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Indicators of Agglomeration: Using Population Density Grids to Assess Growth Momentum in Identifying the Emerging City of Drogheda with Laytown-Bettystown-Mornington (LBM).

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Abstract:

In earlier research literature this author deployed both population size and daytime working population data as measures of potential settlements, for selection as comparable growth centres for the National Spatial Framework, vide Hughes (2013). An identified problem, encountered in defining urban settlements and that of their spatial extent, is the dilemma of opposites; of being able to distinguish between the physical 'separation' and the agglomerating 'contiguity' of discrete settlements.

Focusing on linear distance as its principal 'separation' measure, the United Nations provides a limiting description, for separation, in the task of quantifying singular urban fields of agglomeration and thus in identifying processes of city formation. In contrast, The World Bank advocates three 'D's which, in addition to Distance and Division, includes Density (2009). Particularly for Ireland as a sparsely-populated country this latter measure assumes particular importance, especially given Ireland's scarce number of large settlements and their linear distances from each other. The Central Statistics Office (CSO) now has the facility for grid-enabled data, which can be used in distinguishing between examples of scattered morphology of sparsely-populated ribbon development in contrast to that which can identify densifying urbanisation.

Prior to the availability of the 2016 census population results this paper investigates and applies population grid data measures based on the CSO grid-based demographic data from the 2011 census. Applied to a real-life example, this technique facilitates the further research objective of identifying Ireland's emerging sixth city, the east coast agglomeration of Drogheda with Laytown-Bettystown-Mornington (LBM).

In its census of 2011, the CSO adopted the United Nations updated convention for Settlement distancing in its application of the '100 Metre' rule for settlement separation. This is applied to habitable buildings, including both residential and non-residential structures. The rationale for its use is ...to avoid the agglomerating of adjacent towns caused by the inclusion of low density one off dwellings on the approach routes to town. CSO 2011 Census, Area Volume, Appendix 1.

Analysing the agglomeration of LBM with Drogheda and in comparing this with that of Blackrock (Louth) with Dundalk, on the basis of the EU Grid criteria this Paper concludes by noting the need to distinguish between physical separation and that of physical agglomeration and proximity densification, especially for governance and local administration purposes in this new Putting People First era of local governance rationalisation.

1. Census Geography - Applied Measures:

The CSO's evaluation of settlement size is set out in their *Population Classified by Area* Volumes of recent census results, *vide* Appendix 1, *Census Geographic Definitions*, PP. 151-155, CSO (2012). It applies the linear distance rule for confirming settlement separation, applied so as to distinguish between a densely-populated urban field and an adjoining elongated ribbon of mainly housing development that often occurs on access routes to a defined city or town settlement. The objective is to provide definitive and regular-shaped settlements, thereby defining their footprints from their surrounding rural morphology.

Such measures for 'division' are effective in dividing discrete new urban areas such as Bearna from Galway and Balrothery's separation from Balbriggan, resulting in creating these new town settlements in 2011. Prior to the 2011 Census, the CSO applied a 200 metres measure and with the UN reduction to 100 metres, its effect has been to divide off and separate urban areas so as to create new towns.

However, the application of such tests on their own, for cases of emerging urban agglomeration are inadequate, especially in such cases where two settlements are expanding towards each other and wherein, the provision of shared, linking infrastructure, the momentum of development is designed for and is resulting in their singular densified agglomeration, thereby producing a much larger unified settlement as one that may have more than one central core.

The opposite effect from an inappropriate application of the '100 Metre' rule can serve to ignore or overlook cases such as the emergence of bi-centric, adjacent settlements that are in a process of agglomerating and which are thus forming a larger settlement. One conspicuous example of this failure to 'see the wood from the trees' is that of Drogheda's progress in its agglomeration with nearby Bettystown-Laytown-Mornington (LBM) wherein yet another Local Government boundary adjustment has been initiated in late-2015, confined to Drogheda, with the objective of facilitating its local government administration. Yet, there is no recognition of the bigger picture, of Drogheda's agglomeration with LBM.

2. Impending Urban Boundary Changes and Local Governance Issues:

Notwithstanding Ireland's unusually low level of urbanisation – with a 2011 share of just 62.05% of its population living in settlements of 1,500 and over – its urban development 'catch up' process is resulting in both population growth and a spreading of its urban settlements. Accordingly, many of its cities and towns are experiencing outward growth wherein its towns and environs are spreading beyond their former administrative boundaries.

