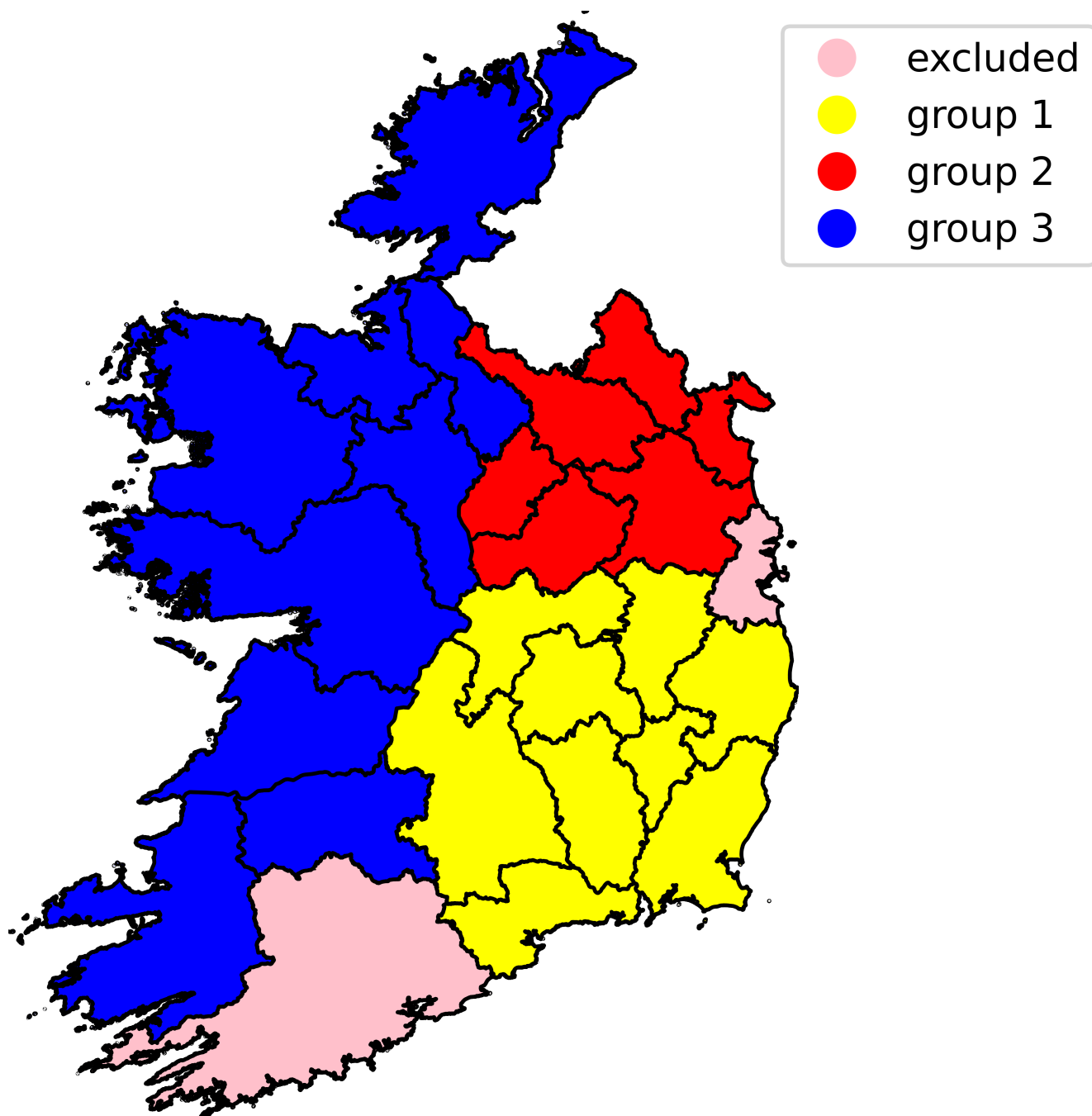


Figure 21: Map of the Groupings