Thus existing settlement boundary lines are being breached with successive waves of outward development. Whereas in the census of 1996 the CSO listed twenty settlements whose population overlapped into another county, by 2011 that number had extended to twenty-eight settlements, *vide* Appendix 4 *Ibid.*, *Populations of Towns or Environs/Suburbs which are located in more than one county*. For modern-day local government administration, such geographic expansion presents particular difficulty and the over-riding objective is to manage single-settlement administration within one county authority.

The frequency of such county-boundary straddling now requires a more inclusive treatment for local governance purposes than the existing, blunt, solution of adjusting county boundaries. In implementing local governance reform since the 2011 census the first-phase in the current processes of local government has focused on the rationalisation and merging of county and city units, sometimes with considerable, unresolved, controversy and opposition, as in the case of Cork.

A second phase in this process of Local Government rationalisation addresses the dilemma of governance adjustments for some larger and expanding settlements. It is noted that the foresighted provisions of *Putting People First* proposes flexible arrangements for cases of straddling settlements. However, such aspiration is likely to require updated, matching legislation that has not yet found its way onto the State's statute books.

Current boundary revisions are being undertaken under outdated 1991 Local Government legislation for Waterford City, Drogheda, Carlow and Athlone towns, in descending order of population size. The misguided objective is to contain such settlements within a single county for administrative purposes and to so do by redrawing county boundaries where considered expedient. Such administrative 'juggling' is intended to be implemented regardless of the evident extent of local business, resident and sporting opposition. This will involve rates-base adjustment or in the creation of further geo-physical anomalies. In Drogheda's case the centre line of the Boyne was the original Elizabethan county boundary.

3. Drogheda – the grid-based evidence for a wider-based Boundary Review:

Despite the publication in 2013 of the Government's visionary *Putting People First* Action Programme for Local Government, the Department of the Environment Community and Local Government (DoECLG) intends to undertake yet another, conventional, review of Drogheda's former Borough boundary under Section 28 of the now dated Local Government Act 1991 Act rather than implementing the principles contained in the *Putting People First* initiative, in pursuance of the administrative objective to retain larger single settlements within a single county council area – even if this will entail other county boundary 'transfers' such as is proposed for Roscommon to Westmeath and from Meath to Louth.

The population growth evidence points to Drogheda's likelihood, to continue its demographic growth at up to three times that of the State population growth rate since 1996 and when confirmed in the census of 2006, it then became and continues to be Ireland's largest town. It is necessary to distinguish the important and unique case of adjoining and merging high-density agglomeration and immediate proximity for Drogheda-LBM, in contrast to low-density and/or geographically separated low-density ribbon development, elsewhere in Ireland. Drogheda-LBM provides a near-unique situation in Ireland where two adjoining plus-10,000 settlements are physically merging.

This ongoing agglomeration momentum is supported by the recent provision and commissioning of a 100,000 population capacity waste-water tertiary treatment plant at Marsh Road, Drogheda with its linking sewer networks and likewise with the completion of

a District-level Shopping Centre at Southgate and the commencement of further residential development that will consolidate the merger of Drogheda with LBM.

In the current local government rationalisation programme, demographic scale is one of two principal issue in question that distinguishes this Boundary Review that marks Drogheda's difference with all previous such revisions. This will result in about 14,000 people who reside south of the Boyne being 'placed' in County Louth pending the 2016 census outcome. This will involve a transfer to Louth of a further seven or more additional square kilometres of what is now part of County Meath. In Drogheda's case, previous county boundary 'adjustments' on a smaller scale, have already resulted in the cumulative 'transfer' of a similar sized area south of the Boyne, from County Meath to County Louth.

The second issue is that of identifying the emergence of a new city on the demographic scale of Waterford City. Unlike Waterford, Carlow and Athlone what differentiates Drogheda is the zero 'Distance' separation *cum* urban proximity of another large *i.e.* plus-10,000 town that presents the most significant factor for the future administration of Ireland's emerging city. These three other settlements are 'stand-alone' ones and unlike Drogheda, they are not adjoined another settlement of 10,000-plus. Of itself LBM is Ireland's thirty-fifth largest town and in 2011 it rivalled Ashbourne as Meath's second-largest town.

The boundary review documentation shows Drogheda's proposed indicative and blue-hatched boundary line to the south of the current Borough area of Drogheda which will result in the town's new boundary extending to the western edge of LBM. To accommodate Drogheda's expansion it also will be necessary to adjust its existing northern boundary line within County Louth which will affect a further 2,000-plus of the town's population.

4. Drogheda-LBM's Population Urban Field Grid Matrix

The Urban Field of the Drogheda-LBM Population Density Grid on a One Sq. Km. basis is applicable to the OSI Discovery Series Map 43 (Fourth Edition, 1:50,000 scale) for the 2011 census population is set out in a population grid format, kindly provided by the CSO to this author in December 2015.

As the complete matrix for the twin settlement of Drogheda and LBM confirms, this grid formation extends to a north-south depth of ten kilometre rows. The respective core populations are set out in an 'all-border' format, comprising the fourteen medium-density central grids totalling 11,297 in population for LBM, located immediately east of and next to the twenty grids totalling 37,669 for Drogheda. Together, these adjoining 34 sq. km. grids comprise a core agglomeration population of 48,996 having an average density of 1,440 people per sq. km., set out as follows:

Drogheda-LBM 2011 census Population Spread – OSI Map Grid References:

Grid cells	<u>6/7</u>	<u>7/8</u>	<u>8/9</u>	<u>9/10</u>	<u>10/11</u>	<u>11/12</u>	<u>12/13</u>	<u>13/14</u>	<u>14/15</u>	<u>15/16</u>	<u>16/17</u>	<u>Totals</u>
79/80	131	54	86	9	28	107	58	97	40	37	-	647
78/79	26	6	27	59	58	84	52	83	5	-	-	400
77/78	20	17	61	16	449	153	79	65	99	-	-	959
76/77	74	219	2,643	3,308	2,423	10	5	80	489	306	-	9,557
75/76	1,212	1,534	3,226	3,553	823	5	46	112	275	1,059	-	11,845
74/75	1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	-	18,314
73/74	73	553	494	705	435	861	56	13	1,224	2,162	185	6,761
72/73	42	20	80	62	45	13	106	11	90	705	392	1,566
71/72	5	25	87	-	85	5	15	20	35	443	1,378	2,098
70/71	51	25	5	61	76	43	52	253	223	21	8	818
Total	2,662	6,084	9,892	10,500	6,833	3,751	1,142	1,486	3,228	5,424	1,963	52,505

Footnote:

So as to maintain local anonymity, the CSO records a count of '5' where grids have recorded census populations of between 1 and 5. Zero-populated grids are as shown. So as to make the interpretation of the grid more manageable, it limits the matrix size to eleven kilometres in width and ten kilometres in depth. It is however recognised that this surface area is therefore somewhat smaller than that of the Drogheda and District area (population 60,646 in 2011) and somewhat smaller again than the Louth and Meath Rural Areas plus Drogheda Borough (population 78,594 in 2011). It is of a size that captures the adjoining Drogheda and LBM towns and their contiguous environs.

Based on the 2011 census demographic outcome there is today, little physical or demographic separation between the settlements of Drogheda and LBM. This is confirmed in the Ordnance Survey of Ireland Map 'spine', of an unbroken high-density 'band' of population in adjoining grids. This central 'spine' extends east-west for ten square kilometres, identified in an axis along the grid 74/75 (including from references 6/7 to 15/16), as shown in the **one-kilometre cells** of this Discovery Series, map No. 43.

This is used as the grid-base for the CSO's grid matrix of populations based on the 2011 census, The west-to-east populations along this 'spine' grid line 74/75, comprises an aggregate population of 18,314, identified in their respective one sq. km. populations which is set out in the following Greater Drogheda's Urban Field Grid Matrix, showing this consolidated 'spine' cells extract, thus:-

	<u>6/7</u>	<u>7/8</u>	<u>8/9</u>	<u>9/10</u>	<u>10/11</u>	<u>11/12</u>	<u>12/13</u>	<u>13/14</u>	<u>14/15</u>	<u>15/16</u>	<u>Total</u>
74/75	1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	18,314

Source: Part of the CSO population grid one-kilometre square matrix dimension, as requested and kindly provided to Brian Hughes, December 2015.

The six left-hand side Drogheda grids, east to include grid 11/12, are immediately followed by the four right-hand LBM ones from 12/13 eastwards. This agglomeration spine' for Drogheda-LBM conclusively presents an interfacing and uninterrupted population density for these adjoined settlements. Furthermore, these 'spine' data represent just one row of a ten-row deep matrix. Their spatial argument, confirming this twin-settlement merger for Drogheda-LBM, is based on this east-west spine of 110 adjacent population grids as laid out hereunder in the matrix grid. These identified ten adjoining 'spine' square kilometre cells have an average population density of 1,831.4 which is higher than the density of any of the four provincial cities in Ireland in that census.

A significant distinguishing feature between 'ribbon development' morphology and a dense, continuous 'urban field' is the extent and depth of development. This author avers the selection of one-kilometre-square grids which is a spatially significant depth; a measure in linear terms which is ten-times that of the 100 metre UN distance. However, in evaluating the process of urbanisation for evolving large settlements and in allowing for pockets of undeveloped land or of large underdeveloped sites, it is also desirable to balance 'space' area with density, discussed as follows using the example of the linking of Dundalk with its adjoining seaside suburb of Blackrock, Co. Louth

5. Dundalk and Blackrock – a Grid Comparison with Drogheda-LBM:

For Ireland second largest town which is Louth's County Town, Dundalk where its seaside suburb of Blackrock is centred to its south at some three to four kilometres remove. All together they comprise a 2011 census settlement population of 37, 816, where Blackrock

comprises 6,500 of its total population. Blackrock is adjudged to conform to the U.N. distance rule and thus to be included as the southern part of a single Dundalk settlement.

However, the one-kilometre square grid populations, when compared with the above Drogheda-LBM grid, reveals that its linking cells are less dense than those comparable ones for Drogheda-LBM, the latter settlement's identified linking cell density being diluted to 328, 482, 117 and 853 persons per square kilometre because of the presence of an 18-Hole golf course at Haggardstown. They are set out in a similar OSI Grid-map Discovery Series No. 36 (2007) format including the specified grid-cell references, as follows:

Dundalk-Blackrock 2011 Census

Population Grid – OSI Map References:

Cells	<u>02/03</u>	<u>03/04</u>	<u>04/05</u>	<u>05/06</u>	<u>06/07</u>	<u>07/08</u>	<u>08/09</u>	<u>Totals</u>
09/10	158	676	380	276	-	50	88	1,628
08/09	236	2,650	1,799	120	362	-	54	5,221
07/08	35	2,232	2,314	1,807	1,854	753	272	9,267
06/07	90	1,024	1,304	4,360	2,872	50	19	9,719
05/06	97	85	637	2,802	2,105	-	-	5,726
04/05	52	69	29	378	328	117	-	973
03/04	66	39	67	255	482	853	-	1,762
02/03	109	83	159	471	2,028	599	-	3,449
01/02	6	27	21	31	331	-	-	416
Total	849	6,885	6,710	10,500	10,362	2,422	433	38,161

Source: CSO Population

Note: The boxed grids delineate the Dundalk-Blackrock 'spine', which runs in a north north-west south south-east axis.

The distorted result of applying the aforementioned U.N. distance criterion on its own, instead of utilising density-proximity measurements is that it masks Ireland's few emerging cases of urban agglomeration. **Such density research is vital to the task of settlement selection in the forthcoming National Spatial Framework, which is intended to be the replacement strategy plan for Ireland's National Spatial Strategy (2002-2020).** From a side-by-side comparing of the two sets of grid population data, the Drogheda-LBM scale and size of urban agglomeration is far superior to that of Dundalk-Blackrock. Hence, the following comparisons are instructive:

- One Km. Grid Size: Drogheda-LBM = 110 sq. km; Dundalk-Blackrock = 63 sq.km.
- Total Grid Populations: Drogheda-LBM = 52,965; Dundalk-Blackrock = 38,161.
- Linking 2-grid Populations: Drogheda-LBM = 1,425; Dundalk-Blackrock = 810
- 2011 Populations: Drogheda = 38,578; Dundalk (excluding Blackrock) = 31,316

- 2011 LBM and Blackrock Populations: LBM = 10,889; Blackrock = 6,500 (*vide* Grid).
- Densest LBM cell = 2,162; densest Blackrock cell = 2,028 population.
- Void cells: Drogheda-LBM = 9 cells; Dundalk-Blackrock = 9 cells.

Given these brief empiric comparisons and their resultant evidence bases, the NSS description of Drogheda’s status and presumed ‘function’ which is officially described as a ‘support’ town to the Dundalk Gateway represents a “tail wagging dog” assessment, focused on a misguided focus of retention of the current ‘county-town’ *status quo*. It also reflects a rigid local governance mind-set of one that refuses to address the density and scale-size evidence of Drogheda’s agglomeration with LBM. This is buttressed in selectively using the U.N. Distance Rule for settlement separation whilst choosing to ignore the fact that Dundalk inclusive of Blackrock’s 2011 population is less than that of stand-alone Drogheda without LBM.

6. Grid Spine Test: comparing Drogheda with Dundalk:

By analysing the population densities of the central spine cells that attach the respective adjoining settlements it is possible to clarify the respective levels of agglomeration of Drogheda+LBM compared with Dundalk including Blackrock Co Louth, in 2011. By definition, the Dundalk-Blackrock infill typifies a ribbon infill morphology which is essentially fixed because of the aforementioned presence and hollowing-out effect of its 18-hole golf course. Along the west side of the golf course, another ‘ribbon’ development links Dundalk southward to Blackrock represented by the cell grids of 378 and 255 populations. In contrast, Drogheda’s higher density link-cells already exhibit much superior densities, despite still having further infill-land development potential. First are the data Dundalk’s spine cells:-

<u>03/04</u>	<u>03/04</u>	<u>04/05</u>	<u>05/06</u>	<u>05/06</u>	<u>05/06</u>	<u>06/07</u>	<u>06/07</u>	<u>06/07</u>	<u>Total</u>
<u>@09/10</u>	<u>@08/09</u>	<u>@07/08</u>	<u>@06/07</u>	<u>@05/06</u>	<u>@04/05</u>	<u>@03/04</u>	<u>@02/03</u>	<u>@01/02</u>	
676	2,650	2,314	4,360	2,802	378	482	2,028	331	16,021

Source: OSI Grid-map Discovery Series No. 36 (2007): west-east first, followed by their north-south coordinates for these nine one-kilometre square populations.

For convenience of easy comparison, the corresponding Drogheda spine cells are shown again, as follows:

Greater Drogheda’s consolidated ‘spine’ cells extract, thus:-

	<u>6/7</u>	<u>7/8</u>	<u>8/9</u>	<u>9/10</u>	<u>10/11</u>	<u>11/12</u>	<u>12/13</u>	<u>13/14</u>	<u>14/15</u>	<u>15/16</u>	<u>Total</u>
<u>@74/75</u>	1,028	3,631	3,183	2,727	2,411	2,470	673	752	748	691	18,314

Source: Part of the CSO population grid one-kilometre square matrix dimension, as kindly provided to Brian Hughes, December 2015.

Thus Drogheda's interface with LBM is at the point shown as where cell (population) 2,470 meets 673; the corresponding Dundalk interface with Blackrock is at the point where population cell 2,802 meets 378. The next respective cells show respective populations of 482 for Dundalk's Blackrock and 752 for Drogheda's LBM. Accordingly, the Drogheda link-cells are significantly denser in populations than those of Dundalk's. The lower densities for Dundalk's link cells are explained primarily by the positioning and location of the golf course. Yet, the contrasting case of Drogheda is noted as one where these specific cells contain some residentially zoned lands which remain to be developed.

Contrasting these two sets of adjoining settlements, it is noted that the NSS in focusing exclusively on the U.N. 'distance' rule deems Drogheda's agglomeration with LBM as one that suggests linear dis-contiguity whilst having no regard for the parallel evidence of density and proximity as adduced above. In contrast to this the NSS seeks to rely solely on the formulation of far-fetched 'Linked Gateways' and 'Linked Hubs', where average distances are some 19 miles (30 km.) separating individual settlement populations in the 10,000 to 100,000 range, but typically for settlements of about 15,000 to 20,000 (e.g. Athlone, Tullamore and Mullingar).

Yet the NSS gave no similar recognition to adjoining urban density and settlement agglomeration cases where there is no effective distance separation, and as is demonstrated in e subject research when applied to the agglomeration of Drogheda-LBM, given their combined population size and population-grid evidence of density.

Thus it is apposite to address the demographic data supporting the Drogheda-LBM agglomeration as Ireland's next city: one that matches the demographics of fifth-city Waterford, based on comparative evidence of selected growth centres, including that of Dundalk.

7. Demographics and the Drogheda-LBM Growth Momentum:

Pending receipt of the 2016 Preliminary census figures, the data set out in Appendix 1 below summarises the 2011 composition of the Greater Drogheda Area and of its sphere-of-influence components, namely the Louth and Meath Rural Areas including the existing Drogheda Borough, comprising a 78,594 population total – *i.e.* more than twice the population of County Longford. Due to the much faster rates of growth since the 1996 census, this Appendix confirms that population total in 2011 is almost evenly split for the north and south banks of the Boyne.

Given the locational advantages of the south bank area, including the south suburbs of Drogheda and LBM, especially given its accessibility to Dublin, the Airport and the M50, it is unsurprising that the two towns are well advanced in their agglomeration with one-another, boosted by the rate of population growth: one that is an historic multiple times that of Waterford city. Also noted, compared with Dundalk's 10,880 'at work' figure Drogheda +LBM's total in the 2011 census was 15,540, resulting in Dundalk being 69.48% of the latter.

As already noted, this unique case of Drogheda-LBM is not repeated in the three other proposed boundary review cases of Waterford, Carlow or Athlone, all of which are stand-alone settlements and are not remotely adjoined to another large town. It is also notable that in the 2011 census, LBM itself was larger in population than Enniscorthy, Tramore or the county towns of Wicklow or Cavan.

Accordingly, the nature of the current Boundary Review and its Terms of Reference misrepresent what has been happening on the ground and are both short-term in effect and are unfit for purpose in addressing the wider demographic picture thus:

Greater Drogheda:- Demographic Growth Evidence from 1996-2011 Censuses

Analysis of Greater Drogheda in 2011:

SUMMARY: Greater Drogheda: Urban and Rural North and South of Boyne								Share of
	Borough	Add non-Bor.	Town+envs.	L-B-M	Dr.+LBM	Rural (net)	TOTAL	Total pop.
North of River	23,830	2,202	26,032	0	26,032	13,279	39,311	50.02%
South of River	<u>6,563</u>	<u>5,983</u>	<u>12,546</u>	<u>10,889</u>	<u>23,435</u>	<u>15,848</u>	<u>39,283</u>	<u>49.98%</u>
Total	30,393	8,185	38,578	10,889	49,467	29,127	78,594	100.00%
Share:	=78.78%	=21.22%	=100.00%					

Analysis of Greater Drogheda in 1996:

SUMMARY: Greater Drogheda: Urban and Rural Growth North and South of Boyne								Share of
	Borough	Add non-Bor.	Town+envs	LBM	Dr.+LBM	Rural (net)	TOTAL	Total pop.
North of River	21,501	36	21,537	0	21,537	7,659	29,196	62.85%
South of River	<u>2,959</u>	<u>786</u>	<u>3,745</u>	<u>3,678</u>	<u>7,423</u>	<u>9,832</u>	<u>17,255</u>	<u>37.15%</u>
Total	24,460	822	25,282	3,678	28,960	17,491	46,451	100.00%

Growth in populations over the 15 years to 2011:

	Borough	Add non-Bor.	Town+envs.	LBM	Dr.+LBM	Rural (net)	TOTAL	Share of Growth
North of River	2,329	2,166	4,495	0	4,495	5,620	10,115	31.47%
South of River	<u>3,604</u>	<u>5,197</u>	<u>8,801</u>	<u>7,211</u>	<u>16,012</u>	<u>6,016</u>	<u>22,028</u>	<u>68.53%</u>
Total	5,933	7,363	13,296	7,211	20,507	11,636	32,143	100.00%

GDrA: % Growth: 15 years to 2011:

	Borough	Add non-Bor.	Town	LBM	Dr.+LBM	Rural (net)	TOTAL
North of River	10.83%	6016.67%	20.87%	0.00%	20.87%	73.38%	34.65%
South of River	<u>121.80%</u>	<u>661.20%</u>	<u>235.01%</u>	<u>196.06%</u>	<u>215.71%</u>	<u>61.19%</u>	<u>127.66%</u>
Total	24.26%	895.74%	52.59%	196.06%	70.81%	66.53%	69.20%

Source: Analysis of CSO censuses of 1996 and 2011, by Brian Hughes, extracted from the Area Volumes, 1.

Note: By mid-July of 2016 the CSO will publish the Preliminary 2016 Census Results. This will provide the first of that censuses Electoral District (ED) population figures for Greater Drogheda. The relevant north Boyne EDs are: Clogher, Dysart, Monasterboice, Mullary, St. Peter's and Termonfeckin. South river the relevant EDs are: St. Mary's, Ardcath, Duleek, Julianstown, Mellifont and Stamullin. It is noted that the St. Peter and St. Mary EDs are split into their respective Borough and rural contents reflecting the pre-boundary review position.

8. The Greater Drogheda Population Urban Field:

These data sets provide incontrovertible evidence of the Drogheda-LBM progress in their agglomeration with each other, based on the 2011 census and the population disposition of Greater Drogheda's Population Urban Field. It is noted that at this early 2016 position in time, we are now at the completion point of the time-cycle between the 2011 and 2016

censuses. In the fifteen years to 2011 the Greater Drogheda population growth was 77.92%, being nearly three times the 26.53% growth for the State since 1996. Accordingly, there needs to be a close scrutiny of the 2001-2016 demographic growth momentum that has undoubtedly taken place since April 2011 that will further reinforce the agglomeration of Drogheda and LBM.

The *Preliminary Report* on the CSO 2016 Census will provide the earliest direct comparison at the Rural and Borough Electoral Districts with the populations of the 2011 Census *Preliminary Report*. Given the young age profile and family formation propensity of the more recently established population growth south of river, it is to be expected that the argument in favour of amalgamating the Greater Drogheda Area population, but especially that of Drogheda with LBM with their intrinsic growth momentum, is both a persuasive and realistic one. As it has been found possible to recognise Dundalk with Blackrock (Co Louth) as a single settlement, how much more so is it arguable to do so as between Drogheda and LBM given their single urban field, based on the evidence of this Paper.

9. Harmonised European Union (HEU) Definition of 'City'

The final area of this research focuses on the EU's new set of rules for defining cities. Until 2015, there was no harmonised definition of 'a city' for European and other countries member of the Organization for Economic Co-operation and Development (OECD). This undermined the comparability, and thus also the credibility, of cross-country analysis of cities. To resolve this problem, the OECD and the European Commission has developed a new definition of a city and its commuting zone in 2011. This new definition works in four basic steps and is based on the presence of an 'urban centre' a new spatial concept based on high-density population grid cells. Source: Dijkstra, L. and Poelman, L. (2015), *European Cities – Functional Urban Area Definition*, European Commission, DG Regio

- Step 1: All grid cells with a density of more than 1 500 inhabitants per km² are selected (Map 1.1).
- Step 2: The contiguous^[1] high-density cells are then clustered, gaps^[2] are filled and only the clusters with a minimum population of 50 000 inhabitants (Map 1.2) are kept as an 'urban centre'.
- Step 3: All the municipalities (local administrative units level 2 (or LAU2) with at least half their population inside the urban centre are selected as candidates to become part of the city (Map 1.3).
- Step 4: The city is defined ensuring that 1) there is a link to the political level, 2) that at least 50 % of the city population lives in an urban centre and 3) that at least 75 % of the population of the urban centre lives in a city (Map 1.4)^[3]

In most cases, as for example in Graz, the last step is not necessary as the city consists of a single municipality that covers the entire urban centre and the vast majority of the city residents live in that urban centre.

10. Interpretation of HEU Measures:

In the 2011 census Drogheda+LBM had twelve grids with densities of 1,500 and over together with a further five with 1,000-plus populations. Dundalk+Blackrock's respective count is eleven and two.

In applying the above 4-step test in comparing Drogheda+LBM with Dundalk+Blackrock the following observations are noted. Dundalk+Blackrock fails on the application of the Step 2 minimum population requirement of 50,000 whereas Drogheda+LBM exceeds that minimum population criterion, but as in the anomalous case of Waterford City, only so when the matrix of all adjoining grids are included. Thus, when these kilometer-square grid cells of at least 1,500 population are identified, the test for 'contiguity' requires each of its surrounding eight cell cluster, in turn, to abut the one whose central cell has a population of at least 1,500 people.

In this context of 'compactness' this 'test' would be satisfied for the following grid cell disposition in the following extract for **Dundalk+Blackrock**, thus:

4,360	2,872	50
2,802	2,105	-
378	328	117
255	482	853
471	2,028	599
31	331	-

In identifying particular 'central' cells with their respective populations and their aforementioned 8-cell clusters, is noted that 'clusters' 2,105 and 2,028 are contiguous with one another at the point (line) where cells 328 and 482 abut.

Where Drogheda adjoins LBM the same test for comparable cell clusters are shown, thus:

823	5	46	112	275	1,059
2,411	2,470	673	752	748	691
435	861	56	13	1,224	2,162
45	13	106	11	90	705

In this case the core cell clusters of 2,270 and 2,162 are at one-remove from each other with respect to their surrounding 8-cell positioning. On that basis, Drogheda+LBM would appear to fail the second-step requirement for contiguity. However, should its cell of 1,224 population grow to equal or exceed 1,500 in a future (e.g. 2016 or subsequent census), then the EU criterion would then appear to be satisfied. This would require this 18.4% shortfall in that particular cell's population to be eliminated.

It is understood that Waterford's comparable cell structure likewise presents some similar dis-continuous anomalies in its 2011 census grid outcome. However, there appears to be provision for the individual EU State to apply for a derogation where a 'city' status already exists. Some six States have already availed of this Appeals' provision.

11. Research **Conclusions:**

The evidence adduced in this research paper, includes its application of the EU grid test to inform the ongoing emergence of Ireland's next stand-alone city; one that is on a scale-size with Waterford City. It has both a larger and denser agglomerating population than Dundalk-Blackrock. It comprises the physical and demographic unification of Drogheda-LBM.

Significant built environment/ infrastructure projects and the demographic and growth-momentum data as presented herein, articulates the progress made by Drogheda-LBM to 2011 – thrice the rate of the State's population growth. The intervening five years to 2016 has seen the 'retirement' of the defective National Spatial Strategy including its conspicuous failure to recognise this most significant example of Irish urban agglomeration. The 2002 NSS classification of Drogheda, where it was neither considered to merit a 'Gateway' nor a 'Hub' designation, but rather assigned a demeaning role as a 'support town' to Dundalk, was deeply flawed. The comparative research evidence presented in this Paper confirms that such spatial classification is perverse.

The forthcoming National Planning Framework is heralded to be evidenced-based in construction and is unlikely to ignore emerging evidence of urban agglomeration, in matrix field densification evidence and in its settlement size classification; in placing Drogheda-LBM in the vanguard of Ireland's major growth centres. Given the *CSO Population and Migration Estimates* for the four years following the 2011 census, with an overall population growth of about 65,000 for the eastern half of the State (the North-South line from Aughnacloy down to Youghal and in dividing the Border Region into its three eastern and three western counties), the forthcoming CSO Preliminary Report on the 2016 census should confirm a population level of more than 80,000 for the Greater Drogheda Area (GDrA). In the fifteen years following 1996 this had already increased by nearly 78% as shown in the above Table of GDrA data. The likelihood of continuing growth together with the evidence of population density and settlement agglomeration provides this compelling evidence for its conformation of Ireland's sixth city.

The background theory and application of grid-based measurement has been pioneered by CSO's Dermot Corcoran, in his DIT Masters Dissertation (2011) *Disseminating Irish Census data using grids: An example of combining spatial and statistical information*. The author of this research Paper is grateful to Dermot for providing the Drogheda and Dundalk grid data in excel format consistent with the respective OSI maps. The use and application of Small Area Population Statistics (SAPS) has the drawback of their wide physical-size variations in comparing the populations of small areas such as Electoral Districts.

However, the application of evidence-based population density grid data at the standardised one square kilometre, provides an internationally-recognised way of avoiding this problem. It represents an accepted methodology for obtaining such insights that utilise such Central Statistics Office data, that has been available only as recent as 2013. It should therefore be extensively utilised in the process of growth settlement selection in future national and regional-level spatial plan formulation for Ireland.

Pending Brussels' approval of Ireland's three NUTS 2 Super Regions, as provided for in the *Putting People First* Action Programme, this will assist the County Louth's integration into the East Region (Map at Page 191, *ibid*). The agglomeration of Drogheda-LBM opens the path for the new Government to undertake the process for the grant of city status. This in turn will consolidate the growth of the Dublin-Belfast Economic Corridor. The centenary of 1916 should be marked with appropriate examples of Ireland's progress and achievements. The agglomeration of Drogheda-LBM provides a significant opportunity to confirm it as Ireland's sixth city!

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